

Some Reflections on the History of Botanical Knowledge in China

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Abstract

Ancient systems of knowledge must be initially approached in their own historical, cultural and social context before any comparison to modern science may be attempted. In this sense, it can be spoken of a “botanical knowledge” in China, although in the available sources there is not a term corresponding neither to the modern meanings of “botany”, nor to a specific knowledge of plants. There are not also texts that may be rated as theoretical botanic manuals or flora, but there is a large number of books on materia medica, horticulture, etc. These reveal the existence of botanical knowledge, although it does not seem to have been theorised in any way until the second half of the nineteenth century. The paper approach corresponds to the historical side of the field known as “ethnobotany”. In this regard, the “traditional” “Chinese botany” should be analysed from an anthropological point of view rather than a teleological approach. This thesis is grounded through the analysis of several examples.

Keywords

Botany; China; Ethnobotany

Resumo

Os sistemas antigos de conhecimento devem ser inicialmente abordados em seu próprio contexto histórico, cultural e social, antes de se tentar qualquer comparação à ciência moderna. Assim é que se pode falar de um “conhecimento botânico” na China, embora nas fontes disponíveis não exista um termo que corresponda às acepções modernas de “botânica” nem a um conhecimento específico das plantas. Tampouco há textos que possam ser considerados como manuais de teoria botânica, mas existe um grande número de obras sobre matéria médica, horticultura, etc. Esses revelam a existência de conhecimento teórico, embora não haja indicações a esse respeito antes da segunda metade do século XIX. A abordagem no presente artigo corresponde ao lado histórico do campo conhecido como “etnobotânica”. Nesse sentido, a “botânica chinesa” “tradicional” deve ser analisada de um ponto de vista mais antropológico do que teleológico. Essa tese é fundamentada através da análise de vários exemplos.

Palavras-chave

Botânica; China; Etnobotânica

Some Reflections on the History of Botanical Knowledge in China

In general, upon approaching the study of the history of botany in any cultural context, it is usual to consider the level that the field has reached in the present time as the end of its development. I do not agree with this view, as I think that ancient systems of knowledge must first be considered within their historical, cultural and social context before any comparison to modern science may be attempted. It is only then that it may be possible to appraise whether and how ancient knowledge preceded the present one.

The choice of the expression “botanical knowledge” in the title of this paper is not by chance, but it follows the rationale mentioned above. In order to ground this assertion, I will begin by an analysis of the meaning of the term “botany” in modern English use.

The *Longman Dictionary of the English Language*,¹ gives the following three definitions: 1) [A branch of biology that deals with] plants and plant life in the world; 2a) The plant life of a particular region; 2b) The properties and vital phenomena exhibited by a plant, plant type, or plant group. In *Webster's Third New International Dictionary*,² a fourth definition is also added, “ a botanical treatise or study: *esp.* a particular system of botany”.

When I was invited by Joseph Needham and Lu Gwei-djen to write the last chapters of the botanical section of Volume 6 of *Science and Civilisation in China*,³ I had taken for granted that there was botany in ancient China, considering the huge corpus of texts I had to analyse. But, as my readings were advancing, I had to admit, first of all, that I had not met any Chinese term corresponding to at least one of the meanings just quoted and that there was not even a term to refer directly to a specific knowledge of plants.

Furthermore, there was not any text which could be considered as a kind of theoretical botanical manual, nor what is called a flora. However, on the other hand, there was a great number of books on *materia medica*, horticultural general treatises and also monographs – which were presented in Volume 6: 1 of *Science and Civilisation in China*. Interesting information could also be found in *biji*, miscellanies where scholars wrote freely about various topics, among them plants and animals. It was obvious that there was an undeniable botanical knowledge, but which did not seem to have been theorised in any way until the second half of the nineteenth century.

To go further, I was helped by an author highly appreciated by Needham, Edward Lee Greene (1843-1915). Professor of botany at Notre Dame University, in the United States, he wrote in 1909, in the chapter titled “The Philosophy of Botanical History” of his *Landmarks of Botanical History*:⁴

“Botany did not begin with the first books on botany, nor with the men who edited them, though every historian of the science whom I have read has assumed that it did. The most remote and primitive of botanical writers, of whatever country or language, found a more or less extensive vocabulary of elementary botany in the colloquial speech of all. The chief organs of plants - stem, trunk, branch, leaf, flower, fruit,

¹ Longman Dictionary of the English Language (1984), 166.

² Webster's Third New International Dictionary (1986), 258.

³ Needham, Joseph. *Science and Civilisation in China*. (Cambridge: Cambridge University Press, 1986), Vol 6: 1.

⁴ Green, Edward L. *Landmarks of Botanical History* Stanford: Stanford University Press, 1983), 118. [Edited by Frank N. Egerton].

pod, seed, root, tendril, thorn, and a multitude of others - had been discriminated and named; the organs even known by all who had acquaintance with plants and trees, and the names were everywhere in use. Even the functions of several of the organs had been correctly ascertained before ever a line of botany had been written, most probably even before letters had been invented. The improvement of wild things by cultivation, the propagating of the newly acquired sorts of cuttings, by division of perennial roots, and, in the case of trees, by grafting, are likewise arts that seem to antedate history; as do also the designating of different varieties or species that are evidently nearly akin, by two-fold names, one generic, the other specific or varietal”.

This definition was perfectly adequate for the botany that I was discovering in the Chinese texts. Indeed, it corresponds to the historical side of the field known today as “ethnobotany”⁵ and we can appreciate the distance between this one and the botany of modern botanists. In consequence, I became convinced that the “traditional” or “indigenous” “Chinese botany” should be analysed from an anthropological point of view rather than as the pre- or proto-scientific stage of a modern science. This choice of refusing a teleological approach would enable me to consider the content of all the Chinese sources not in comparison to post-linnean texts, but in their own context. A comparison could still be done, but only after this first independent step.

However, in doing so, I realised that I was challenging one of the axioms of Needham’s historiographical approach, as expressed, for instance in his “Address to the Opening Session of the XVth International Congress of the History of Science”. Here he stated:⁶

“I suppose we all generally agree that there is only one unitary science of nature, approached more or less closely and built up more or less successfully and continuously, even if very slowly, by the several groups of mankind from age to age. This means that we could expect to trace an absolute continuity between the first beginnings of astronomy and medicine in ancient Babylonia or ancient Egypt, through the advancing natural knowledge of mediaeval China, India, Islam and the classical Western world, to the break-through of late Renaissance Europe when, as has been said, the most effective method of discovery was itself discovered ...

Of course we must not see in the traditional sciences of China or India simply 'failed prototypes' of modern science; we must get inside the minds of those who cultivated them and understand how it was that they came to their conclusions. But we must never deny the fundamental continuity and universality of all science.

On the one hand, there are those individual anticipations of modern scientific knowledge which show the slow and steady

⁵ When Greene was writing his book, ethnobotany had just been defined by John W. Harshberger as the investigation of knowledge related to plants through the remains found in archaeological excavations of ancient sites occupied by Indians in the south of the United States. Harshberger, John W. “The purposes of ethno-botany”. *The Botanical Gazette*, (1896): 146-154.

⁶ Needham, Joseph. “Address to the opening session of the XV international congress of the history of science, Edinburgh, 11 august 1977”, *The British Journal for the History of Science*, 11 (38, 1998): 103-113, 110.

development of science. On the other, there are the differences between the world-views and scientific philosophies as a whole, of mediaeval China, Islam, India, and the ancient West, and how all of these differed from the outlook of modern ecumenical science.

All the ancient and mediaeval systems before the coming of modern science need to be studied and defined in contrast to our present-day pattern of ideas, which itself is of course not final (...) Modern ecumenical science was indeed their common end, but their appearance can only be explained in the context of the various possibilities open or closed within the totality of ideas, values and social attitudes of their times and places”.

