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KEYWORDS: Classification, craft research, craft systematisation, documentation, perennials, plant propagation, propagation practice.

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# Classification of Plant Propagation Practice

*By Tina Westerlund*

## INTRODUCTION

When large numbers of gardens and garden centres choose to buy ready-grown plants from other countries, the knowledge transfer in plant propagation practice is at risk. Previously, this kind of horticultural knowledge has been a natural part of the gardener's competence, but with changes in people's attitudes to plants, in divisions of labour, and in industrialisation and globalisation, local professional propagation practice is decreasing (Ryberg 2012; Olausson 2014). However, this craft tradition is important in order to meet the challenges of creating a sustainable and resilient society. UNESCO has pointed out documentation as one way to safeguard traditional craftsmanship, an intangible form of cultural heritage (UNESCO 2003). This raises an overarching question: *How can knowledge in craft be documented so that it can be conveyed to others systematically?* In this chapter I will focus on that issue in relation to the gardener's knowledge of propagating plants.

In practice situations, experiential knowledge transfer between practitioners is facilitated by the materials and actions seamlessly and in real time. When experiences and knowledge are described separately from the practice, for example as an instruction in a book, knowledge transfer may be hampered by the representational difference. Within propagation, one of the challenges in mediation lies in the great diversity of plants, their variations in form, and their differing stages of development. A common way of distributing knowledge of cultivation and propagation is by presenting information sorted alphabetically according to plant name. While this is functional, it does not support the possibilities of making comparisons and finding relationships between variations in plant forms and presumptive propagation methods. An-

other challenge in the knowledge communication is that general practice also varies because of the fact that there are personal and situational ways of doing things. A result of these different variations is that important details of the practical knowledge are often left out from the written instructions.

There is also a general problem, sometimes referred to as the tacit knowledge of craft, when the practitioner has so much of a routine within their craft that they do not have to pay attention to the knowledge that is being used (cf. Polanyi 1966, 10–11, 16–17). What is perceived as obvious is rarely described. The bodily and sensual aspects involved can be difficult to capture and put into words (cf. Tilley 2006; Ehn 2014; Palmsköld and Fabler 2018). Even so, the attention to sensual assessments is a vital part in the transfer of craft knowledge.

Motivated by these challenges, I have searched for a way of systematising plant information so that it responds better to the knowledge of propagation practice.

Systems for classifying organisms have a long tradition. One well-known example is the sexual system of the plant kingdom, launched by the gardener, botanist, and taxonomist Carl Linnaeus (Carl von Linné after his ennoblement) in 1735. Above all, classifying systems like this tend to revolve around organisms or objects being arranged into groups according to particular attributes. The systems create a practical way to sort information about the objects. In order to meet the complexity involved in communication of plant propagation knowledge, a classifying system could be adapted to the practice.

In this chapter, I will present a classification system for documentation of propagation practice that I developed during my doctoral study, and introduced in my doctoral dissertation, written in Swedish (Westerlund 2017). By documentation, I refer to different kinds of media that give information about the propagation practice. This documentation can be compiled instructions, or collective narratives of someone's experiences, told without the aim of instruction. The classification system is adapted to the vegetative methods used in plant propagation.[1] Vegetative propagation occurs in some species in the wild, but it is also used in horticulture—humans' organised cultivation. Instead of seeds, certain plant parts are used, such as pieces of stem, leaves, or roots. When they come into contact with moisture, they form new shoots and roots, and develop into new plants. My systematisation involves grouping plant parts used in vegetative propagation in order to link them to descriptions of the practice.

I will present how this classification system can be used by showing examples of documentation from the propagation of a plant called the shooting star (*Dodecatheon meadia*). This plant was chosen because I also want to highlight the necessity of craft knowledge in safeguarding plants of historical interest. The shooting star was cultivated in Sweden, as early as in the second half of the eighteenth century by Carl Linnaeus, and it grew in the flowerbed at his house in Hammarby, outside Uppsala. Today, his home and garden are a museum, and the flowerbeds have been reconstructed and the shooting star is growing there again (Figure 1A-B).[2] By keeping the plant in this place, a story is told about Linnaeus and his important work with plants. Since the shooting star does not spread by itself in this environment, a preservation of it at Hammarby implies continuous horticultural propagation.

If documentation intends to serve as a safeguarding strategy, it benefits from being adapted to the craftsmanship involved. This requires an understanding of what kind of knowledge is to be

**Figure 1A: The Shooting star (*Dodecatheon meadia*) at Linnaeus's Hammarby. Photograph by Jesper Kårehed, The Linnaean Gardens of Uppsala, Uppsala University.**

**Figure 1B–C:** The so-called mull benches outside the house at Linnaeus's Hammarby are reconstructed after Linnaeus's own descriptions (B). He writes about them in a letter to the French botanist Antoine Gouan in 1765 (Linnaeus). Among the plants is the shooting star (*Dodecatheon meadia*), which develops its leaf rosettes in the spring and blooms in the early summer (C). Photographs by Tina Westerlund.

documented (cf. Tunón, Kvarnström, and Malmer 2015; Almevik 2016). Therefore, I will also discuss the meaning of my own experience within the documented craft practice. For research to contribute to advancing practice, the research must pay attention to the needs and logic of systematising information within the practice under study.

