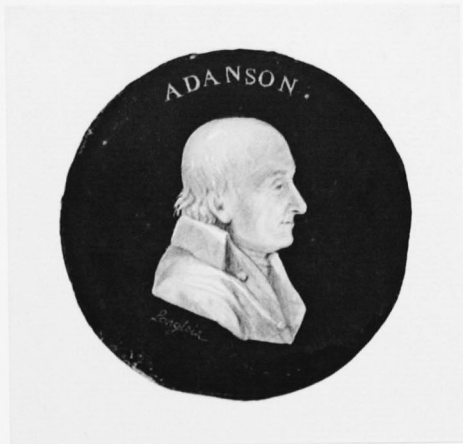


ADANSON

The Bicentennial of Michel Adanson's

«Familles des plantes»

Part One



The Hunt Botanical Library

Carnegie Institute of Technology Pittsburgh Pennsylvania

1963

Copyright ©1963 by
The Rachel McMasters Miller Hunt Botanical Library
Carnegie Institute of Technology
Pittsburgh, Pennsylvania

Library of Congress Catalogue Card Number 63-21502
All rights reserved

Number 1 of The Hunt Monograph Series

Editor: George H. M. Lawrence

Director, The Hunt Botanical Library

Contents

Foreword		ix
Figures		vii
Adanson, the Man	<i>Jean-Paul Nicolas</i>	i
Adanson and his «Familles des plantes»	<i>Frans A. Stafleu</i>	123
Background of the century		127
Botany in France in the year 1763		138
Historical preface to Volume One		145
«Familles des plantes» Volume Two		204
Publication and reviews		237
«Familles des plantes» its fate		240
References		247
Appendix		259
The Adanson Collection of Botanical Books and Manuscripts	<i>Willem D. Margadant</i>	265
Printed books		279
Holograph letters		307
Manuscripts		340
Index		369

Adanson and the «Familles des plantes»

Frans A. Stafleu

I INTRODUCTION

In many respects Adanson's *Familles des plantes* (cf. Fig. 15) must be considered one of the classic publications in plant taxonomy. Adanson was the first author to provide a logical basis for a natural classification of plants, at a time when this subject constituted one of the major problems in taxonomy. Although by no means the first author to speak of natural classification, or even the most successful one, Adanson must be regarded as the first botanist to have made a consistent attempt towards such a classification founded on a clearly expressed philosophy and a thorough knowledge of the achievements of the past.

Adanson's importance as a historian of botany and of ideas in botany is evident: no botanical author before him had realized so clearly that a knowledge of the ideas of the past and the facts assembled by our predecessors are an essential element of the thoughts and methods of today. The *préface istorike* to the *Familles des plantes*, is, among other things, an exemplary history of botany, and also one of the first of its kind.

Adanson was typically a man of his century: his life spanned the greater part of this era of enlightenment, rationalism, and natural history. If ever a century has deserved the designation "century of the life-sciences," it was the eighteenth century. The great scientific and philosophic achievements of the previous decades pervaded natural history and created a receptive background for everything concerned with nature. Many facets of Adanson's work can be understood when seen in this light.

One of the important features of Adanson's view of plant taxonomy is that he realized fully that this branch of science should not be based on knowledge derived from plants of the temperate zones alone: a thorough knowledge of the tropical flora is essential, not only from material brought home by others, but by personal observation. The Europe-centered or Mediterranean-centered view of the plant-world was consciously abandoned and condemned by him. In this respect Adanson showed true vision, a vision conspicuously absent in many of his con-

FAMILLES DES PLANTES.

*Par M. ADANSON, de l'Académie des Sciences, de
la Société Royale de Londres, Censeur Royal.*

I. PARTIE.

Contenant une Préface Istorique sur l'état ancien & actuel de la
Botanique, & une Théorie de cette Science.

*Tot generibus Erbarum, utilitatibus hominum aut voluptatibus genitis
recensitis, quantum plura restant, quantum que mirabilia inventu ! PLIN.
Hist. nat. Lib. 22 Proœm.*



A PARIS,
Chez VINCENT, Imprimeur-Libraire de M^{sr} le
Comte de PROVENCE, rue S. Severin.

M D C C L X I I I.

AVEC APPROBATION, ET PRIVILEGE DU ROI.

Fig. 15. Title-page facsimile (reduced) of the *Familles des plantes* (vol. 1).
[Cf. Margadant, AD 5.]

temporary fellow-botanists whose horizons were still those of the old world. Adanson also stressed how important it was for a taxonomist to see living material, to grow plants himself, to make ecological observations and to conduct experiments, *e.g.* by hybridizing and by observing the offspring of plants from the wild propagated in the garden.

The critical and open mind of Adanson is at its best when faced with the delicate problem of the constancy of species. In his *Familles des plantes* Adanson, certainly stimulated by Buffon, advocated the variability of species and the possibility of the formation of new species by hybridization and spontaneous mutation. In later years Adanson abandoned these far-reaching views, but his insight, shown as early as 1763, is nevertheless astonishing and far ahead of his time.

When we compare Adanson's work with that of his contemporaries and especially with that of Carolus Linnaeus and of Bernard de Jussieu we shall find that the merits of the natural systems put forward by these three men were of equal value, but that Adanson's contribution was the only one accompanied by a methodical treatment and by ample descriptions and discussions of the taxonomic units, mainly his families. The family descriptions given by Adanson are often astonishing in their completeness and several of them are still models of their kind. Adanson wanted to give every genus a definite place in his classification and by doing so he included several extraneous elements in his families, but so did his contemporaries.

When drawing up his families, Adanson stated clearly that he based them on as many characters as he could possibly find. As has been pointed out by Cain (1959) and Gilmour (1961), his method was inductive since he tried first to list all attributes and to discover from this listing the degree of similarity. His evaluation of the importance of the attributes for the purposes of classification was made *a posteriori*, an approach which showed that Adanson was far ahead of his time. Furthermore Adanson stated also that the importance of the various attributes differed in each group: every family had its own "character" or *génie*. The principle of general comparison, the evaluation *a posteriori*, the idea of the relative, rather than absolute, value of single characters, and the stressing of the importance of combinations of characters and structural patterns are important contributions to taxonomic thought made by Adanson. He acknowledged no strict *a priori* subordination of characters, as for instance did A.-L. de Jussieu, because this was in his opinion artificial, and led to the circumscription of taxa by a few arbitrarily chosen attributes. Adan-

son's thoughts show the influence of the philosophy of René Descartes (1596-1650) who, in his *Discours de la méthode* of 1637, had laid the foundation of the scientific rationalism which is at the basis of Adanson's natural method. The four basic Cartesian methodical rules: doubt, analysis, synthesis, and enumeration (Descartes 1637, ed. 1937, p. 109) were faithfully observed by Adanson, and helped him to reject the scholastic philosophy of his school-days.

The contrast with Linnaeus is clear. Linnaeus was first concerned with pragmatic classification and easy reference although he realized the possibility and even the necessity of establishing natural relationships. Adanson was so much in reaction against all arbitrarily chosen systems imposing a human order on nature, that he could not accept any other guidance than that which he thought to find in nature alone.