Following this rationale, Needham presented the ancient Chinese botanical knowledge systematically in comparison to modern botany. In his concluding remarks, he writes “Li Shih-Chen [Li Shizhen] (1518-1593) building on Liu Wen-Thai foundation, brought classification in botany to a Magnolian or Tournefortian level”.⁷ In volume 6, part 1, we can read that “We find that indigenous Chinese botany reached a Magnolian or Tournefortian level, rather than a Linnean one” and, “So one again has the impression that traditional Chinese botany attained a Magnolian or Tournefortian level, not an Adansonian one”.⁸

In reference to the latter statement, there is a very important note:

“Where the taxonomy of natural families is the topic of concern, it is better to avoid the term Linnean. To speak in this way is not to imply that the Chinese felt the need for a formalised system in the manner of Tournefort, but that they perceived very clearly a relationship among the genera of plants genera, even though these were often ‘submerged’ within their oecological and physiological classification. Only in the mid-eighteenth century did modern science start in the plant world, not in the seventeenth”.

To appreciate this statement, it is necessary to give a hint of the classification of plants by Li Shizhen⁹ - who achieved the most sophisticated presentation of the *materia medica* which can be found in China -, in his *opus magnus*, *Bencao Gangmu*, (“Classification of the *Materia Medica*”), published in 1596.¹⁰ We must keep in mind that he was concerned only with some 1095 medicinal plants. He arranged them from the smallest to the largest, as he indicated in an introductory chapter *fan li* of his book, in five main sections, which he called *bu*, and 30 categories *lei*. The five sections are, following this order: *cao* grasses, *gu* grains, *cai* vegetables, *guo* fruits, and *mu* trees. The following are the categories found in each of these sections.

⁷ Needham, Joseph. *Science and Civilisation in China*. (Cambridge: Cambridge University Press, 2004), vol 7:2, 143.

⁸ Needham. *Science*, 6 :176-177.

⁹ On the classification of Li Shizhen, see Métaillié, Georges. “Histoire naturelle et humanisme en Chine et en Europe au XVIIe siècle: Li Shizhen et Jacques Dalechamp”. *Revue d'Histoire des Sciences*, 42 (4, 1989): 353-374 ; Métaillié, Georges. “The *Bencao gangmu* of Li Shizhen - An Innovation in Natural History?”, in, *Innovation in Chinese Medicine*, org. E. Hsu (Cambridge: Cambridge University Press, 2001), 221-261.

¹⁰ Li, Shizhen. *Bencao gangmu* [Classification of *materia medica*]. (Beijing: Renmin Weisheng Chubanshe, 1975-1981).

- Herbs (*juan*¹¹ 12 to 21) *cao bu* are divided into: mountain herbs (*shancaolei*, j. 12-13), fragrant herbs (*xiangcaolei*, j.14), marshland herbs (*xicaolei*, j. 15-16), poison herbs (*ducaolei*, j. 17), creepers (*mancaolei*, j. 18), water herbs (*shuicaolei*, j. 19), stone herbs (*shicaolei*, j. 20), “mosses and his kindes” (*tailei*, j. 21),¹² sundry herbs (*zacao*, j. 21), named and not used (*youming wuyong*, j. 21).
- Grains (*juan* 22 to 25) *gu bu*: “hemp-barley/wheat-rice” (*mamaidaolei*, j. 22),¹³ millets (*jishulei*, j.33), soja and legumes (*shudoulei*, j. 24), fermented products (*zaonianglei*, j. 25).
- Vegetables (*juan* 26 to 28) *cai bu*: seasoning (*hunxinlei*, j. 26), soft and slippery (*rouhualei*, j. 27), gourd-vegetables (*luocailei*, j. 28), aquatic vegetables (*shuicailei*, j. 28), fungi (*zhierlei*, j. 28).
- Fruits (*juan* 29 to 33) *guo bu*: “Five fruits” (*wuguolei*, j. 29),¹⁴ mountain fruits (*shanguolei*, j. 30), exotic fruits (*yiguolei*, j. 31), spicy fruits (*weilei*, j. 32), “gourd-like fruits” (*luolei*, j. 33), aquatic fruits (*shuiguolei*, j. 33).
- Trees/woods (*juan* 34 to 37) *mu bu*: fragrant trees (*xiangmulei*, j. 34), tall trees (*qiaomulei*, j. 35), lesser trees (*guanmulei*, j. 36), parasitic trees (*yumulei*, j. 37), trees in clusters (*baomulei*, j. 37), miscellaneous woods (*zamulei*, j. 37).

Besides this classification, clearly explained by Li Shizhen, in several cases within one category, a few names designating plants belonging to what today is known as a same “natural” botanical family, are listed in a row. For example, seven plants of the cabbage family (Brassicaceae / Cruciferae) are listed in the “soft and slippery category” (*rouhualei*, *juan*. 27) (Fig. 1). The names of twelve plants of the mint family (Lamiaceae / Labiaeeae) are found among the “fragrant herbs” (*xiangcaolei*, *juan* 14). The most salient example is found among plants of the carrot family (Apiaceae / Umbelliferae). The 27 botanical species identified by Read (1936) are found in ten categories. In seven categories there is only one plant, but there are three consistent groups, one of six species - Vegetables section, the seasoning category (*hunxinlei*, j. 26), and two of seven within the Grasses section, respectively, the “fragrant grasses” (*xiangcaolei*, *juan* 14) and the “mountain grasses” (*shancaolei*, j. 12-13). There are several occurrences of the grouping of names of a few plants belonging to some other botanical families, like the Rosaceae, the Asteraceae (Compositae), the Euphorbiaceae or the Araceae.¹⁵

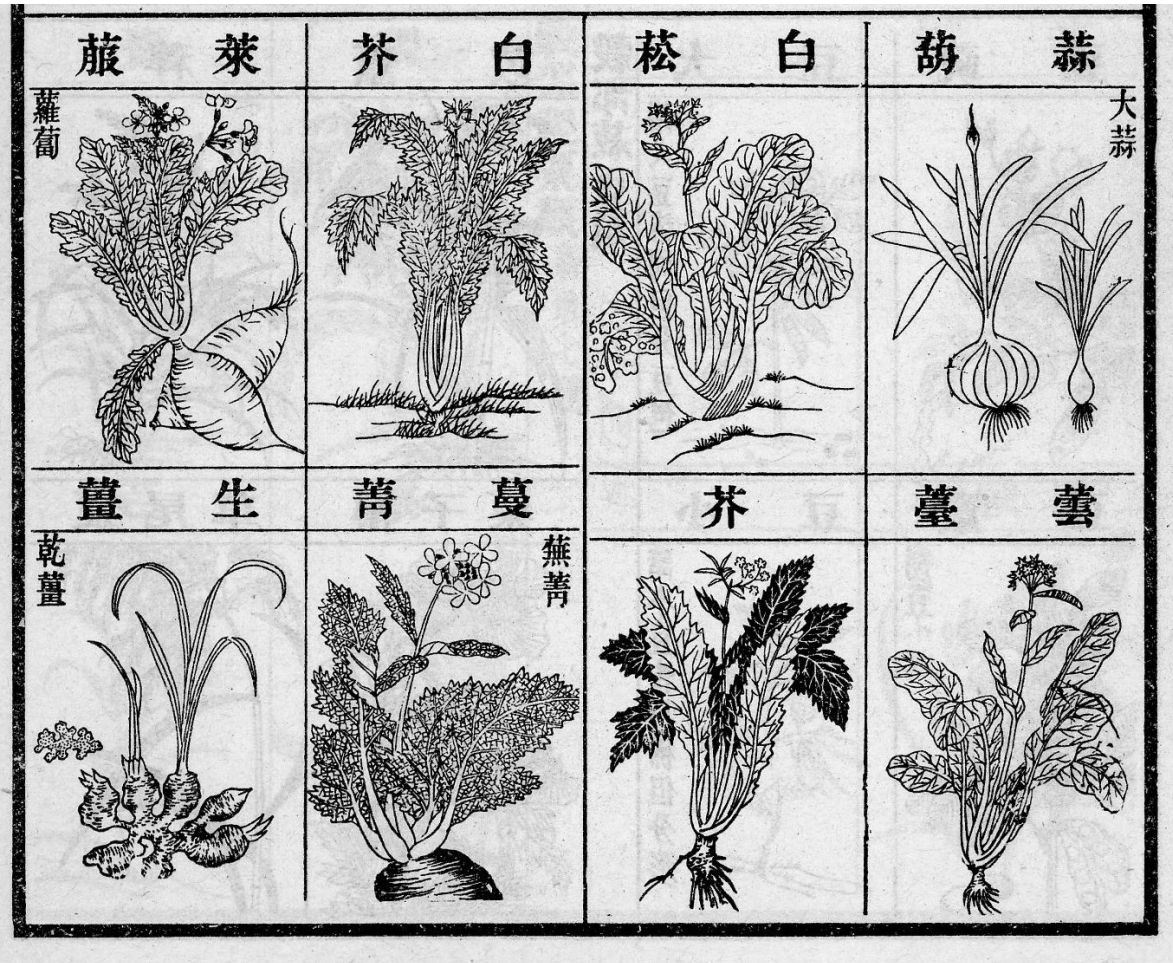
¹¹ Roughly speaking a *juan* corresponds to a chapter.