## KNOWLEDGE PERSPECTIVES ON THE PRACTICE OF PLANT PROPAGATION

In order to make a statement about what propagation knowledge entails and how it can be documented, I have used Bengt Molander's understanding of knowledge-in-practice and his idea about three different orientations of the concept of theory (Molander 2015; 2017; Molander in this anthology). He describes theories as "human system of orientation with which we move forward, intellectually and/or in more concrete terms, in the world" (Molander in this anthology, 377). When this orientation is based on someone's experiences, it is seen as subject-oriented theory. In relation to knowledge development within craft research, Molander also emphasizes the importance of "separating the purely subjective from that which is tenable and informative for everyone with (adequate) craft proficiency" (ibid., 391).

When theory attempts to describe how to act in different contexts, Molander explains it as a practice-oriented theory. In relation to craft, he suggests that a practice-oriented theory can help to "establish and maintain robust connections between craftspeople and what they work with and on [...]" (Ibid.). Theory from an object-oriented perspective is described by Molander as follows:

> Theory is also designed to highlight (describe) 'the real,' the underlying forces and tendencies (etc.) that control what happens within a specific area of reality. A theory should go beneath the surface of empirical observations and experiences (which reach neither the smallest parts nor the biggest entireties) and present the most fundamental components of reality. Theory in this sense is to depict or represent reality. (Molander in this anthology, 377)

Molander points out that all three perspectives are needed in the understanding of knowledge-in-practice. Thus, to investigate what knowledge in practice in the craft of propagating perennials with vegetative methods entails, I have combined these three theoretical perspectives (Westerlund 2017). In this text, I will proceed from this understanding and discuss how an object-oriented perspective can be used to form links to a practice-oriented perspective. This link acts as a starting point for communicating the documentation of propagation knowledge in a systematic way.

## THE CRAFT IN PLANT PROPAGATION AND THE CRAFT IN RESEARCH

Within horticultural research, the general focus has not been to describe craft knowledge. Literature in plant propagation published by universities in the early 1900s partly describes craftsmanship in the professional tradition, but does so mostly in general terms (e.g., Bailey 1911; Kains [1916] 2007; Hottes 1925). This is natural when we consider that plant propagation was practised at that time by many people, and the know-how of, for example, when and how cuttings are made was taken for granted. In recent decades, the scientific focus has been on making cultivation in the commercial nursery business more effective (Preece 2003). The development of knowledge in the field is further described, but with less and less focus on the craft (e.g., Bowes 1999; Hartmann et al. 2002; Preece and Read 2004). With this background, there is a need to develop strategies for documenting knowledge of plant propagation. My goal is to make a contribution to this development and to bring these issues to the fore.

I have been active in the field of maintenance and cultivation of plants for many years, as student, professional gardener, teacher, and lately as a researcher. By working both alone during my research training and together with students as a teacher, I have acquired much experience in the vegetative methods of plant propagation. During this time, I compared and tested existing manuals and descriptions of plant propagation and I observed and documented plants in various stages of development. An important part of the inquiry has been participation in work at nurseries, where propagation is still part of the business (Westerlund 2014; 2017). The research methods I have used at the nurseries have consisted of interviews, observations, and participant observation (cf. Ehn and Löfgren 1996; Ehn 2011; 2014). As well as taking notes of what I heard and observed, the work has been documented with photographs and in some cases with video. Afterwards, I have brought together different types of information into documentations of the performed procedures. By using these different methods, I have switched between being the researcher and the research subject—a research strategy used in autoethnographical studies, where the researcher's personal experience is used in, for example, the analysis of a practice (Ehn 2011; Adams, Holman Jones, and Ellis 2015).

Practice as a part of the research methodology is used in practitioner-research (Niedderer and Reilly 2010; Sjömar 2017; Mäkelä and Nimkulrat 2018). In relation to research in art and design, Kristina Niedderer and Linden Reilly point out the

importance of integrating experimental knowledge in organised inquiries in order to "facilitate a holistic approach" (Niedderer and Reilly 2010, 8). They also encourage researchers in other fields to develop methods that include experiential knowledge, not only for providing data and to verify theoretical conjectures or observations, but also because:

> the inclusion of practice in the research process or as a research outcome helps to integrate and communicate those kinds or parts of knowledge that cannot easily be made explicit, such as the tacit part of experiential knowledge, commonly known as tacit knowledge. (ibid., 6)

What is the difference between professional craft practice compared to the use of craft practice in research? Peter Sjömar, director of research in the craft field, reflects upon what unites and distinguishes craftsmanship and craft research: "in both situations, one reads and interprets signs: in professional practice to choose and control between different methods and materials, and in research to manage and represent knowledge" (Sjömar 2017, 110, my translation).

My experiential knowledge from this practice field opens up the possibility for conversations with others who are experts in plant propagation. This experience helps me to interpret information, to ask relevant and specific questions, and to put the received information into a context. I can relate to what the other expert says and performs, although a certain propagation situation is new to me. This in turn means that I am more likely to be accepted in the craft environments I visit, as mutual experiences increase opportunities for communication (Kaiser 2000, 103). Based on our mutual experiences, we can communicate and reflect over the actions, and on descriptions of actions. By working together, communication and experiential knowledge transfer can also take place in action.