Both men were great botanists and it is not surprising that their natural systems were very similar. Adanson never realized, however, the enormous importance of the binary system of nomenclature as developed by Linnaeus, and he missed the opportunity to present his own sound ideas on classification in combination with the technical innovations of the Swedish botanist. The great advance in practical presentation of botanical knowledge by the pragmatic Linnaean system in the course of the second half of the eighteenth century acted as a brake on the development of natural classification. In that respect Adanson was too early: the success of the Linnaean system did much to keep Adanson's *Familles* in the background. Adanson himself, moreover, presented his views in an unattractive form, spoiled by a crude personal orthography, which also prevented a more general diffusion of his ideas. Further reasons for early and undeserved oblivion are found in the circumstance that Adanson, although a member of the Académie Royale des Sciences, never received the opportunity to spread and clarify his ideas in contact with students: a post at the Jardin du Roi, which would have been appropriate, was never made available to him, and those who occupied the chairs of botany during his lifetime and even for a considerable time after his death did nothing to draw attention to the *Familles des plantes*. A certain competitive attitude on the part of Antoine-Laurent de Jussieu can, alas, not be denied. These circumstances: the surge upwards of the Linnaean system, the unattractive presentation of the *Familles des plantes*, the lack of contact with students, and the consistent ignoring by the botanical establishment of his day, together with a rather difficult psychological make-up, account for the oblivion into which Adanson's book fell almost from the beginning.

The rediscovery of Adanson's book as a "landmark in botanical history" is due to Henri Baillon, more than a century after its publication. Soon after him others recognized Adanson's early achievements: Edward Lee Greene, Otto Kuntze, Auguste Chevalier, and Émile Guyénot, to mention only a few. At the present moment, two hundred years after its publication, the time is ripe for a re-assessment of Adanson's great contribution to the plant sciences.

II THE BACKGROUND OF THE CENTURY

The eighteenth century was the century of the natural sciences, of nature and the natural. The seventeenth century had seen great progress in scientific ideas and concepts, but mainly in the physical, mathematical, and astronomical sciences. The foundation of modern scientific methods based on objective registration of facts, on experiments, and on unbiased co-ordination of the facts and results of experiments into a scientific picture of the universe had been laid in the century of Newton and Leibniz. The application of these methods to the natural sciences, however, took place mainly in the course of the eighteenth century. The changing image of the universe as brought about by the great scientists of the seventeenth century also pervaded philosophical thinking and we thus see that the rationalist approach to phenomena of the spirit and of life go more or less hand in hand.

The enormous diffusion of knowledge in the field of natural history in the eighteenth century and the great popularity of everything concerned with nature are features of a changing social pattern: the coming of the enlightenment.

The essence of the enlightenment is to be found in the success of its ideas: the ideas themselves were not new, and had gradually pervaded the minds of scientists and advanced philosophers since the renaissance had seen the great reaction of the human mind against the medieval domination of mere authority. The fifteenth, sixteenth, and seventeenth centuries saw a steady growth of independent thinking, a growth mainly among scientists and philosophers, rather than among the educated classes as a whole. The success of the enlightenment was the general acceptance of the basic freedom of the human mind to carry out a rational analysis of all phenomena whether worldly or unworldly, physical or spiritual, natural or social, philosophical or religious. The sweeping success of this opening of the human mind, of the acceptance of reason instead of belief, was accompanied by a broad interest in all

natural sciences. Nature is the key-word to the eighteenth century, because nature stood for objectivity, was accepted as exemplary, and provided the essential basis for judging the world and its institutions.

This broad interest in the natural sciences on the part of all who made up that literary-minded society of eighteenth-century France is reflected in the gradual increase of science items in such fashionable journals as the *Mercure de France* and the *Journal encyclopédique*, and even the thoroughly conservative anti-Voltairian, anti-encyclopedist *Année littéraire* of Elie Fréron (1718-1776). Adanson's *Familles des plantes* was extensively reviewed by all three of them, and this was not at all exceptional. The literary journals were all concerned with physics and biology as well as politics, philosophy, and belles-lettres. The more scientific *Journal des sçavants*, which had appeared since 1665, was extremely popular and widely read: so popular that pirated editions appeared abroad, closely following the Paris original. The *Journal encyclopédique*, that remarkable journal published in Bouillon, away from the Paris censor, from 1756 to 1793, was at the time the most fashionable and independent, but also one of the most widely read "literary" journals that accompanied the encyclopedist movement. Its every extensive and fair treatment of Adanson's work is typical of its character and indicates a general interest in such books as the *Familles des plantes*.

The words nature and natural have their own special meaning in every phase of human culture and as such the terms are very difficult to define. In the eighteenth century the terms were used in relation to man or to human institutions or to patterns of thinking. In this respect "natural" was used in opposition to "supernatural," the natural really meaning the rational, that which is open to reason, the supernatural standing for what is above reason or even contrary to reason. Deference to the natural implies distrust of the traditional and especially of the traditional patterns of thought. This "naturalism" is found in the eighteenth century in theology as well as in philosophy; in theology it had already led in the seventeenth century to the phenomenon of deism and the denial of the possibility of revelation; in philosophy it led to free thought and liberal thinking.

This twofold aspect of naturalism, the theological and the philosophical, is characteristic of eighteenth-century natural scientists. It was often dangerous to take sides with the philosophical rationalists and to deny revelation, but one could easily indulge in open and free research in biology ("natural" history), so long as one did not draw the all too

obvious conclusions. A remarkable feature of many biological publications, and especially of the thriving popularizing books, was the lip service paid to certain theological opinions, the most generally found one being the statement that all research revealed the wisdom of God in creation. The eighteenth century is also still the century of the clerical scientists: according to Mornet (1911) about half of the authors who then published on natural history in France belonged either to the Roman Catholic clergy or were Protestant ministers.

The great attention paid to nature by non-scientists, especially with regard to biological and sociological phenomena, shows the liberalizing influence of science on the human mind in the eighteenth century. With "nature," that "new" source of truth, that unspoiled reality which could be invoked to attack established authority, natural history became popular to an unsurpassed degree. This popularity was also evident in an important aspect of natural history which is lacking in the physical sciences: the possibility of making collections. The century was one of collections, of natural history cabinets and private herbaria. The discovery of new countries produced an influx of new material from overseas: travelling and reading about travelling was in vogue. Collecting items from overseas, from faraway unspoiled and natural countries, was part of it: besides such great collectors as George Clifford (1683-1760) in Holland, Sir Hans Sloane (1660-1753) in England, René-Antoine Ferchault de Réaumur (1683-1757) in France there were many who collected on a smaller scale, whose collections often constitute the foundation of present-day institutional collections. The importance attached to these collections is shown in the full title of Buffon's *Histoire naturelle, générale et particulière, avec la description du Cabinet du Roi* (vol. 1, 1749). The Cabinet du Roi was the museum counterpart of the Jardin du Roi; Buffon was director (*intendant*) of both of them. Another sign of the popularity of collections and natural history cabinets is the steady stream of catalogues describing them that came from the press in the seventeen-sixties. Hérisant (1771, p. 51) cites not less than five such catalogues for the year 1763 alone. Réaumur's natural history cabinet was frequently visited by Adanson in the early years before his Senegal voyage. Collecting plants was relatively easy and a very popular pastime: Jean-Jacques Rousseau (1712-1778) compiled a considerable herbarium (cf. Jansen 1885, and Lanjou et Uittien 1940), and so did many of the other *philosophes*. "Det är nu a la mode att hafva Natural samlingar" (it is now a la mode to have natural history collections) writes Clas Alströmer (1736-1794) on 30 January 1763 to his