¹² This translation follows the terms in “The tables of English Names” of The Herbal by John Gerard (1633), because for Li Shizhen, *tai* - which in modern Chinese means specifically "moss" - had also a broader meaning, including other plants like lichens.

¹³ Actually the three morphemes have a generic meaning and must be considered as 'generic species' as meant by Atran, Scott., Paul Esin & John C.D. Medin. “Generic species and basic levels: essence and appearance in folk biology”. *Journal of Ethnobiology*, 17 (1, 1997): 17-43. The 12 'folk specific' zhong in this lei are: *huma Sesamum indicum* L. sesame, *yama Linum usitatissimum* L., wax, *dama Cannabis sativa* L., hemp; *xiaomai Triticum aestivum* L., wheat, *damai Hordeum vulgare* L., barley, *yanmai Avena fatua* L., oat, *qiaomai Fagopyrum esculentum* Moench., buckwheat, *kuqiaomai Fagopyrum tataricum* Gaertn., *dao Oryza sativa* L., rice, *jing Oryza sativa* L. cultivar., *xian Oryza sativa* L. cultivar.

¹⁴ Under this heading are quoted the main fruits cultivated in Northern part of China, the “classical fruits”. Sivin, Natham. “Li Shih-chen”, in *Dictionary of Scientific Biography*, org. C. C. Gillespie (New York: Charles Scribner's Son, 1973), 390-398, 392.

¹⁵ Needham, Joseph. “The development of botanical taxonomy in Chinese culture”, in, XIIe Congrès International des Sciences. Paris 1968. Actes. Tome VIII: Histoire des Sciences Naturelles et de la Biologie. (Paris: Librairie Scientifique et Technique Albert Blanchard, 1971), 127-133. Chen, Jiarui. “Dui



(Fig. 1. This figure must be read from right side to left side browsing from up to bottom)

Taxa of this level form what anthropologists call “covert categories,” intermediate between the life-forms and folk generics or generic species. Li Shizhen ordinarily did not give a name to these categories, but in encyclopaedic texts they are often named through the juxtaposition of two generic terms, like *tao-li* “peach-prune” or *song-bai* “pine-cypress”, for instance.¹⁶ Li Shizhen wrote in the introductory commentary to the tree/wood section,¹⁷ that “[with] colour, perfume, *qi*, taste, one distinguishes categories” *se, xiang, qi, wei, qubian pinlei*.

In the case of botanical taxa with homogenous chemical properties, having also particular morphological features, like plants from the mint or carrot families, it is not odd to find convergence between the folk and scientific classifications. The “submerged family” of Needham correspond to these “covert categories”. These categories can be found in almost all the folk taxonomies.¹⁸ Their convergence with taxa of a scientific

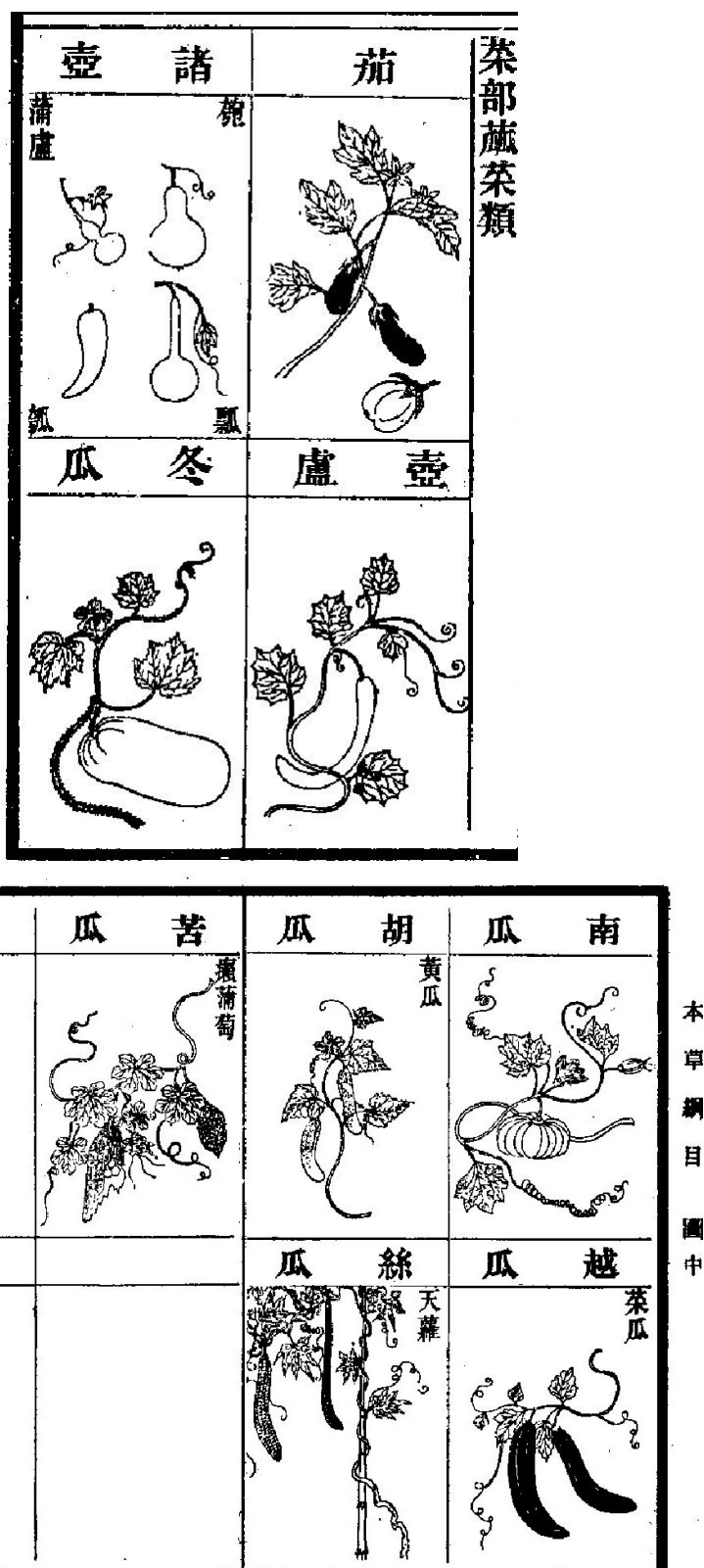
woguo gudai zhiwu fenleixue ji qi sixiang tantao”. (About Chinese ancient plant classification and its ideology). *Zhiwu fenleixue bao – Acta phytotaxonomica sinica* 16 (3, 1978), 101-112.

¹⁶ Métaillé, Georges. “Chinese Ethnobotany”, in, *Encyclopaedia of the History of Science, Technology, and Medicine in Non-Western Cultures*, org. H. Selin (Dordrecht: Kluwer Academic Publishers, 1997), 312-315, 314.