## EXISTING SYSTEMS OF CLASSIFICATION FOR VEGETATIVE PROPAGATION

Since there are a lot of presentations of vegetative propagation in literature, there are also a number of examples of how information can be collected and communicated. Each source of literature gives examples of systematisations. Handbooks on gardening or specialised literature on plant propagation contain descriptions of horticultural propagation, while the botanical literature describes plants' natural ways of spreading. In this section I briefly discuss advantages and disadvantages in the systems used for categorisation in horticultural and botanical literature. This is followed by a reflection of how gardeners themselves gather their experiences.

### Systematisation in Horticultural Literature

The conventional way of communicating knowledge about the cultivation and propagation of plants in horticultural literature is to sort information according to the names of the plants (e.g., Miller 1733; Bailey 1911; Lorentzon 1989; Toogood 2006). This is usually arranged in alphabetical order of the scientific name of the plants. This system makes it easy to find information related to the plant that you are searching for, and more information can be added successively. The system has its disadvantages, however. Carl von Linnaeus criticised it in the eighteenth century: "If the cultivation of individual plants were to be described in this way, the work would grow into so many books that it could scarcely ever be read" (Linné [1754] 2007, 13, my translation). Linnaeus had a point; certainly, the gathered information would soon be too extensive to be able to give an overview of it. He believed that the only way to give the horticultural culture a place among the "noble sciences" was to choose a method that describes gardening

according to climate and soil—in other words, to classify it based on plant environments (ibid., 13).

Examples of systems for presenting descriptions of propagation based on plant environments are represented in some horticultural literature (e.g., Hills 1950; Toogood 2006). These kinds of classification categorise the propagation methods by explaining how cultivation should take place in relation to the environments from which the plants originate. From a craft perspective, this way of explaining horticultural practice says more about adaptations to the growing environment than how variants of methods are adapted to a large diversity of plant forms.

Other systems for presenting propagation methods are based on the plant parts that are used for propagation, such as shoot tips, stems, leaves, bulbs, or roots (cf. McMillan Browse 1999; Hartmann et al. 2002). These systems provide descriptions for a number of different propagation methods. In some cases, a general description is given for each method; in others, the methods are described on the basis of one or a few plant examples. The disadvantage of most of these systems is that they use examples of woody plants (trees and shrubs) more than they do herbaceous plants (perennials and annuals). This often results in even greater generalisations, which result in further difficulties when comparing the description with a real case.

A related subject area that utilises classification of both plants and methods in a systematic way concerns weed control. This subject area is about unwanted propagation and describes methods for combating the spreading of plants. When weeding methods are communicated, it is partly done on the basis of different plant forms, like how to handle plants with deep tap roots or plants with horizontally growing stems (e.g., Bolin 1933; Adams 2004; Lundkvist 2014).

## Related Systems of Classification in Botany

Other types of classification systems that can be linked to vegetative propagation are those used in botany to describe plant morphology (the outer shape of the plants), life cycles, and dispersal biology (cf. Klimeš et al. 1997; Bell 2008; Widén and Widén 2008). These systems contain descriptions of the different parts of a plant, but sometimes also how plants develop over time. The main groups in most of these systems are based on *stems*, *leaves*, *roots*, and *flowers.*

Another system based on life cycles concerns the so-called "life forms" that Christen Raunkiær first published in 1907 (Raunkiær 1934). It does not sort plants according to vegetative reproduction methods but according to how they survive cold or dry periods, specifically where the surviving parts are located in relation to the ground surface.

None of these botanical classifications are adapted to the practice of plant propagation. However, they have some similarities with the knowledge held by the experienced plant-propagating gardener.

## The Gardener's Systematisation

Some of the gardeners I have met document which plants they propagate at a certain time.[3] The records seldom contain descriptions of how things are done, but they are an example of gathered information recorded in chronological order, which can later be supplemented with experiences of results. This is information that links plants to different human actions at different times in a propagation process. Such documentation is sorted by plant name. For the gardener, it is a functional way of gathering information that can be saved for many years and used for assessments in future working situations. Throughout my conversations with other gardeners, I perceive that their systematisation of experiences mainly takes place in another

way, which is not as easy to document. It could be described as an 'inner systematisation' to gather knowledge of plant forms, how plants change over time, what properties are of importance, and the outcome of different propagation methods.

Historian Pamela Smith describes something similar when she presents experiences from reconstructions and interpretations of an instruction on binder making with elm roots from a sixteenth-century technical manuscript (Smith 2016). In the reconstruction, they became aware that they could not get the guidance in today's categorisations where elm is represented because these only took morphological descriptions into account. Smith noticed that the author of the manuscript, presumably a craftsperson, seems to have performed his own taxonomy: a categorisation of the materials "on the basis of the properties they exhibit, or the processes through which he puts them." She calls it "his system of classification" (ibid., 223–24).

When Donald Schön presents his theory of knowledge in professional practice, he describes that the reflective practitioner builds up "a repertoire of examples, images, understandings and actions," which "includes the whole of his experience, as well as being accessible to him for understanding and action" (Schön [1995] 2003, 138). Likewise, I see the gardener's inherent propagation knowledge as a repertoire of examples, based on comparisons of actions in relation to different plants and their developmental stages. Development processes in gardening vary in time, which means that in some cases it takes a very long time to build an experience of these, if it is even possible at all. The knowledge can be conveyed through examples, but the whole repertoire of experiences that this knowledge is built on is not represented in these examples. Even the knowledge of systematising information can be seen as tacit.