master Carl Linnaeus (Fries 1909, p. 69). Next to the general predilection for collecting, the interest in natural history was promoted by the literary journals and by popular books such as *Le spectacle de la nature* by Noel-Antoine Pluche (1688-1761). This book was found by Mornet in 206 out of 500 catalogues of private libraries in eighteenth-century France. According to P. Rousseau (1945, p. 298) it was more widely read even than the works of Voltaire. The book was published in nine volumes from 1732 onward and new editions of the first volumes were already necessary long before the last ones appeared. The second edition of volume one appeared in 1733 and was pirated that same year in Utrecht. Translations appeared in many languages and the success was enormous, only to be equaled seventeen years later by Buffon's *Histoire naturelle*. This popular book was of great importance in lending prestige to natural history and promoting this science among the members of the established classes. Gradually its ideas pervaded social ideas as well, as became evident in the later activities and publications of the encyclopedists. Books and journals like these, together with the craze for collecting, brought about a situation in which knowledge of natural history was a "must" for every educated person, and through which social institutions felt the influence of the "new look" in human thinking.

Adanson and his *Familles des plantes* must be seen against this background. The "case" of Adanson is by no means exceptional; there is much in the man and in his book that is characteristic of the century as a whole. No man can ever be understood from his environment alone, but this does not mean that we must look at Adanson as an isolated crackpot with extravagant or even erratic ideas, and out of touch with reality. Adanson was anything but out of touch with his world: many of his ideas and convictions can be understood as expressing general eighteenth-century sentiments and thoughts.

The natural classification proposed by Adanson was for him the only method of arranging living beings, because it was based on nature itself. When drawing up the "natural method" one should take into account all attributes. This is the reason why Adanson preferred the use of the term "method" and why he insists that there are *many* artificial *systems* as opposed to *the* natural *method*. A "system" was characteristic of the scholastic thinking which had just been abandoned. Adanson went to school with the Jesuits and would certainly have had a good scholastic-philosophical training. Abstract systems based on human assumptions or on abstractions were an essential part of it. Scholastic theology, for

instance, is "concerned with precise definition of and deduction from dogma" according to the Oxford English Dictionary. Pre-eighteenth-century thought was characterized by this "science of repeating itself without contradiction." The new philosophy, however, was based on facts instead of dogmas, on experiments instead of abstractions, on nature instead of revelation. Science starts from facts, and the scholastic systems, called by that term and popular as an educational exercise, were at variance with it. Adanson must have spent many hours of his youth in "systematically" treating such questions as "can God be confined in the category of substance," and knowing his later free approach to an objective study of nature, we can understand why he condemned so vehemently the artificial systems. This expression is for him a tautology: every system is artificial. Botanists who used artificial systems did not follow *la marche de la nature*, they did not observe and register as much as they could, but they were satisfied to describe nature in systems which were human rather than natural, and based on artificial assumptions or abstractions not unlike the systems that he had learned at school. "*Sapere aude*," dare to know, Kant's motto had become Adanson's maxim.

Adanson's contemporary, the Abbé Lambert, published his more or less popular scientific journal *Bibliothèque de physique et d'histoire naturelle* from 1758 onward. In his first volume he stated that natural history and physics had found their proper form only "since they had abandoned the spirit of the system and substituted the *génie d'observation* for it." Adanson thought exactly along these lines and Lambert's words might have been his motto in the first volume of his book.

The insistence on observation and registration, and the tendency to take all parts of the plant into consideration for classification, can also be seen as a reaction against the neo-scholastic teleology based on the Aristotelian principles of Adanson's school-days. Adanson shared this attitude with his great hero in botany Tournefort (see Leroy 1957, p. 204): both authors denied that there were certain parts of plants that were "nobler" than others because they played a rôle in nutrition and reproduction, and both were free from teleological speculations. Adanson is the most outspoken of the two in this respect, and seen in the light of a reaction against out-of-date but still very powerful non-scientific concepts his strong criticism of the idea that everything connected with the flower was *a priori* of greater importance than the rest becomes understandable and adds to the picture of him as a man of the enlightenment.

The word "natural" in "natural method" also has a typical eighteenth-

T H E
VEGETABLE SYSTEM.

O R,
The INTERNAL STRUCTURE,
A N D
The LIFE of PLANTS,
Their PARTS and NOURISHMENT Explained;

T H E I R
CLASSES, ORDERS, GENERA, and SPECIES,
Ascertained and Described;

In a METHOD altogether NEW.

C O M P R E H E N D I N G
A N A R T I F I C I A L I N D E X,
A N D
A N A T U R A L S Y S T E M.

With FIGURES of all the PLANTS; Designed and Engraved by the AUTHOR.

The WHOLE from NATURE only.

BY JOHN HILL, M. D.

VOL. V.

Containing the entire Class of AGGREGATE or CLUSTER-HEADED PLANTS:

With Observations on a natural Method, so far as it regards the Connection of the Classes;
on the Production and Propagation of MULISH or INTERMEDIATE PLANTS;
and on certain PLANTS which are common to England and America.

L O N D O N:

Printed at the EXPENCE of the AUTHOR.

And Sold by R. BALDWIN, in Pater-Noster-Row.

MDCCLXIII.

Fig. 16. Title-page facsimile (reduced) of John Hill *The vegetable system* (vol. 5, 1763) showing his stress on *nature* in "The whole from nature only."

century connotation, as will be clear from the importance attached by the century to everything which was "natural." Adanson was not the first to use it: Linnaeus had already spoken of *ordines naturales* in 1738 (see p. 52) and several other authors (cf. Fig. 16) had done the same. Adanson did not claim to be the inventor of the natural method; he claimed only that his own method was the best for finding the natural units in nature. The idea of a natural system, as it is usually called (though not by Adanson), is an idea found in many eighteenth-century botanists and zoologists: it was in the air. The word "natural" sanctified the method: everything that was "natural" had to be accepted and had precedence over man-made systems based on arbitrary criteria. An artificial system had its criteria chosen by man, the natural method gave a picture of nature in accordance with reason, facts, and experience. The emotional impact of the word "natural" in the terms "natural system" or "natural method" in Adanson's century was much the same as that of the term "phylogenetic," when applied to classification, in late nineteenth-century biology. The term "phylogenetic system" also implied a uniqueness: "this was the way it grew"; the term "natural" stood for "this is the way it is." The "one and only natural method" is a phrase repeatedly used by Adanson: this is exactly why the "method" given in the *Familles des plantes* is so superior in his opinion: it was not his own—it was the natural one. The artificial systems were all based on a personal choice and therefore arbitrary. In our detailed discussion of Adanson's method we shall repeatedly come across references to the contrast between natural and artificial, and between method and system: in his abhorrence of the *systèmes*, in his devotion to nature and in his insistence on observation Adanson embodied eighteenth-century science. In this respect it is interesting to note that Adanson's idea of the importance of basing one's philosophy on all aspects of nature was such that he criticized Newton for trying to explain physics in terms of attraction alone (vol. 1, p. cliv). For him this is just as artificial as Linnaeus' sexual system and he insists that for "the true principles of that science" it is equally necessary to consider not only one aspect, such as attraction or weight, but the totality of mechanical principles: only a science based on the combination of these principles can be universal.