¹⁷ Li, 1911.

¹⁸ On this crucial question, see Atran, Scott. “Covert fragmenta and the origins of the botanical family”. *Man* (N.S.), (18, 1983): 51-71.

taxonomy occurs generally in a small scale as we have just seen and as is shown by the example of the category of gourd-like vegetables in the *Bencao gangmu* (Fig. 2).



(Fig. 2. *Bencao gangmu* by Li Shizhen, 1596 edition. Section of vegetables, category of gourd-like vegetables. Notice that the first one (top left) is the eggplant)

On the other hand, in the same book other taxa are grouped in a way that may look very unfamiliar to a modern taxonomist. Needham and Lu Gwei-djen gave the example of plants belonging to the *ma* group, *i.e.* having a polysyllabic name ended with *ma*.¹⁹ “More than twenty plants and trees have this character in their names, though belonging in terms of modern botany to more than a dozen families”. They add: “The resemblances were perfectly real, whether in fibers fit for textiles, in oil extractable from the seeds, or in the shapes of leaves, the polygonal character of the stem cross-section, the position of the seeds in the capsules, etc.”

From these criteria, it is understood why all these plants were considered as kinds of *ma*, the type being hemp *Cannabis sativa* L. And it is also understood why they do not belong to the same botanical genus or family, as the main criteria to associate them - textile fibers and oil-seeds – have no discriminative botanical significance, and the shape of the leaves is a discriminative character of low botanical significance.

When we turn to Pierre Magnol (1638-1715) and Joseph Pitton de Tournefort (1656-1708), we learn that Magnol was the first French botanist interested in natural classification “who, inspired by Ray's [‘most natural and philosophical’] method proposed the family as natural taxonomic grouping and discussed the criteria for defining them with extreme acumen”²⁰ in his *Prodromus Historiae Plantarum in quo Familiae Plantarum per Tabulas Disponuntur* (1689). On the other hand, Tournefort proposed an artificial system of “attractive simplicity”, “principally on the basis of characters of the corolla and the fructification”, in his *Institutiones Res Herbariae* (1700), where he defined and illustrated 698 genera.²¹

Considering Li Shizhen’s work, it seems to me that the nature of his classification does not belong to the same field of the methods proposed by Magnol and Tournefort. In his main sections *bu*, he follows the model proposed by Tao Hongjing (456-536) in his *Collected Commentaries to the Shen Nong bencao jing* (end of 6th century). *Shen Nong bencao jing jizhu* and the categories *lei* are not at all deductive, but basically subjective, taking into account different factors, like ecology, taste, toxicity, and including even artefacts – various products made with soybeans, herbaceous plants or old pieces of wood.

The teleological approach induces a further comparison between Li Shizhen and Tournefort to justify the statement about the level reached by the traditional Chinese botany. Needham wrote:²²

“Perhaps the most striking comment that can be made concerning the Chinese knowledge of the hemp plant is that, while it preceded everyone else in the appreciation of its dioecious character, Chinese botany did not, down to the end of its time of independence, range hemp in the same family as the mulberry (Moraceae). But how many of us realise the lateness of this appreciation in Europe? De Tournefort (+1700, +1719) had them as far apart as Li Shizhen, the former (*Cannabis*) as genus 5 of section 6 of class 15 (herbs and suffruticose plants with apetalous or staminate flowers), the latter (*Morus*) as genus 4 of section 4 of class 19 (trees and fruit-trees with amentaceous flowers). By +1763, however, Adanson is placing them

¹⁹ Needham, *Science*, 6:1, 170-176.

²⁰ Morton, A. G. *History of Botanical Science*. (London/New York/Toronto/Sydney/San Francisco: Academic Press, 1981), 294.

²¹ *Ibid.*, 295; 228.

²² Needham, *Science*, 6:1, 176-177.

together in his chestnut family, *Castanea* (n°47). So one again acquires the impression that traditional Chinese botany attained a Magnolian or Tournefortian level, not an Adansonian one.

From an anthropological perspective on the history of botanical knowledge, a different appreciation can be made for this example. As a preliminary remark, it must not be forgotten that before the 20th century, whereas the Chinese physicians or scholar-gardeners, as Tournefort, used to make a fundamental division in the vegetable kingdom between trees and grasses, the modern notion of botanical family did not exist neither for Tournefort, nor the traditional Chinese botany. In order to make my critical point of view precise, let us look at the way Li Shizhen (1596) and Tournefort (1700) present the hemp *Cannabis sativa* L.

Li Shizhen²³ puts it in the Section of grains *gu bu* within the Category hemp-barley/wheat-rice: *ma-mai-dao lei*. First, there is an enumeration of seven synonyms found in various sources. After quoting various authors, Li Shizhen indicates that it is widely cultivated, that the plant is peeled and the seeds harvested.

“There is female and male. The male is called *xi*, the female *ju*. Big stock resembling sesame, narrow and long leaves, like those of Chinese motherwort [*Yimucao* : *Leonurus* sp.], seven or nine leaves on a branch. During the fifth and sixth months opens thin yellow flowers forming a spike, then are formed the fruits, like coriander seeds. One can make oil. One peels its skin to make hemp. The stalk is white with edges. Can be used for candle wick”.

Then follows a long explanation to distinguish male and female seeds. After all these explanations, there is a long chapter devoted to the medicinal uses of the various parts of the plant. The only illustration found at the end of the book represents very approximately the whole plant (Fig. 3).²⁴



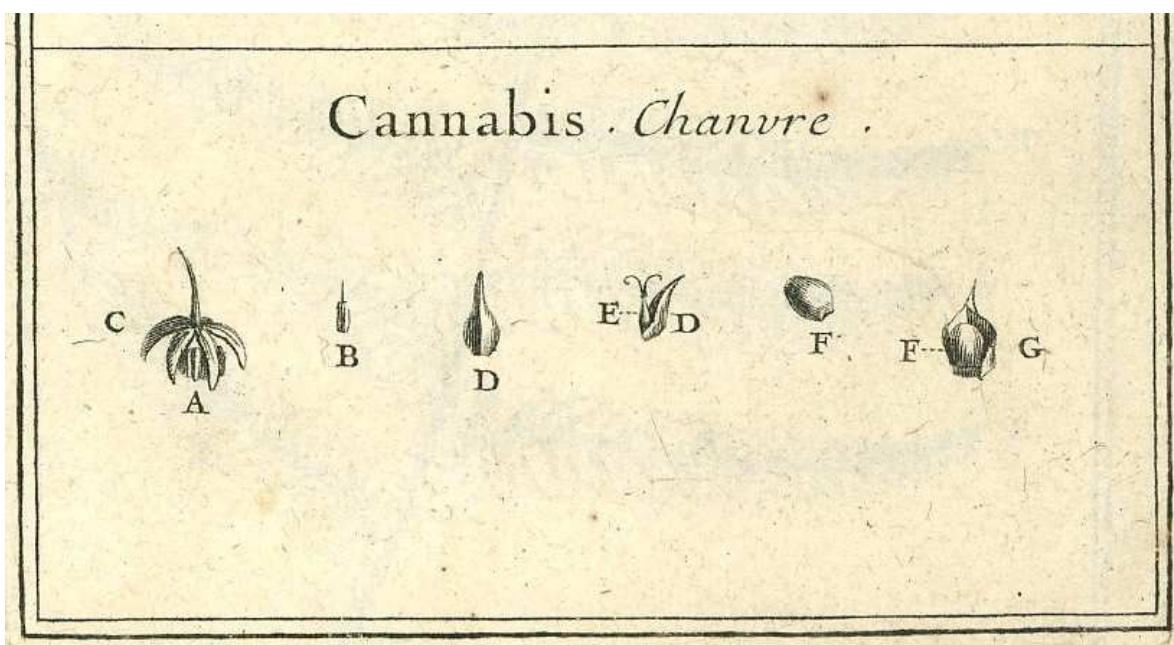
(Fig. 3. *Cannabis sativa* L., hemp. *Bencao gangmu* 1596 edition)

²³ Li, 1444 sq.