Both of these ways of systematising experiences—"the chronological" and "the inner"—are specifically adapted to the gardener's own practice. What I developed as a result of my research is a form of systematisation that can gather experiences from many different types of activities and situations of work with plant propagation.

## A CLASSIFICATION SYSTEM FOR THE PROPAGATION PRACTICE

The method for systematising that is presented allows plant parts to be linked with information about the practice of horticultural plant propagation. From now on I will refer to this system as the Classification of Propagation Practice (CPP). Unlike most other systems of presenting propagation practice I have found, the CPP only involves perennial herbaceous plants. I have made a hierarchical system of plant materials, grouped according to the differences in their structure. The system is built in three to four levels of groupings which lead to 32 groups, or categories, of plant parts. These 32 categories represent different plant parts used in vegetative propagation of perennials. I call these *propagating parts*. The classification results in the grouping of propagating parts with different attributes, and these differences also require different methodologies in the propagation practice. Here follows a brief description of how the system is formed.

What is special about this system compared to others is the division of plants into three main groups: 1) parts above the ground; 2) parts above the ground and underground; and 3) underground parts (Figure 2). These three groups constitute the first level in the hierarchical system. Here, I was inspired by Raunkiær's division which is based on where the surviving organs of plants are situated

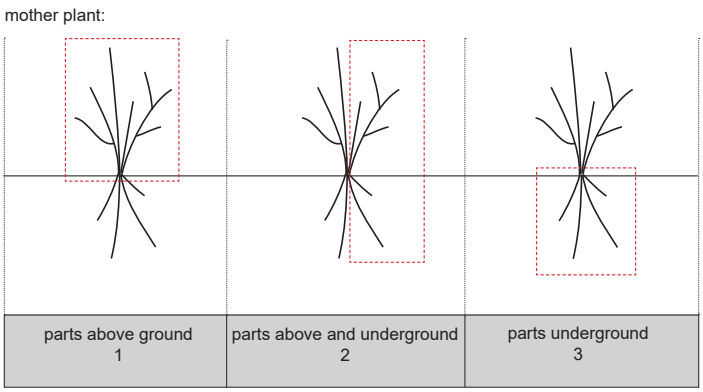


**Figure 2:** The three main groups in the Classification of Propagation Practice (CPP). Image by Tina Westerlund (revised from Westerlund 2017, 74).

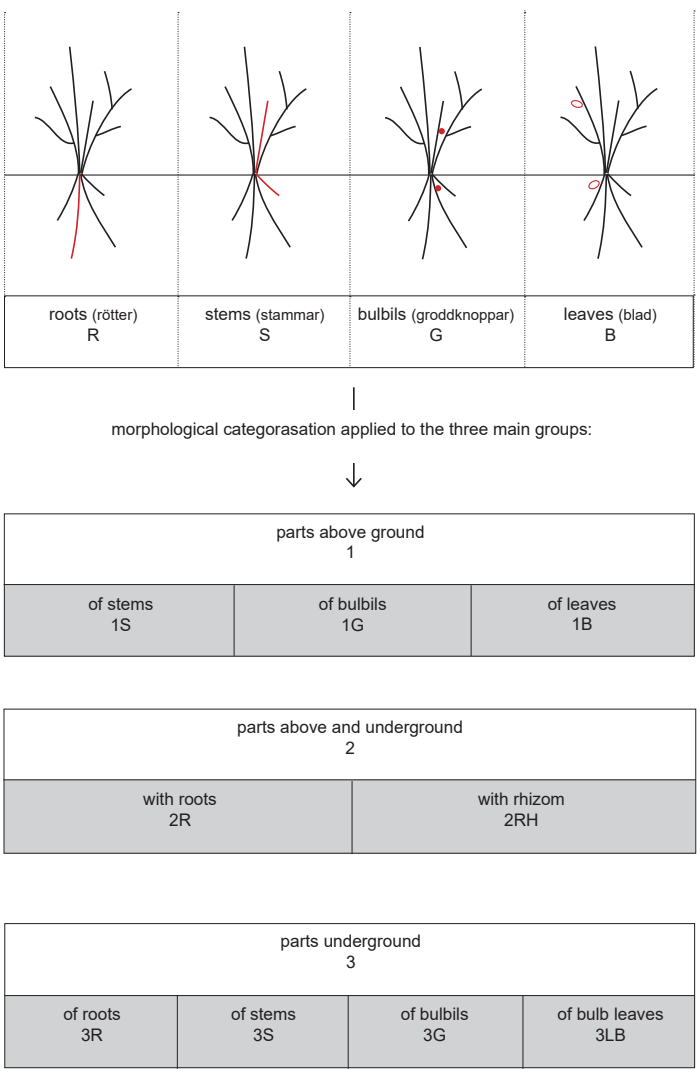


**Figure 3:** The second level of the classifying system groups plant parts according to their morphological belonging. Stems, bulbils, and leaves are represented both above ground and underground. The numbers and letters form a code system that can be used to link documentations in the system. Image from Westerlund 2017, 78.

in relation to the ground surface (Raunkiær 1934). The reason why I think his system is useful is because of the similarities with the conditions in the propagation practice, where the plant parts used are in different stages of development, and are therefore situated both above and under the ground surface. With this first level, differences in the propagation practice can be grouped according to where the plant parts are located in relation to the ground.