Another aspect of Adanson's *Familles des plantes* that can be understood only against the background of his century is his usage of French instead of Latin in a scientific work. The number of scientific publications in French increases rapidly during the century (cf. Hérisant 1771). The

growth of the ideas of the enlightenment meant in this respect the abandonment of Latin, as the language of the few and of theology. The renaissance had brought a revival of the interest in the classical authors, but this did not necessarily mean that the medieval custom of transacting philosophy and science in Latin was to be continued. On the contrary, the ideals of the new development were to diffuse knowledge as widely as possible and to use the common language instead of Latin with its authoritarian flavor. The example had been given in 1637 by René Descartes with his *Discours de la méthode*. Voltaire said, speaking of his youth, "I knew Latin and follies" (*je savais du latin et des sottises*), others spoke of the *tyrannie des anciens*. Jean-Jacques Rousseau in his *Émile ou de l'éducation*, dating from 1762, advocated the return to nature and primitive virtue and in his proposed reform of educational methods he rejects the immoderate part played by Latin at the schools. The *Encyclopédistes* also advocated the use of the common languages for science and education. Buffon, who certainly exerted a powerful influence on Adanson, also published his highly successful *Histoire naturelle* in French. Voltaire was one of Adanson's favorite authors, to judge from the densely annotated works by this author in Adanson's library (Chevalier, 1934, p. 43); his ideas on the use and the spelling of the French language were evidently shared by Adanson.

It is in this spirit that Adanson wrote in French: he was not the first, as can be seen from the increase in articles written in French in the *Journal des sçavants*, and in the publications of the Académie des Sciences; his great predecessor de Tournefort also wrote his *Éléments de botanique* in French (1694), although later editions were in Latin. Linnaeus almost always wrote in Latin, but perhaps for the additional reason that Swedish was not so widely understood as French. The use of the French language in scientific and educational publications became more and more important towards the middle of the century. Two of the most peculiar features of Adanson's book, his nomenclature and his orthography, can also be understood in this light: Adanson wanted to accept all names of plants whether vernacular or classical and greatly objected to the Linnaean prescription of having names in Latin form. Every name had the same status whether vernacular or Latin and he felt free to choose what Linnaeus called barbarous names. Adanson discusses the use of the word "barbarous" and points out the relativity of this notion. Names had been given to plants by man, as such they were artificial anyhow, but this was no reason to increase the artificiality of nomencla-

ture by restricting the choice of names to those in Latin form. Adanson's approach to botanical literature is that of the open-minded observer, accepting all the facts and names brought together by his predecessors. He criticizes the latter in their systems, but he judges them by the amount of factual information presented in their books. He treated botanical literature in the same way as he treated nature: he registered and made use of all aspects where necessary, and he did not single out special criteria. Special attention was given to the writings of the classical authors which had been rediscovered by the renaissance: the findings of Theophrastus, Pliny, and Dioscorides were equated with contemporary knowledge and even if their names were not always accepted by Adanson, otherwise a supporter of absolute priority, they are nearly all included in the synonymy. Adanson's reverence for the classical authors was profound: he insisted that botanical authors of his day could learn much from their writings, although the reading had to be critical.

We have already referred to Adanson's far-reaching spelling reform, adopted in his first volume and proposed but not carried out for all names of plants in the second volume. Here, too, Adanson's approach is towards the "natural": all his reforms aim at writing as one speaks, and at the omission of superfluous mute letters. During his stay in Senegal Adanson had studied the Ouolof language which existed only in speech and not in writing. His attempts to develop a phonetic transcription of that language made him more and more aware of the artificiality of the orthography of his own language.

Still another facet of Adanson which is characteristic of his century is his attitude towards travel and towards the knowledge to be obtained from it. He explains at length the great advantages of travel for the biologist. The forms of life and the general aspect of nature change when one moves to the tropics. His decision to go to Senegal to study nature in an unspoiled state was prompted by the conviction that his knowledge of living beings could never be satisfactory without a knowledge of the tropics. Students of eighteenth-century culture, such as Atkinson (1924) and Kingsley Martin (1962), have pointed out that the influence of the traveller's evidence about natural man and nature on the *philosophes* was far greater than was generally supposed. Voltaire in his *Essai sur les mœurs et l'esprit des nations* (1756) directed the attention of his Europe-centered public to the culture and thoughts of non-European nations, a characteristic element of the enlightenment. Adanson was perhaps not so obsessed by social problems as most of his fellow philosophers and sci-

entists, but in his attitude towards travel he was a typical man of his time, and it is interesting to compare him again with Linnaeus, who hardly travelled and who never visited the tropics. Adanson's conviction that travel and knowledge of unspoiled tropical nature were essential for his science was truly "enlightened."

We have several times alluded to Adanson as belonging to *les philosophes*. The influence of Descartes, Voltaire, and Rousseau on the thoughts of Adanson has already been indicated, but Leibniz, Hobbes, Locke, and d'Holbach should also be mentioned in this respect. Writers on the cultural history of France in the eighteenth century have attached different meanings to the term *philosophe*. Some stress the point that the *philosophes* were those enlightened thinkers who were strongly engaged socially, others mention that science and enlightenment went hand in hand and that all who were concerned with science in that period can truly be labelled *philosophes*. This last version seems to be applicable to the latter part of the century whereas at first the term was used only for a restricted group of humanists who frequented certain liberal salons. For Mornet (1911) whose *Les sciences de la nature en France au XVIII^e siècle* is a classic in its field, a *philosophe* is simply one who occupies himself with science: science and philosophy are synonyms. All the *encyclopédistes* were *philosophes*, for instance. Adanson collaborated in the *Encyclopédie* of Diderot and d'Alembert, as has been related by J.-P. Nicolas (cf. p. 75). In many ways, however, he proved to be *plus encyclopédiste que les encyclopédistes* as is evident from his later obsession to write such an encyclopedia himself. This encyclopedic spirit, however, pervades already the *Familles des plantes*, and from his Senegal days onwards Adanson planned to make a comprehensive effort to describe the rest of the world from the same point of view as the vegetable kingdom. The renaissance ideal of the *uomo universale* was an inspiration for Adanson. As a work of science the *Familles des plantes* is the work of a *philosophe*, although Adanson very carefully avoids touching religious or social problems. He is concerned with nature alone and the way he treats nature betrays his deepest convictions. Buffon's words: "The use of books, solitude, the contemplation of the works of nature, indifference with respect to the turmoils of the world are the only elements in the life of a *philosophe*" could have been written for him. Adanson's book invites us in many respects to compare these two men whose lives were socially so different. From the way Adanson quotes Buffon in his work it is clear that he held him and his opinions in high regard although he sometimes wished to differ. Fundamentally, the