²⁴ About botanical illustration in Chinese ancient literature, see Haudricourt, André Georges & Métaillé, Georges. “De l’illustration botanique en Chine”, *Études chinoises*, 1-2, 13 (1994): 381-416 ; Métaillé, Georges. “The representation of Plants : Engravings and Paintings”, in, *Graphics and Texts in the Production of Technical Knowledge in China. The Warp and the Weft*, org. Francesca Bray, Vera Dorofeeva-Lichtmann, Georges Métaillé. (Leiden: Brill, 2007), 487-520.

Considering Tournefort now, here is the quotation of the diagnosis found in the *Institutiones Rei Herbariae*.²⁵ It belongs to

“Class 15: Herbs and suffruticose plants with apetalous or staminate flowers.²⁶ Section 6: Herbs with apetalous flowers, of which in the same genus some have flowers and other fruits.²⁷ Genus 5. Cannabis *Chanvre*. Cannabis is a genus of plant. A²⁸ apetalous flower, there are many visible stamens B, calyx C, sterile as taught by Cesalpino. In these species of Cannabis, the flowers which carry the embryos D, E, have in a capsule G a round seed F. The species of Cannabis are: Cannabis sativa C. B. Pin. 320. Cannabis mas J. B. 3. 447. Cannabis faecunda Dod. Pmpt. 535. Cannabis erratica C. B. Pin. 320. Cannabis foemina J. B. 3. 447. Cannabis isterilis Dod. Pmpt. 535. Cannabis Africana, procerior, semine minori” [(Fig. 4)].²⁹



(Fig. 4. Illustration corresponding to the text about hemp, *Cannabis sativa* L. in *Institutiones Rei Herbariae* (1707) by Tournefort)

Taking into account the contents of the two passages, it is obvious that they do not belong to the same scientific context. Li Shizhen distributes the plant in the first category of the grains; this category is defined – by association of the names of three important crops - following subjective criteria, the fact that they formed probably the basic staple food for him. On the opposite, Tournefort based his system of classification on morphological characteristics of the plants and placed a species in a group following a logical and objective deduction.

²⁵ Tournefort, Joseph Pitton. *Institutiones Rei Herbariae*. (Paris: E Typograpia regia, 1719).

²⁶ Idem, 1719, vol 1, 501

²⁷ Idem, vol 1, 532.

²⁸ The capital characters are in reference to the illustrations found in the third volume, Tab. 309.

²⁹ Idem, vol 1, 535.

In my opinion, it is difficult to compare both situations under the idea that the first one would represent a previous stage in an evolution leading to modern botanical science. However, if one compares Li Shizhen's book to the work of one of his European contemporaries, Jacques Dalechamp, who was also a doctor, one finds similarities and differences that may allow for a better understanding of the relative situations and further developments.³⁰

If we take the last book of traditional botany, the *Zhiwu ming shi tu kao* (Researches on Pictures, Reality of Names of Plants) (1848) by Wu Qijun (1789-1847) as a second term of the comparison with the tournefortian level, it is striking that the author used distinctions that Li Shizhen had introduced but only at a level without any hierarchy.³¹ He arranged some 1714 kinds of plant names under the following 'categories' *lei* exclusively : grains (52 *zhong*), vegetables (176), mountain herbs (201), marshland herbs (284), stone herbs (98), water herbs (37), creepers (235), fragrant herbs (71), poison herbs (44), ornamentals 142), fruits 102), and trees (272).

One of the greatest points of interest of the text is that it takes into account plants known as *materia medica* and ornamentals, but also new ones without specific uses. Many of them, which the author had the opportunity to see during his travels in China as a high ranking official, appear in this book for the first time. It is also the first time that the term *zhiwu* is used in a title to name plants in general. However, as Needham remarked,³² "though written at such a recent date, this splendid and well-illustrated treatise was entirely traditional in character, and did not take in any account the advances of botany made by Camerarius and Linnaeus".

Even if the pictures were of a remarkable quality compared to those of previous *materia medica* (Fig. 5), it is important to realise that the main purpose of the book had not too much relationship to botany. Working within the frame of the "Evidential Research Movement" *kaozhengxue*,³³ the author was mainly interested in two problems resumed in the title of the book: to give the adequate names and the proper representation of all the plants mentioned in the book. It must be kept in mind, however, that these plants were not all he could have seen and collected, as a modern botanist would have done, but they were only those which had a cultural significance. To do so he researched both ancient literature and local folk knowledge. In the case of the plants already known, he chose what he considered the most correct term; for the plants described for the first time in his book, he adopted two different attitudes. In most cases, he chose a vernacular name as the main entry; but in twelve cases, having not found a proper name or no name at all, he gave a description and a picture and left the plant unnamed *wuming*. He even referred them in this way in the index at the beginning of the various sections of the book. This reminds the procedure of Otto Brunfels of Mainz (d. 1534), who in *Herbarum vitae eicones* (1530) called "*herbae nuda* (nameless waifs)" the plants which had been drawn by Hans Weiditz from nature but were not named by Dioscorides.³⁴

Besides a large amount of beautiful and realistic pictures, Wu Qijun also reproduced poor drawings of plants with the corresponding text, found in ancient sources

³⁰ Métaillé, "Histoire Naturelle".

³¹ Wu Qijun. *Zhiwu ming shi tu kao* (Researches on pictures, reality of names of plants). (Taipei: Shijie shuju, 1974 [1848]). To be referred in the text as ZWMSTK.

³² Needham, Joseph. "The roles of Europe and China in the evolution of oecumenical science", in, Clerks and Craftsmen in China and the West, org. J. Needham (Cambridge: Cambridge University Press, 1970), 396-418, 400.

³³ One this see Elman, Benjamin A. From Philosophy to Philology. (Cambridge (Mass.): Harvard University Press, 1984).

³⁴ Sarton, George. Six Wings. Men of Science in the Renaissance. (Bloomington: Indiana University Press, 1957), 132.

but unknown to him, in order to let his readers the possibility, through further researches, to recognise them.



(Fig. 5. *Cannabis sativa* L. , hemp. *Zhiwu ming shi tu kao* (1848) by Wu Qijun)

This first book in Chinese history solely devoted to plants without any other purpose than knowledge, cannot be compared to any book of scientific botany. Through the descriptions of plants and the pictures it is possible to realise what a good observer the author was. He was also an innovator, as nobody had previously done such a research on the flora of various provinces. Nevertheless, his interest was not botanical discovery and taxonomy, but cataloguing plants - either from the woods and the fields or found in old books - related to mankind. In other terms, a kind of recognition and compilation of the knowledge on plants since the beginning of the Chinese civilisation. In doing so, he was probably creating a new field, a kind of human centred cultural botany, without economic implications. Also in this case, he was concerned with something different from Tournefort or Magnol's interests. So, once again, it seems to me that a comparison is not possible, except to say that the two fields of interest belonged to two completely different worlds.

I would like to give now a few more examples on the significance of considering the ancient naturalistic knowledge *per se*, without a systematic reference to modern scientific knowledge. The first concerns botanical classification.

In a lecture at the XII International Congress of Sciences, in Paris, in 1968, titled "The Development of Botanical Taxonomy in Chinese Culture", Needham began, in a way consistent with his perspective, with this question:³⁵ "When did Chinese scholars interested in plants and animals, begin to classify them in a dendritic or hierarchical manner? (...) More especially when did three levels of groups or classes and sub-classes appear?" To immediately continue, by saying: "**Perhaps the best way to open this subject is to have a look at the terms used by modern Chinese botany and zoology for the various levels of classification**". Noticing "that nearly every one of these terms, defined in strict hierarchical order today, occurs in ancient texts going back to the middle of the -Ist millenium", even if "they were not ranked always in the same order or with the exact meaning they have now", he assumed that "there are certain examples in the *Erya* where we can find a classification in three levels - very roughly corresponding to family, genus

³⁵ Needham, "Development", 127.

and species”. All this may seem true, but if we analyse the contents of the *Erya* without any reference to modern taxonomy, the conclusion is sensibly different.