Although various aspects of where the plant parts are situated in relation to the ground surface have been taken into account in horticultural categorisations before, it has not been the first level of a grouping (cf. Bailey 1922; McMillan Browse 1999). The advantage of having these three groups as the first level is that propagation parts from all types of perennials can be sorted without being affected by other group belongings, such as plant environments or plant genera.

In the next level, the grouping of plant parts consists of morphological belonging (Figure 3). In this grouping, the starting point is the common classifications of botany, for example roots, stems, and leaves. To arrive at the final groups, which relate to the propagation parts, another one or two levels are needed. In these levels the plant parts are grouped according to further differences, like size or location at the plant.

The grouping itself gives a description of the appearance, structure, and location of the different propagation parts. It can be clarified further by adding examples. In addition, it is also possible to add explanations of the biological qualifications and cultivation conditions.

The final grouping into 32 categories of propagation parts consists, figuratively, of 'boxes' into which documentations with descriptions of propagation methods can be sorted (Figure 4).

Descriptions can be mediated in various ways depending on documentation media, such as film clips, text, photographs, and drawings, to visualise the steps in propagation procedures. Descriptions from propagation procedures of different plants can then be sorted, as well as examples of practice from different situations. With this system it is possible to search through the various levels and groups by making comparisons. This is a tool that makes it possible to perform comparisons similar to those that the experienced gardeners perform in their 'inner systematisation.'

## TESTING THE CPP

Next, I will show an example of how plant parts and propagation methods can be sorted into the CPP. To do this, a case study using documentations of propagation of the shooting star flower (*Dodecatheon meadia*) (Figure 1B–C) will be presented and tested in the system. The flower has its origin in America, but it was already cultivated in Sweden at the time of Linnaeus, in the eighteenth century. The documentations are the result of interviews, observations, and participant observation at a perennial nursery, as well as comparisons of descriptions in literature and a propagation test.

My experience is that the shooting star easily dies away unless the cultivation conditions are right. To preserve it, the plants need to be propagated regularly. Like many other plants, it can be propagated using a variety of vegetative methods. The choice of method affects when the work is carried out, depending on the stage of development of the plant. One method is to propagate it with roots.

### Participant Observation

The first time I came into contact with vegetative propagation of the shooting star was at Djupedal's plant nursery outside Gothenburg. Carina Liljebladh, an employee at the nursery for many years,

main group 1

| parts above ground 1 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| of stems 1S | | | | | | | of bulbils 1G | | | of leaves 1B | | |
| detached from mother plant 1S1 | | | | attached to mother plant 1S2 | | | from leaf axil 1G.1 | from leaf 1G.2 | from flower 1G.3 | whole leaf 1B1 | | section of leaf 1B2 | |
| stem tip 1S1.1 | stem section 1S1.2 | basal shoots 1S1.3 | shoot with heel 1S1.4 | layering 1S2.1 | mounding 1S2.2 | shoot on runner 1S2.3 | | | | without dormant bud 1B1.1 | with dormant bud 1B1.2 | pinnate veined 1B2.1 | parallel veined 1B2.2 |

main group 2

| parts above and underground 2 | | | | | | |
|---|---|---|---|---|---|---|
| division of plants with roots 2R | | | | division of plants with rhizom 2RH | | |
| of horizontal roots 2R.1 | of adventitious roots 2R2 | | of primary roots 2R3 | | with terminal shoot 2RH1 | with several shoots 2RH.2 |
| | with single shoot 2R2.1 | with several shoots 2R2.2 | with single shoot 2R3.1 | with several shoots 2R3.2 | shorter than 10 cm 2RH1.1 | longer than10 cm 2RH1.2 |

main group 3

| parts underground 3 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| of roots 3R | | | of stems 3S | | | of bulbils 3G | | of bulb leaves 3LB | |
| with horisontal root 3R.1 | with tap root 3R.2 | with tuberous root 3R.3 | of bulb 3S.1 | of corm 3S.2 | of rhizom 3S.3 | without a stem 3G.1 | on a stem 3G.2 | whole with dormant bud 3LB.1 | without dormant bud 3LB.2 |

**Figure 4:** The Classification of Propagation Practice (CPP) in its entirety, with its three to four levels which lead to 32 groups of different plant parts that can be used for vegetative propagation. The numbers and letters form a code system that can be used to link documentations in the system. Image from Westerlund 2017, 81.

told me that they had worked with the root propagation one and a half months earlier, "when the new side shoots look like white teeth."[4] She showed me that a plant consisted of a "mother's shoot" in the middle, with several side shoots close by. When the propagation is performed, the shoots are more like buds and can consist of a total amount of between 10–12 side buds. By loosening a side bud together with a root, the resulting plant part can develop into a new plant. Carina said: "It's like wiggling a loose tooth, and it says 'click' when it breaks off."

Carina also said that it is sometimes difficult to get the bud and root to come loose. In such circumstances, a stronger movement is required when wiggling, the clicking sound is not as distinct, and more roots are damaged when they are removed. Her interpretation is that the plants have then grown too much and that this method is no longer functional at that stage. By sharing her judgement, describing both the haptic feel and the sound, she gave me a description with a relative time indication for when the method works.