men had much in common; both were great scientists with wide and all-embracing original ideas, "universal men" with an open mind towards nature, with pronounced personalities and with a pronounced style of writing: Buffon's words *le style est de l'homme même* is just as applicable to Adanson as the above description of the life of a philosopher. Both men were concerned to express their ideas concisely and clearly and held universal theories on life and the world. Both Buffon and Adanson ignored theology and providence in their writings in a century in which natural science was officially still the servant of theology, and in which biologists were usually expected to sing the praise of God in one way or another in their writings. They both stressed the variability of species and the possibility of the formation of new species by means of natural processes. The contrast between Adanson's early insight in these matters with the firm belief (cf. Linnaeus and A.-L. de Jussieu) in the constancy of species is remarkable. Both Buffon and Adanson added greatly to the awakening of minds in this respect, though their efforts were ignored by many of their contemporaries.

The success of the first volumes of Buffon's *Histoire naturelle* must have impressed Adanson. Its eloquence and visionary explanation of the world were perhaps not exactly in agreement with Adanson's own temperament; but the way in which Buffon's work is treated by Adanson indicates that it nevertheless impressed him. The two men differed in other ways: Buffon was far more inclined to meditation and even speculation than Adanson, who was above all an observer. It is interesting, however, that Adanson's opinion of Buffon is so favorable, while the attitude of many contemporary scientists towards the *Histoire naturelle* was more critical because of the many hypothetical statements and abstractions which tended to remind them of the scholastic systematists.

To sum up, we must class the *Familles des plantes* with the publications characteristic of the enlightenment and its proponents, the encyclopedists and philosophers. The book reflects its age, and some of its characteristics that tend to strike us as peculiar idiosyncrasies of Adanson can be understood from contemporary ideas and ideals. The natural method, as professed not only by Adanson but by many of his fellow eighteenth-century biologists, must be seen against the background of the philosophical and social ideas of the time, when the word "natural" meant much more than simple "as found in nature"; it stood for the essence of eighteenth-century thinking.

III BOTANY IN FRANCE IN THE YEAR 1763

Plant taxonomy and horticulture were thriving in France at the time of the publication of the *Familles des plantes*, but this happy state of affairs is not reflected in the number of botanical publications of the year 1763. In addition to his major work Adanson published in that year his excellent treatise on the *Malvaceae* under the title *Description d'un arbre d'un nouveau genre appelé Baobab, observé au Sénégal*, but this publication had been already submitted in 1761 and was contained in the *Histoire* and the *Mémoires* of the Académie Royale des Sciences for that year, which was published two years late. The only significant French horticultural publication of the year was *De la culture des mûriers* by Pierre-Augustin Boissier de la Croix de Sauvages (1710-1795). We could ignore the now almost useless publications of Pierre-Joseph Buc'hoz (1731-1807), the private physician of King Stanislas I, sovereign of the counties of Bar and Lorraine, if they had been ignored by his contemporaries as consistently as they are today. Buc'hoz, however, that "miserable compiler" (Pritzel, 1876, p. 47), was a widely read botanical *vulgarisateur* who was admired by his contemporaries and whose books were often well received by the literary press. In his "modest" way in 1787 he claimed to have published 260 volumes (cf. Buc'hoz 1787, p. 63) he did much to promote an interest in botany, more or less along the same lines as the abbé Pluche, but more purely botanical and with less reference to theology. The second volume of his *Traité historique des plantes qui croissent dans la Lorraine et les trois Evêchés* appeared in 1763. Buc'hoz and Adanson met in 1764; in a letter to him dated 26 November 1764 the Nancy botanist called himself a pupil of Adanson (Margadant AD 170). Buc'hoz tried to obtain through Adanson a nomination as *Correspondent* of the Académie Royale des Sciences. In his later years he got more and more obsessed by publishing and he ended by pirating the books of his colleagues.

The modest extent of French botanical publications in 1763, however, is not at all characteristic of the taxonomic and horticultural activities at that time. The year was an important one for botany: the second volume of the second edition of Linnaeus' *Species plantarum* was published in July; Jacquin's first folio, the *Selectarum stirpium americanarum historia* (cf. Fig. 17), was published in Vienna nearly at the same time; Koelreuter published the second part of his epoch-making studies on the sexuality of plants; and in addition to these major works there were quite a number of smaller publications (for a selected list, cf. p. 259, Appendix). On the political scene, 1763 was marked by the treaty of Paris (10 February)

NICOLAI JOSEPHI JACQUIN
SELECTARUM STIRPIUM
AMERICANARUM
HISTORIA,

IN QUA

AD LINNÆANUM SYSTEMA DETERMINATÆ
DESCRIPTÆQUE SISTUNTUR PLANTÆ ILLÆ, QUAS IN
INSULIS MARTINICA, JAMAICA, DOMINGO, ALIISQUE, ET IN VICI-
NÆ CONTINENTIS PARTE, OBSERVAVIT RARIORES; ADJECTIS
ICONIBUS IN SOLO NATALI DELINEATIS.



VINDOBONÆ.

EX OFFICINA KRAUSIANA.

MDCCLXIII.

Fig. 17. Title-page facsimile (reduced) of N. J. von Jacquin
Selectarum stirpium americanarum historia (1763).

by which France lost her colonial leadership to Great Britain.