This text might have been composed between the fourth and second centuries B.C.³⁶ Of obscure meaning, it had been the subject of many commentaries all along Chinese history, the most ancient still extant was composed in 310 by a scholar named Guo Pu (276-324). The text is mainly a glossary with archaic terms as entries, followed by a standard synonym or a short definition. The terms are organised in nineteen chapters, two of them dealing with plants “*Shi cao*” (Explaining herbs) and “*Shi mu*” (Explaining trees). In this way, a clear distinction is made between herbaceous and woody plants, and different names are also used to name flowers of herbs and flowers of trees. Most of these entries are plant names, which may be generic, specific or may make reference to wider categories like *hui*, for instance, for the whole herbs.

Besides the distinction made by these two chapters, there is no other formal presentation of other categories. However, at the end of the chapter on trees some terms are quoted, which seem to give some clues to understand how the authors of the book appreciated plants.

We can read the following list: *guan mu* “grouped trees”; *guan* “trees growing together”; *hui mu* “tree without branches with difformities and excrescences”; *fen* “tree with an abundance of fruits”; *bao qiu mu* “grouped trees with excrescences on the nodes of roots and branches”; *shen* “tree bending naturally”; *zi* “standing dead tree”; *yi* “dead tree lying on the ground”; *yi* “trees rubbing each others”; *xi* “tree with rough bark”; *shao* “brancheless dead tree standing”; *qiu* “tree bending downwards”; *qiao* 1/ “with branches curved like feathers”, 2/ “with branches bending upwards”, 3/ “looking like catalpa”, 4/ “with intermingled branchlets upwards”; *bao* “[growing in clusters] like *Phyllostachys* bamboo”; *mao* 1/ “[with dense foliage] like pine and cypress, 2/ “[with dense foliage] like sophora; *xi* “without branches”.

A modern botanist may wonder to what kind of classification this inventory refers. The insistence on morphological details particularly visible may indicate a special function of the trees in the landscape, as landmarks of itineraries for instance, in any case, far from a botanical taxonomy.

Taking into account only the information given by the text itself, we can conclude that in the *Erya*, the plants are divided in two main categories, grasses and trees, the basis of a folk classification that can be found in many human groups.³⁷ Inside each of these categories, when considering the nomenclature and the descriptive vocabulary, various levels of classification of plants can be found which I summarise in the following way:

unique beginner:	<i>caomu</i> (plants)
life-forms:	<i>cao</i> (herbs) / <i>mu</i> (trees) / <i>teng</i> (creepers)
intermediate categories:	<i>taoli</i> (peach-prune), <i>songbai</i> (pine-cypress)....
generic-specieme:	<i>tao</i> (peach), <i>li</i> (prune), <i>zhu</i> (bamboo), <i>gua</i> (gourd)
folk variety:	<i>yingtao</i> (cherry)

³⁶. Quoting Karlgren (1931), W. South Coblin. “Ehr ya”, in, Early Chinese Texts: A Bibliographical Guide, org. Michael Loewe. (Berkeley: The Society for the Study of Early China and the Institute of East Asian Studies, University of California ,1993), 94-99: 96, writes “the *Erh Ya* is a work of different hands and probably dates from the third century B.C.”. About this first encyclopaedia see also Needham, Science, 6:1, 126 ff.

³⁷. See for example Brown, Cecil H. “Folk botanical life-forms: Their Universality and growth”. American Anthropologist, 79 (2, 1977): 317-342.

The basic level corresponds sometimes to a botanical species, but generally to a botanical variety or cultivar, as it is clearly the case for eleven jujubs trees quoted in the text. Intermediate levels are not equivalent neither to botanical genera nor families, even if a partial overlapping may be found. Let us take as an exemple the morpheme *tao*. Today this term designates the peach tree. In the *Erya*, three kinds of *tao* are mentioned, *xingtao*, *dongtao* et *shantao*. The commentary by Guo Pu precises that the first is “today’s *yingtao*” (a cherry tree), the second “ripens its fruits in winter”, and the third has “fruits like pears but smaller and without kernel”.

This example shows that in the reality reflected by the text, the peach tree and the cherry tree were considered as belonging to the same category *tao*. All the plants belonging to the *tao* group are a part of a larger category called *tao-li* “peach-prune”, which is a part of the superior category *mu*, “tree”. It can be tempting in this case to assimilate *tao-li* to the genus *Prunus* of modern systematic. But then, what to do with the category named *xing-mei* which associates also two species belonging to the same genus, *Prunus armeniaca* et *Prunus mume*? It must be kept in mind that the logic and the rationale of folk taxonomies are not those of modern taxonomy. Even if a partial overlapping between categories of folk and scientific taxonomies may be found, there no *a priori* reason to find in the *Erya* the principles of modern taxonomy.³⁸

The following example of the anthropological approach addresses a problem in technical terminology.³⁹ I was puzzled by the fact that the term *rui* was explained in modern dictionaries of classical Chinese as “stamen and pistil” or “sexual parts of a flower”. Considering medieval and other ancient texts prior to the discovery of plant sexuality (from the end of the 17th to the middle of the 18th century in Europe), I wondered how it was possible to write such a thing. So I checked the descriptions of plants in Li Shizhen’s work and found interesting examples.

On the willow flower he wrote : “In Spring it produces first catkins and then gives flowers with yellow *rui*”. As for the flower of the eggplant, it possesses “five pegs *leng* and yellows *rui*”. In the description of the poppy’s flower, he says that “in the middle of the flower there is a jar surrounded by beards *xu* and *rui*”. For the lily flower, Li Shizhen notes that it has “red *rui* hanging in all directions”.

It is easy to notice from these quotations, that *rui* is often associated to names of other parts of the flower like “pegs” *leng*, “beards” *xu* or “jar” *yingzi*. Considering the pictures of poppy and lily flower it is obvious that *rui* corresponds to what today is called “anther” in botany - the yellow or red colour coming from the pollen it bears - and that the beards or pegs are the “filets” which bring the anthers on their tops. Both are parts of the male organ of a flower, the stamen. However, no reference is made to male or females part of the flower.

In the description by Cheng Yaotian (1725-1814), - another *kaozheng* scholar particularly famous for his researches on archaic bronze bells⁴⁰ - in 1804, of the composed

³⁸ About comparisons between folk and scientific taxonomies, see in particular Atran, Scott. Cognitive Foundations of Natural History. Towards an Anthropology of Science. (Cambridge: Cambridge University Press, 1990) ; Friedberg, Claudine. “Classifications populaires des plantes et modes de connaissance”, in, L’Ordre et la Diversité du Vivant, org. P. Tassy. (Paris: Fayard-Fondation Diderot, 1986), 23-49. About the principles of folk taxonomies see Berlin, Brent. Ethnobiological Classification: Principes of Categorization of Plants and Animals in Traditional Societies. (Princeton: Princeton University Press, 1992); Ellen, Roy. The Cultural Relations of Classification. (Cambridge: Cambridge University Press, 1993); Friedberg, Claudine. “Le Savoir Botanique des Bunaq”. Mémoires du Muséum National d’Histoire Naturelle, Botanique, 32 (1990).

³⁹ See the development of this point, here summarised, in Métaillé, Georges. 1994. “A propos du sexe des fleurs: le cas des *rui*”, Cahiers de Linguistique Asie Orientale, 23 (1994) :223-230.

⁴⁰ Elman, 182.

inflorescence of plants from the Chrysanthemum family (Asteraceae / Compositae), the meaning of the terms changed from a botanical point of view, *rui* corresponding to the stigma, and *xu* to the style, two elements of the female part of a flower, the pistil. However, the only characteristic noted for *rui* was its colour, yellow.