Some years later, at the end of February, I visited the nursery again to be involved in the propagation of the shooting star. Jonas Bengtsson, the owner of the nursery, showed me how he handles the plants (Figure 6). I observed the different procedures and actions, and filmed while he was working. I then tried the process myself. I shook the plants free of soil and wiggled the roots to see which root was associated with which bud. Now I understood Carina's metaphor of a loose tooth. I wiggled it so that the part detached from the plant with a clicking sound (Figure 8). In the next step, we planted each root one by one into pots, together with a bud, and filled them with soil.

While we were working, there were some roots that were broken off. None of us knew whether the pieces could develop into new plants. I took them with me and made my own propagation test. After eight weeks, none of the pieces had developed any new shoots, so the test was ended. The fact that plants from certain families and specific species can be propagated with pieces of roots is well known, and a variety of methods are documented (cf. McMillan Browse 1999; Hartmann et al. 2002). In the most common method, roots can be cut into several parts, where each root part can develop new shoots and become a new plant (3R.1 and 3R.2 in CPP, see Figure 5). I had not read about this method of removing roots with a bud at the top before.

## Comparisons of Descriptions in Literature

Descriptions of the propagation of the shooting star can be found in horticultural literature. Sometimes it is noted in the records and lists without any mention of propagation by roots (e.g., Hartmann et al. 2002, 821). Some sources say that propagation by roots is a possible method for the shooting star, but it describes neither what the part of the plant looks like or how the procedure is done (e.g., Jagne 2006, 117; Lorentzon 1989, 261). A few sources refer to methods which are similar to those used at Djupedal's nursery, but they are described in very short terms. One example is from Bailey:

> Cuttings of the whole root can be used effectively, the root being torn off the crown, planted upright, and covered with the sandy soil commonly used in this form of propagation. (Bailey 1911, 228)

Other documentation consists of short notes where both buds and roots are mentioned, without describing the procedure (e.g., Månsson and Johanson 1994, 122; Thompson 2005, 200; Toogood 2006, 195). I found a more detailed description by Blanchette, a nursery man who described an almost identical version of the method to that used at Djupedal (1998, 328–29).

**Figure 5: From the left: Blue Eryngo (*Eryngium planum*) is a genus that can be propagated by cutting the roots into pieces. A common recommendation is to take roots as thick as a pencil and put them vertically into a sandy soil, with the top of the root piece in the soil surface, before covering with a layer of grit. The result in a propagation test shows that shoots can develop from root pieces without visible buds. Photographs by Tina Westerlund.**

## Placement in the Classification System

Into which category of propagation parts in the CPP can this method for the shooting star be placed? I shall now discuss this question based on what has emerged from the case study.

The propagation is performed when the plant does not have any active parts above the soil surface. The first level in the classification system is thus to determine propagation with *underground parts* (the third group of the CPP). Morphologically, the underground parts are roots. This gives the next level in the classifying system, as the propagation is performed with plant parts that originate from *roots* (see Figure 4, group 3R). Roots are then grouped into three different categories of propagation parts: 1) those which grow horizontally and which naturally develop new shoots along the roots; 2) roots that grow with a downward direction into the ground, and which can develop new shoots only when they are damaged or separated from the plant; 3) the roots that are swollen—so-called tuberous roots—where a bud must follow to allow the root piece to develop a new plant.

My experiences from working with the shooting star plants are that the roots have a downward direction and are not particularly swollen. In a first attempt, I therefore chose the group *parts of descending roots* (see Figure 4, 3R.2) and asked: Is this the right category? In the general descriptions of root propagation in the horticultural literature, I did not find anyone who addressed this variant where a bud at the root top was needed to succeed with the propagation. The propagation test, where I used root pieces without visible buds at the root tops, was a way to try to get an answer. While my test did not show any successful results, this does not necessarily mean that it cannot work. However, this result, and the practice at Djupedal's nursery, does indicate that the way to success is to use root pieces with a visible bud at the top.

The practice shows that this propagation method best fits into the category of *tuberous roots* (3R.3). This placement explains that a following bud is a prerequisite for a functional propagation method, although the shape of these roots does not resemble most of the other examples that can be sorted there (Figure 8).

## Reflections on the Propagation Test

The case study of the shooting star shows that the propagation method used at Djupedal's nursery is known but is rarely described. This is one example of a practice that is linked to a special variant of a propagation part. It is also an example of how vital knowledge in propagation practices risks being left out when descriptions in horticulture literature are generalised. The test shows that the use of the CPP could draw attention to differences in propagation parts and to how these differences affect the practice. By building a hierarchic system of the plant parts used in propagation, the systematisation resembles the gardener's 'inner systematisation.'