Botanical research in Paris in 1763 was carried out mainly at the two great botanic gardens, the Jardin du Roi and the Trianon garden. The Jardin du Roi of which the full name was the *Jardin Royal des herbes médicinales*, was founded in 1635 as an establishment to promote the teaching of pharmaceutical botany. In 1635 three physicians were designated to demonstrate to the pupils "l'intérieur des plantes," by which was meant the pharmaceutical properties. The royal act of foundation (cf. A.-L. de Jussieu 1802 and François 1952) also provided for a special cabinet in which dried specimens of plants were to be preserved as well as other rare items of natural history. Bernard de Jussieu (1699-1777) was appointed in 1732 to take care of that cabinet, which then contained among many other rather irrelevant items the herbaria of de Tournefort (see Duprat 1957, p. 208) and Vaillant; in 1745 he became *sous-démonstrateur de botanique*. In 1739 Georges-Louis Leclerc de Buffon (1707-1788) was appointed director (*intendant*) of the establishment. By 1763 Buffon, who had worked hard to reform the garden and to add to the collections, had become the almighty prince of French biology. He had great influence at court and his advice on appointments to the garden was practically always accepted by the king. Buffon had started the publication of his *Histoire naturelle* in 1749; the tenth volume of this important work was published in 1763, containing thirteen chapters written by Buffon and twenty-one by his aide, the Montbard physician and naturalist, Louis Daubenton (1716-1800). Buffon, who spent perhaps four months a year in Paris and the remaining months at Montbard, managed the Jardin du Roi in such a way that it rapidly became a thriving university for the biological sciences. The various teaching posts at the garden were coveted by all biologists, not only because of the remuneration but also because of the excellent opportunities for research. In 1763 the chair of botany was occupied by Louis-Guillaume Le Monnier (1717-1799), one of the state physicians, later first court physician to Louis XV. Le Monnier had been appointed in 1758 when he succeeded the aged Antoine de Jussieu (1686-1758), who in turn had occupied this chair since 1706. Le Monnier was not a botanist by profession but an amateur, and his appointment had been a surprise since the older Bernard de Jussieu (1699-1777) (cf. Fig. 18), an excellent teacher and a profound botanist, was already at hand as *sous-démonstrateur*. Apart from Bernard de Jussieu, Adanson would have been a good candidate, but both men were bypassed by the king, and by Buffon no doubt, mainly at the recommendation of Louis de Noailles, Duc D'Ayen,

the amateur horticulturist and forester whose arboretum at Saint-Germain had inspired Louis XV to set up his Trianon garden. This Louis de Noailles had known Le Monnier at Saint-Germain as a physician. Le Monnier was with the French army on the Rhine in 1758 (it was during the Seven Years' War) when the appointment was made, and, upon his return to France, offered the post very considerably to Bernard de Jussieu. The latter declined, much to the disadvantage of Adanson who would otherwise have been his logical successor as *sous-démonstrateur*. In this way Adanson was practically denied a professional botanical career and his subsequent fate as a botanist and the lack of success of his *Familles des plantes* are also connected with these teaching positions at the Jardin du Roi. Le Monnier never published anything of importance (Pritzel cites no works except a short treatise of 1744), and this is understandable because of his strenuous duties as court physician, a post that was certainly not a sinecure. Apart from the regular professor of botany, Le Monnier, and the *sous-démonstrateur*, Bernard de Jussieu, who taught the field courses, the only other professional botanist at the garden was the head gardener Jean-André Thouin (x-1764), who had occupied that position from 1745 onward. He was succeeded by his son André Thouin (1747-1824), who was later to become the first *Professeur de culture* at the new Muséum. Another member of the group at the Jardin du Roi greatly interested in botany was Madeleine Basseporte (1701-1780) who held the title *Peintre du roi pour la miniature* which meant that it was one of her duties to paint flowers for the paintings in the *Préface istorike* to his first volume (cf. p. cxlij). The relations between Adanson and Bernard de Jussieu were good; Adanson was one of Bernard's pupils and had a great respect for his teacher. Nothing is known of an unpleasantness between these two men, who were both fanatically devoted to their science, and were men whose ideas had much in common. Alströmer in his above-mentioned letter to Linnaeus (Fries 1909, p. 69) writes of Bernard de Jussieu "Han approberar mycjet Adansons arbeten, som bor mitt emot honom, och de äro offn tillsamman" (he approves very much the works of Adanson, who lives opposite him; they are often together).

Because of the rather one-sided publicity given in later years to Bernard's work, the impression was created that there was some antagonism between the two men: nothing could have been less true. Antagonism developed later between Adanson and Bernard's nephew, Antoine-Laurent de Jussieu (1748-1836), but the latter was not yet in Paris in 1763; he arrived only two years later. When Bernard de Jussieu died



Fig. 18. Bernard de Jussieu (1699-1777). A. Guilleminot *del.*, Ph. Langlois *sc.*

in 1777, it was his nephew who succeeded him in 1779, as *démonstrateur* after having deputized for Le Monnier since 1770.

The other center of botanical activity at the time was at the Trianon garden. Louis XV (1710-1774) had become interested in the arboretum of Louis de Noailles at Saint-Germain. This influential courtier had obtained the appointment of Bernard de Jussieu to the garden with the charge to set up a system for the arrangement of the plants. Le Monnier had previously been asked to do this but had declined because of his medicinal duties. Another Saint-Germain protégé of de Noailles was appointed to the Trianon garden: the gardener Claude Richard (1705-1784). The latter's son Antoine Richard (1735-1807) was at that time travelling in the Mediterranean area (1760-1764) to collect plants for the Trianon garden. He took care of this garden from 1770 onward. Adanson's own connection with the Trianon garden was rather loose: there is no evidence of an official appointment, although he was allowed to use a room in the Grand Trianon (cf. Nicolas, p. 57).

The amateur botanists connected with the Versailles court, such as de Noailles, had free access to the Trianon gardens. Apart from this small group, however, the public does not seem to have been admitted. Among those who had the *droit-de-regard* at the Trianon was Antoine Duchesne, the provost of the king's buildings, an ardent amateur botanist, who, with his son Antoine-Nicolas (1747-1827), discovered in 1763 what appears to be one of the first spontaneous mutations observed in plants: a strawberry with simple leaves. Adanson must have been delighted with this discovery, since in his *Familles des plantes* he firmly held the opinion of the mutability of species.

Another amateur botanist connected with the Versailles court was Chrétien-Guillaume de Lamoignon de Malesherbes (1721-1794), the state secretary of the royal house, director of the publishing trade, and president of the *Cour des Aides*, a fiscal court. De Malesherbes, one of the most famous and liberal French statesmen of the second half of the century, did much to help his fellow botanists, and in this light we can see Adanson's appointment as royal censor in 1758, a post kept by him during thirty years. De Malesherbes was a typical advanced aristocrat wholly taken by the ideas of the enlightenment, and it was thanks to him also that the *Encyclopédie* of Diderot and d'Alembert, in which Adanson later co-operated, could be published in Paris without too much interference from the government.

It was also in 1763 that the *Cour des Aides*, that group of magistrates out-

standing in their attempts to achieve a better social and fiscal order (cf. Stafleu 1963, p. xiv), were the first to call for a meeting of the States-General to open the way for far-reaching reforms.

De Malesherbes and Bernard de Jussieu were well acquainted with Jean-Jacques Rousseau (1712-1778), also an amateur botanist, whose later *Essais élémentaires sur la botanique* (1771) were widely read and who attributed an important rôle to botany in his proposed educational reforms. It is unlikely, however, that Rousseau and Adanson ever met, since the former left Paris in 1734, the year the latter returned from Senegal. Adanson must have been acquainted, however, with his writings: *Émile ou de l'éducation* had been published in the Netherlands in 1762 and had been prohibited in Paris soon after its publication: the surest way to promote its circulation. It was reviewed extensively in the *Journal encyclopédique* (1763, 1(1): 48. 1 Jan. 1763), the same journal that reviewed the *Familles des plantes* so favorably. For Rousseau 1763 was the year of his famous letter to the archbishop of Paris in which he replied to the latter's *Mandement* of that year. His interest in botany started in 1763 or 1764.