Thus, I thought that it was not possible to translate *rui* in the various contexts neither by anther nor stigma. In order to find a solution, I checked European Renaissance works. In the French translation of Rembert Dodoens's *Cruydt Boeck, Histoire des Plantes*, (1557), by Charles de l'Écluse, on the lily flower it says that in the flower "apparaissent six languettes toutes jaunes assises sur autant de queues..." (appear six small tongues all yellow, sitting on as many tails). For the poppy, it is written that the flower has in its middle many "filets et un rond chapiteau" (small threads and a round big top). In *Histoire Générale des Plantes* by Jacques Dalechamp (French edition 1653), on the lily it is stated that in the middle of the flower, it can be seen "certains filaments jaunes qui se tiennent droits lesquels ont une graine jaune au bout" (some yellow filaments standing up with a yellow seed on the top) and some lines below, that "il sort des filets jaunes faits à la mode de langues" (yellow small threads looking like tongues come out). In *Historie of Plantes*, the English translation of the French version of Dodoens book, published in 1578, it says: "the flower has in the middle many small hairy threddes with little tippes at the endes".

Through these quotations, it can be established that the European authors also distinguished the parts that Li Shizhen called *rui* and *xu* (or *leng*). The terminology was not settled either and the terms were also purely metaphoric. However, here at least we have possible ideas for an accurate translation of the Chinese terms without any mistaken implicit interferences with modern level of botany.

We may wonder why this interest in China for the *rui*. A possible answer can be found in horticultural books since the 11th century, where peonies were the most appreciated flowers. Besides the colour and the number of petals, the size, number and disposition of the *rui* were crucial elements to distinguish varieties.

Now, I would like to come back to some aspects of the *Zhiwu mingshi tukao* previously briefly presented. The book has 1714 entries, consisting of plant names, each one of them illustrated and accompanied by a written description. Looking carefully at the texts and pictures, two paradoxical facts are found. On the one hand, quasi botanical pictures are side by side with very crude ones. The former are considered by modern Chinese historians of science as the proof that the book is a "true botanical work of great value", while the latter are judged as shortcomings. However, the author explains that in some cases, due to contradictions and insufficiencies in the available texts, it was impossible for him to give proper advice. In such cases, he chose to give the rough information he had to the reader, in order to allow for further researches, if possible. These cases clearly illustrate the "*tu kao*" of the title "research on pictures". In most of the other cases, he had been able to find out the "reality of the names" of the plants, the "*ming shi*" of the title, and he gave good descriptions and illustrations of them.

But there is still another kind of entry to which no paper that I have read has paid any attention to. As mentioned above, in twelve cases, Wu Qijun introduced plants previously unknown, and instead of giving them a name, he merely wrote "unnamed" *wuming*, as the entry. In these cases, he gave his own description to conclude by comparing the plant to another already known. One example is:

"One kind without name *wuming yi zhong*. There are many in Jiangxi and Hunan provinces. Long running stems following walls, round nodes like bamboo. At the nodes, opposite small branches/twigs,

[with] five leaves growing from the same place *wu ye tong sheng*, which look like [those of] *Cayratia japonica* (Thunb.) Gagnep. but are longer. The leaves head are not regular, they have deep teeth and coarse veins, thick and rugose like wrinkles. On the internodes, there are small beards which stick to the walls like fly legs. It is of the same category as Japanese ivy [*Parthenocissus tricuspidata* (Sieb. et Zucc.) Planch.]”

This last indication may help a botanist to identify this plant as a Chinese virginia creeper [*P. henryana* ?].

These two procedures, introducing apparently outdated illustrations and texts on the one hand and unnamed previously unknown plants, on the other, are basically different from what a modern botanist would do. In the second case, it is fascinating to realise, that, a botanist without botany, the author, when facing a previously not named plant, is able to give a proper picture and a description, to put it in a category, but cannot invent a name for it; and he did this for twelve plants among more than 1700.

Reasons? Probably the *kaozheng* “evidential research” tradition. In China, it was believed that all the knowledge had been given to mankind by the first mythic holy emperors. This knowledge had been partially lost and the aim of the scholars was to find again this lost knowledge through researches into ancient literature, archaeological remains and common people who, being illiterate and non polluted by the errors of the later books, were supposed to have kept the original knowledge of the names of the things of nature. So, when no name could be found in the ancient texts or through enquiry among the common people, the plant had to remain logically “unnamed”, until someone would discover its proper name through further research. In this case, probably the most correct way of naming was to leave the plant unnamed. In the same way, the author gives the information found in ancient texts for obscure plants in order to induce further researches.

The names chosen for entries must be considered from an ethnobiological point of view, because in some cases they have a specific meaning, and a generic one in other cases. They generally correspond to folk generics, not to botanical species. A particularly good example is given *juan 11* under the entry *lan* :

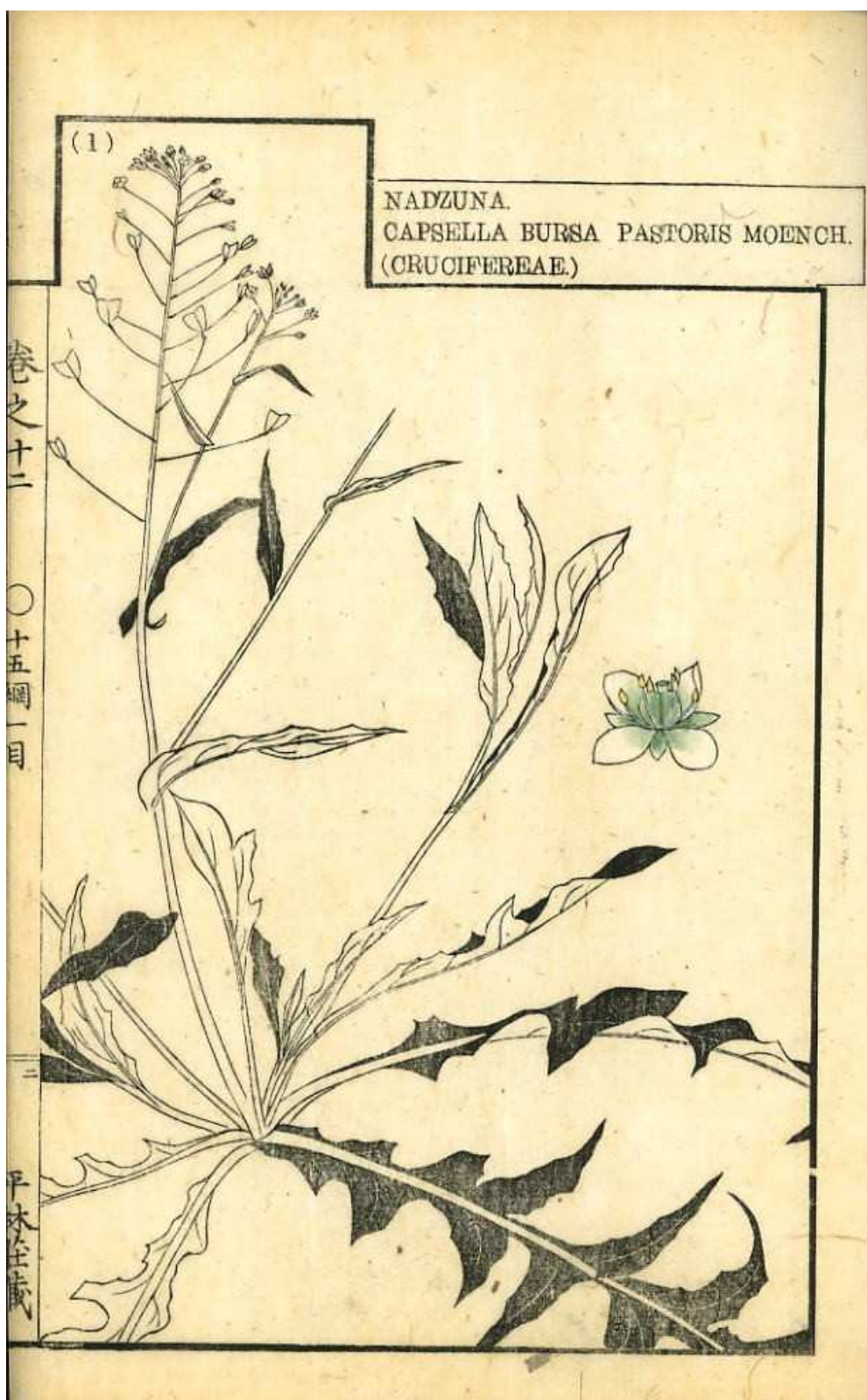
“Li Shizhen divides it in five kinds *zhong*, but actually, it is obvious that there is a great confusion because considering their leaves and flowers, they are all different from each other. Today, the most cultivated kinds are *liaolan*, a knotweed [*Polygonum tinctorium* Ait.], *songlan*, a Chinese variety of dyer's woad [*Isatis tinctoria* L. var. *indigotica* Chao et Kuan], and *malan*, common conehead, [*Strobilanthes cusia* (Nees) O. Kuntze].”