The CPP is built on observations of the form of the plant parts and their different stages of development, but also from experiential knowledge about the outcome of different propagation methods. As described, the shooting star can be propagated by roots, but it can also be propagated by division when the leaves have developed. In the latter case, it is sorted into another group in the system (2R2.1). Unlike systems where the descriptions of methods are sorted into lists according to the name of the plant, this system increases the chance of discovering connections between methods of propagation and various plant forms. In fact, the name of the plant does not even need to be known; instead, a

Figure 6: At Djupedal's nursery, Jonas Bengtsson is moving the roots of the shooting star to see which bud is moving. Click the image to see the video if reading a pdf version, or scan the code to the right, or go to: https://youtu.be/Re4rr5k3M4c. Photograph and video recording by Tina Westerlund

Figure 7: The propagation part of the shooting star, a root with a bud at the top, has been detached from the mother plant. Photograph by Tina Westerlund.

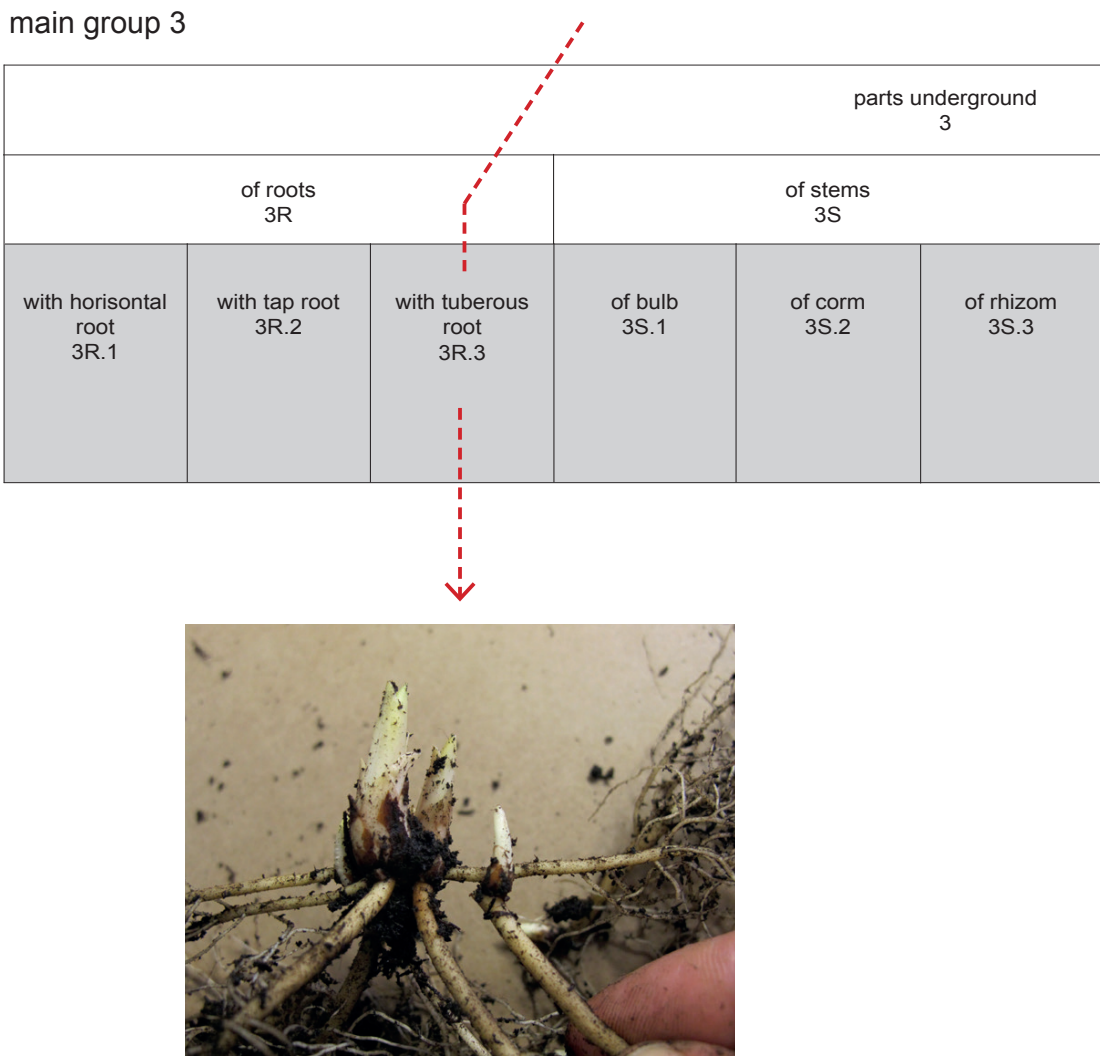


**Figure 8:** At Djupedal's nursery, they propagate the shooting star at a time when the plants do not have any active parts above ground. The plant parts used are *roots*. This gives the two first steps in the classifying system (3 and 3R). By comparing the method used at the nursery with other variants of root propagation, it is possible to see that the roots do not grow horizontally. At least one bud at the top of the root pieces is a prerequisite for the propagation parts that I have grouped as *tuberous roots* (3R.3). Image by Tina Westerlund.

hierarchic system with examples gives guidance. By sorting this example into the classification system, it is possible to make comparisons and ask questions.