Other botanists at the court were Claret de la Tourrette (1729-1793), Henri-Louis Duhamel du Monceau (1700-1782), the Abbé Nollin, and the little-known M. de Bombarde (x-1766). The latter is mentioned by Adanson as one of the three people (Claude Richard, de Bombarde, and Adanson) who took down from dictation in 1739 the natural classification developed by Bernard de Jussieu for the Trianon garden. This system was published in 1789 by Antoine-Laurent de Jussieu and played an important rôle in the subsequent glorification of the de Jussieu family, partly at the expense of Adanson. De Bombarde had a botanical library which Adanson was allowed to use, as well as a botanic garden (cf. Margadant, AD 258). The Abbé Nollin was the director of the king's nurseries; de la Tourrette, a councillor at one of the fiscal courts, was for some time a botanical "courtier," but he spent the greater part of his life at Lyon. He was one of the recipients of Rousseau's letters on botany. Duhamel was the man who had been bypassed in 1739 for the appointment of the new director of the Jardin du Roi, a post given to Buffon. Duhamel du Monceau was a remarkable man, an agronomist and meteorologist, who held the sinecure post of inspector of the navy, but whose interest was mainly in horticulture and forestry. His *Traité des arbres et arbustes* of 1755 was for many decades the standard work on French forestry. Adanson speaks of Duhamel's work at great length in his *Préface istorike*.

Other French botanists of the time, not connected with either the Jardin du Roi or the Versailles Court and the Trianon, seem to have had little contact with Adanson. To round off the picture of French taxonomists about 1763 we can cite the keeper of the natural history cabinet of the Duc Louis d'Orléans, Jean-Étienne Guettard (1715-1786), whose work was mainly floristic and geological; the Montpellier botanist Antoine Gouan (1733-1822), a pupil of Boissier de Sauvages; and the remarkable *provençal* Louis Gérard (1733-1819), who was the first to use a natural system in a local flora, the *Flora gallo-provincialis* of 1761. A curious Paris figure of the time was Valmont de Bomare (1731-1807), a pharmaceutical botanist who gave successful public courses from 1756 on.

The picture of French botany around 1763 is not complete without a reference to the group of botanists at the Académie Royale des Sciences. Adanson had been elected in 1759 (23 July); the most important other botanical members at the time were Bernard de Jussieu (elected 1725), Le Monnier (1743), Guettard (1743), de Malesherbes (1750, honorary member), and Duhamel du Monceau (1728). Carolus Linnaeus (1707-1778) had been appointed *Associé étranger* on 12 December 1762 at the instigation of Bernard de Jussieu.

Plant taxonomy in France and especially in Paris in 1763 thus presented an impressive picture. The circumstance that botany was fashionable had great influence on the number of posts available for professional botanists and besides these there was a swarm of amateur botanists, many of whom occupied important government positions. The climate was favorable for the development of botany; still it is remarkable that the two decades of 1750-1770 produced only two really eminent botanists, one of whom, Bernard de Jussieu, published practically nothing, whereas the second, Adanson, became scientifically sterile after the publication of his major work. There is no doubt, however, that Bernard de Jussieu, as a great teacher, influenced many outstanding later botanists, such as his nephew Antoine-Laurent de Jussieu, Desfontaines, Gérard, and L'Héritier. His influence as a teacher and Adanson's influence through the *Familles des plantes* must be regarded as basic for the later grandiose development of French scientific plant taxonomy.

IV THE HISTORICAL PREFACE TO VOLUME ONE

The first volume of the *Familles des plantes* is the more interesting from the general and theoretical point of view. It is a pity that it is so rarely read; its verbosity and crude personal orthography are undoubtedly to be

blamed for keeping most taxonomists away from it. However, the book contains a great many original ideas and valuable critical discussions (besides, alas, too much repetition), and the purpose of the following chapters is to give an outline of Adanson's ideas on the history of botany, of his view of the ideas of his contemporaries, and of his theory of plant taxonomy. This volume actually appeared later (April 1764) than the better-known second volume, in which the families and genera are treated in taxonomic order. This belated publication (the title-page bears the date 1763) is illustrated by the presence of the official material, such as the authorization given by the Academy, in the second volume.

The main parts of the first volume are: a historical preface (*préface istorique*) of no less than 325 pages numbered with lower case roman numerals, and 190 pages with arabic numerals containing a chronological table of the main botanical authors from Zoroaster to Jacquin, a long discussion of the contemporary knowledge of organization, anatomy, and functions of plants, and an analytical subject index. The historical preface is the important part since it contains Adanson's views on the development and the character of the natural system, as well as a general exposition of his ideas on the theoretical aspects of plant taxonomy. In this part he also gives his sixty-five artificial systems which are at the basis of his natural classification as well as a detailed and critical evaluation of the work of his predecessors. Revolutionary ideas are expressed on the nature of species which are stated to be variable, new species having been known to have arisen during the five decades preceding the publication of his book. On the whole, a piece of work astonishing by its thoroughness and its frank and unbiased approach to nature.

The motto of the *Familles des plantes*, printed on the title-pages of both volumes, is taken from Pliny (cf. Fig. 19), in whom Adanson had been interested from his youth: "Tot generibus Erbarum, utilitatibus hominum aut voluptatibus genitis recensitis, quantó plura restant, quantó que mirabiliora inventu." The full text in Pliny, *Natural history* (ed. 1510), lib. 22, 1 is as follows: Complese poterant miraculum sui natura: atque tellus reputantium vel prioris tantum voluminis dotes, totque genera herbarum, utilitatibus hominum, aut voluptatibus genita. Sed quanto plura restant: quantoque mirabiliora inventu? (Nature and the earth had, one can say, filled to overflowing the measure of their miracles when we look only at the attributes enumerated in the preceding volume and they had produced so many plants for our use and pleasure. But then:



Fig. 19. Cajus Plinius Secundus (23-79 A.D.). Portrait from André Thévet,
Les vrais portraits et vies des hommes illustres (1584).

how many are there still to be described which are even more wonderful?)

Pliny and Aristotle were the first classical authors with whom Adanson became thoroughly acquainted because he received copies of their work as prizes in his early school-days. The Adanson copy of Pliny's *Historiae mundi libri XXXVII*, in the Geneva edition of 1631, was the second book numbered by Adanson; he received it in 1739 when he was twelve years old. This book is now in the Hunt Botanical Library Adanson collection (cf. Margadant AD 103).

A HISTORY OF CLASSIFICATION

The title of the first part of the historical preface is "The methods or systems, or plan and comparison of the works on botany" (p. iij). This essay is not intended to replace Tournefort's *Isagoge* for which Adanson has the highest praise, but to explain the methods of classification of previous authors from Theophrastus onward with special reference to those hitherto underestimated such as Cesalpino, Morison, Ray, Knaut, Hermann, and Boerhaave. Linnaeus gives a similar review, but much shorter and citing a smaller number of authors, in his *Philosophia botanica* of 1751. Adanson tries, as Linnaeus did not, to evaluate these earlier efforts in the light of his ideas on natural classification.