On this point, a Chinese botanist, Chen Chongming considers that the plant named *lan* in ancient texts must be identified as [*Isatis tinctoria* L. var. *indigotica* Chao et Kuan] which, today is called *songlan*.⁴¹ Since the two pictures accompanying the text correspond one to the knotweed *liaolan*, and the other to the common conehead *malan*, he concludes that Wu Qijun was wrong in considering them as true *lan*.

However, if this case is analysed from an ethnobiological point of view, we come to another conclusion. The Chinese term *lan* is not less ambiguous than its English or French equivalent, “indigo”. This term designates at the same time a

⁴¹ Chen, Chongming. “Dui Zhiwu ming shi tu kao sanshiliu zhong zhiwu de dingzheng” (Nomenclatural revision of 36 species of plants in the Chinese Herbar ‘Zhi wu ming shi tu kao’). *Zhiwu fenlei xuebao-Acta Phytotaxonomica Sinica*, 19 (1981): 136-139, 136.

technical object, a blue dye, and plants from which it is extracted. If we understand *lan* as “plant giving a dark blue dye”, Wu Qijun is just indicating the three species he recognises within this generic.



(Fig. 6. *Capsella bursa-pastoris* (L.) Medic., in *Somoku tsuetsu* (2nd ed. 1874) by Inuma Yokusai)

From this rather schematic presentation, it may be agreed that the book does not belong to modern botany. A simple comparison with a Japanese book written in 1852 by Inuma Yokusai (1782-1865) and published in 1856, *Sômoku zusetu*, shows a clear difference. In the Japanese book, the descriptions of the plants are still partly analogical, but the plants are classified following the Linnean system, considering stamens and pistils, even when their names are only in Japanese and Chinese. The Latin binomials will be added in a second edition published in 1874 (Fig. 6). The quality of the pictures is botanical and aesthetic, while in the *ZWMSTK* it is realistic and aesthetic.

Instead of considering this book, like many Chinese scholars today do, as the first true scientific botanical writing in China, it seems to me that it is the climax of something completely different from modern scientific botany. In this book the plants are considered, in the first place, not as natural but as cultural objects. The case of the anonymous ones could be explained as a first step towards the approach of a naturalist, but the fact that these plants bear no name shows, on the contrary, the strength of the cultural environment.

This did not prevent the *ZWMSTK* to become a work of great interest to the botanists, being the first in the history of China to take into account so many plants from so many different parts of the country. Indeed, in 1883 a Japanese botanist, Ono Motoyoshi (1843-1890) published a Japanese edition. In 1888, it was chosen, with the *Bencao gangmu* by Augustine Henry, a naturalist working in China, as the reference for the vernacular names of Chinese plants. Matsumura Jinzô, (1856-1928) another Japanese botanist, assistant professor in the University of Tokyo, used it as the most recent reference for the Chinese names of plants in his *Nippon Shokubutsu mei-i or Nomenclature of Japanese plants in Latin, Japanese and Chinese*. (1884, 2nd ed.: 1895). Between 1912 and 1922, the Bureau of Plant Industry, U.S. Department of Agriculture, prepared the *Indexes of the Great Chinese Botany Chih Wu Ming Shih T'u K'ao*. It is still a very precious document for the history of the investigation of the Chinese flora, as shown by the research of a botanist like Chen Chongming. In no way, however, it can be considered as a genuine book of botany. It is an outstanding example, in my eyes, of what I would call an "holistic botany".

To conclude, I come again to the other *kaozheng* scholar previously quoted, Cheng Yaotian. One booklet in 4 chapters *juan* is titled "Researches on the 9 grains" *Jiugukao*, the other in one *juan*, "*Small notes about 'Explanations of herbs'*". This title makes allusion to the chapter, bearing this name, in the *Erya*, the 3rd century B.C. encyclopaedia already mentioned. In these two texts and several smaller ones, the author considers names having a botanical meaning obscure to the various commentators of ancient texts and he proposes his own interpretation. I will give now a glimpse of his method which I have developed in a paper.⁴²

The problem was the meaning of a character *tu*, which appears in this context: "*tu*, the *tu* of the bitter vegetable *kucai*". In order to elucidate this, he identified two plants known as "bitter vegetable" at his time. He began by the first one, which is a wild lettuce. He made enquiries at the countryside, observed the plant, tasted the white sap which appears when one cut its leaves, and he also asked questions to the local countrymen. Then, he compared the notes he had gathered to what was available in ancient texts. In this way, he concluded that in the first case, the word *tu* meant the downy seed-heads.

Then he went on with the second "bitter vegetable", which is the sow thistle (*Sonchus oleraceus* L.). He concluded that the two plants had various similarities, like a

⁴² Métaillé, Georges. "Des mots, des animaux, des plantes", *Extrême-Orient Extrême-Occident*, 14(1992):169-183.

bitter taste of their sap, a similar flowering period, the seed-heads and considered them as members of a group. Then he enumerated all the plants he knew having similar characteristics. He noticed also that they had something in common with reeds and, considering another quotation of the same 3rd century B.C. encyclopaedia where a term is given as a synonym for *tu* when reeds are concerned, he concluded that there was evidence to associate all these plants in a general implicit category.

Thus, beginning from a philological problem, the true meaning of a term in an ancient text, Cheng Yaotian, after inquiries among countrymen and naturalistic observations confronted to text exegesis, proposed an answer to the philological problem, but also a kind of botanical classification. In another case he gathered seeds in the wild and sowed them in order to observe the development of the plant. He also used to collect plants and made drawings, always to solve philological problems. As a conclusion, it seems to me that he may be considered a kind of botanist without botany.

A research note on four grains entitled *Tu shu ji dao liang si gu ji* following his *Research on the Nine Grains* provides more evidence on the empirical dimension of Cheng Yaotian's scholarship. Here Cheng proceeds as an anthropologist when he investigates what really was meant by *shu* broomcorn millet (*Panicum miliaceum* L.), *ji* broomcorn (*Sorghum* sp.), *dao*, rice (*Oryza sativa* L.), and *liang* foxtail millet (*Setaria italica* (L.) Beauv.). His inquiry considered the level of knowledge among adults and children; folk taxonomy; the differences between the various crops in different parts of the country; and the dates of sowing and harvesting. He also added five pictures of his own observations of the plants, one for each of the four crops plus one of *you*, a "weed" growing in foxtail millet fields – already quoted in the *Shuo wen jie zi* (121 A.D.) – which is actually a spontaneous cross between the crop and green bristle grass (*Setaria viridis* (L.) Beauv.).

It seems to me that Wu Qijun and Cheng Yaotian are interesting examples of the scientific attitude of Chinese scholars in the nineteenth century, who had a completely different relationship to the natural objects than the one in Europe. An analysis of their works considering only modern botany, would induce bias by focusing on their supposed mistakes in identification or by letting aside what appears as non botanical, which precisely reveals the ethnobotanical character of these works and their strong originality, when compared to modern scientific botany.

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