If the classification system is translated into an open-source database, it becomes a tool for many users. A database for propagation practice can be used both for teaching purposes and as a communication tool between professional gardeners. New information can gradually be registered as it emerges. The step-by-step arrangement of groups also makes the CPP possible to rebuild, and allows for the renaming of groups. The addition of the root propagation of the shooting star shows that the name "tuberous roots" isn't perhaps the most significant group name since it seems to be the buds that are important and not the swollen root form. If new categories are needed to describe differences in the propagation practice, more groups can be added and specified, and the system improves iteratively. However, too many groups may lead to a system that is hard to navigate. The number of 32 groups of propagation parts can be discussed, but it shows a way of building a tool that has the ability to communicate documented knowledge in plant propagation in a systematic way. To enable the system to handle a great diversity of plant forms and variations in propagation practice related to that, examples must be added to the groups. With the ability to combine information, the classifying system becomes a tool that can provide answers and formulate new questions.

Participating in the work at the nursery made me pay attention to a special practice in propagation that forms an important part in the development of the CPP.

The communication at the nursery showed a need for the development of narrative documentations. The gardeners told me about what they did, but they did so in ways that were not only verbal; gestures, identifications, and comparisons were also part of the communication. The video of Jonas Bengtsson working shows the handgrips and the movements, but it also makes it possible to distinguish the clicking sound that he could not have told me by words, nor could I have documented it in writing. This kind of representation is an important part of knowledge development, and with a classifying system like the CPP, video recorded narratives and verbal accounts can form part of a knowledge-forming structure.

## THE CONTRIBUTION OF SYSTEMATISATION IN CRAFT

If documentation is to function as a way of safeguarding knowledge, as pointed out by the *Convention for the Safeguarding of the Intangible Cultural Heritage* (UNESCO 2003), it must be done in a way that is useful for others, as a form of guidance in their practice. To meet the complexity inherent in craftsmanship, the development of good documentation methods is important in research on practice. One challenge lies in capturing the practical knowledge, another in making the documented information available. An individually represented documentation of a craft situation can be valuable in itself, but to be part of a knowledge-forming structure, it must be sorted into a context. As said earlier, Schön reminds us that practical knowledge is built up like "a repertoire of examples, images, understandings and actions" (Schön [1995] 2003, 138). I have taken this statement literally in my own research, creating a tool for sharing such a repertoire with others. When documentation is systematised, the communication of knowledge can be built on the experiences of many different people. In this chapter I have presented a method for sys-

tematically collecting, and communicating, documented craft knowledge—in this case, the craft of propagating perennials with vegetative methods.

The classification system is based on a knowledge perspective where practice-oriented theories, descriptions, and explanations of practical knowledge are linked to the objects involved in the practice. The chosen objects are the plant parts used in vegetative propagation. With an object-oriented perspective these can be described as the "most fundamental components of reality" (Molander in this anthology, 377). The hierarchic system in the CPP makes it possible to group and describe plant material despite there being a great diversity in plant forms and therefore many variants of practice in making new plants. This system enables a gathering of documented experiences, despite the influence of personal choices and adaptations to different practices. It allows the possibility that personal knowledge can become more general and useful for others (cf. Polanyi 1958).

The systematisation is the result of a craft research methodology, where the craft practitioner perspective is needed both to formulate questions and to pay attention to what is important in knowledge communication. In this chapter, I have demonstrated how the researcher's own practice is used as a method for delving deeper into interpreting and evaluating craft documentation. If empirical knowledge of specific craft areas is used to inform systems of classification, not only will this create a hive of relevant information, but it is more likely that the systems devised will be useful for the practice field. Even though there can be similarities in documentation methods relating to practical knowledge, each craft has its own conditions that direct the way in which documentation can be systematised. The point of departure could be the differences in the attributes of the material used (cf. Källbom in this anthology), or it could be built on the result of a craft procedure, for example different models of boats, interlock techniques in a tapestry, variants of joints in timber framing, or a shape of a hedge (see the respective chapters of Leijonhufvud, Holmberg, Hjort Lassen, and Seiler in this anthology). The systematisation could also be built on the words used within a craft. One example is the family tree of words used in metalcraft, where the verbs that describe different metal craft activities are categorised to communicate knowledge in practice (see Thane in this anthology).

If crafts can be systematised in this way, there is a potential to build databases and applications to which information can be added and made available to many users. Such a tool would make it possible to take part in a comprehensive and varied knowledge base, such as a recorded story, a relative time indication, or a video clip. However, it is not just about collecting information; it also implies making that information available for further processing. Craft research is not just about learning from practice but is also about adding new knowledge to practice. With better conditions for exchanging experiences, knowledge development increases. When documentation becomes available, it can be used as a basis for discussion. Not only does this provide craftspeople with opportunities to communicate and develop their knowledge; it is also a way of demonstrating the importance of this knowledge for other occupational groups—groups that can influence a continued demand for practice. In relation to plant propagation, I believe such communication provides an important strategy in safeguarding the knowledge that is needed to maintain garden practices, such as those used in sites like Linnaeus's Hammarby.

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## ENDNOTES

1. Through plant breeding, one tries to combine the properties of different plants to develop new ones. When this material is to be propagated, genetic copies are desired and so-called vegetative propagation can be the only way to achieve this.
2. Linnaeus's flowerbeds, in front of the house, were reconstructed by Rutger Sernander in 1928 (Manktelow 2008). They were reconstructed during the 1990s and again before the Linnaeus anniversary in 2007 (oral information, Jesper Kårehed, December 2015).
3. Oral information, Roland Törnqvist March 2009, Ulla-Lena Wiik, April 2010.
4. Carina Liljebladh, April 2010.