The Predecessors (pp. v-cxiiij)

The first botanical author to be discussed (p. vj) is Theophrastus, (ca. 270-285 B.C.), whose *Enquiry into plants* is the oldest botanical text. Adanson used the 1483 Treviso (Tarvisium) edition, which is the Latin version given by Theodore Gaza (cf. Hort 1916, p. xi), or perhaps the 1644 Amsterdam edition based on it. With this oldest text the first classification makes its appearance, although still a predominantly pragmatic one: Theophrastus begins his first book with a discussion of classification and in 1(3) he gives definitions of the various classes into which plants may be divided: The main division is into trees, shrubs, under-shrubs, and herbs, classes which are duly defined. This criterion of woodiness will prove to be a long-lasting one. Other criteria are differences in appearance, habitat, qualities, and properties. Adanson finds forty-eight chapters in which plants are brought together, but states that only seven of these groups are natural. Theophrastus' classification, as well as that of every author discussed in the *Préface istorique*, is judged by its proportion of natural to artificial classes or sections. Although the criteria for this judgment are not given, it is clear from what follows

that Adanson compares every system with his own. By comparison of as many characteristics as possible, derived from all parts of the plant as far as was technically feasible at the time, Adanson points the way to the natural classification (the term "natural method" was preferred by him), a classification which is regarded as unique, based on nature and independent of the person who describes it. We shall see later how Adanson argues that his own system gives the most faithful picture of this objective natural classification possible to contemporary knowledge. It is therefore not surprising that he judges every other system against his own. This is only superficially pedantic: his own system was not really his own, but the one existing in nature. His own performance had simply been to demonstrate the existence of this system in nature and to describe it as correctly as possible. It is against this, in his opinion, objective background that he gives the proportion of natural and artificial taxa in each system under discussion.

Dioscorides (ca. 100 B.C.) receives Adanson's praise for his ample descriptions although he has not one natural class, and Pliny, "that indefatigable compiler," presents his material in such a predominantly historical way that everything is in it but in "a beautiful disorder."

In Pliny the Romans had produced the last botanist of any consequence in their time and in the fourteen centuries of Christianity that followed botany was "confused with medicine." For Adanson, the first modern botanist is Hieronymus Bock (Tragus) (1498-1554) who has a very simple and "entirely unnatural" division into wild herbs, grasses, cereals and edible herbs, and trees and shrubs in his *New Kreutterbuch* of 1539 and his *Kreuterbuch* of 1546.

It is not so remarkable that Adanson, who was so critical of illustrations, does not mention here the epoch-making *Herbarum vivae eicones* of Otto Brunfels (1488-1534) published in 1530. The reason is that Adanson discusses the systems only and that the pictures in the *Herbarum*, which are by Hans Weiditz, are infinitely better than the text. The latter is mainly based on Dioscorides, but applied to plants from the environment of Strasbourg (see Arber 1938, p. 55). However, in Adanson's chronological table of botanical authors (pp. 1-30), which follows the historical preface and which should be consulted with it, due acknowledgement is given to the exceptionally good plates.

Rembert Dodoens (1517-1585) whose *Stirpium historiae pemptades sex* of 1583 is referred to by Adanson, is treated very shortly (p. vij): Adanson has little use for him. Of the twenty-nine classes he says that none is natural,

which is rather unfair because Dodoens recognized, for example, the Umbelliferae! These early authors did not pretend to give scientific arrangements and their systems were free pragmatic mixtures of groups of plants with a certain common economic use or certain common rather ornate characters. Mathias de l'Obel (1538-1616) who distinguished in his *Plantarum seu stirpium historia* orchids, palms, mosses, grasses, trees, shrubs, etc. is looked upon more favorably, but his descriptions are said to be too short; in that respect Carolus Clusius (1525-1609) earns more praise because his descriptions are excellent. The Clusius book used is his early (1576) "*Rariores et exoticae plantae*," a misquotation for *Rariorum aliquot stirpium per hispanias observatarum historia* which was not written as a taxonomic treatise but as an enumeration of the rare and new plants encountered by Clusius in Spain, and of the plants newly introduced into cultivation in western Europe. Adanson notices only one aspect of Clusius' greatness: his extensive descriptions, "infinitely superior to those of Dodoens and de l'Obel," but he has no eye for the fact that Clusius was not a "herbalist" like Brunfels, Bock, Dodoens, and de l'Obel. Clusius was a modern botanist interested in plants for their own sake and not because of their medical use, and is one of the first authors who let "botany, the science of plants, emerge from its medieval chrysalis" (cf. Rickett 1958, p. xxvi).

In the treatment of Andrea Cesalpino's (1519-1603) *De plantis libri XVI* of 1583, Adanson erroneously takes the books (except no. 1) for classes, but otherwise than Linnaeus (*Phil. bot.* no. 54, "Caesalpinus est fructista") he notes that there are forty-seven sections based not only on the characters of the fruit and the seed, but on a number of other characters as well, showing great originality of approach. Bremekamp (1953) has shown that there are thirty-two main groups to be distinguished, or forty-one if one takes into account some of the lower subdivisions. Adanson, although he discussed him very shortly, did not miss the essential significance of Cesalpino as the first author to "attempt to arrive in a truly scientific way at a classification" of plants (Bremekamp *l.c.* p. 580).

Caspar Bauhin (cf. Fig. 20) was a man after Adanson's taste: his enumeration and system given in the *Phytopinax* of 1596 and the *Pinax* of 1623 (of which Adanson used the 1671 edition) are cited as exemplary (p. xiiij); seventeen of his seventy-two sections are said to be natural. Adanson has great respect for the fact that all Latin phrase names applied to plants since Bock are faithfully enumerated. Kindred souls: Pliny,

Caspar Bauhin, and Adanson were in the first instance faithful and industrious compilers who had due respect for what had been done by their predecessors! Apart from this, however, Adanson recognized in Caspar Bauhin one of the first botanists who tried to classify plants according to their natural affinities: the inductive method in plant taxonomy may be dated from him (Rickett 1958, p. xxvi).

It is not necessary to follow Adanson all the way: this historical enumeration is remarkable because he pays homage to the systems of his most outstanding predecessors, acknowledges their insight, and shows what he owes them. A rare phenomenon and a great tribute to his character! He also makes it clear that the history of botany is not just an idle pastime; the knowledge brought together by the ancient authors was essential to the building of his picture of the vegetable world. The analysis of the ideas behind the systems of previous authors also helped to clarify his own thinking. The history of botany is also the history of ideas and as such essential to the understanding of the heritage of the past and of the bases of our contemporary theories.

The real object of this part of the *préface* is, however, to show the development of natural classification. The first attempt at such a classification came from the Scot, Robert Morison (1620-1683) (cf. Fig. 21), who was one of the first authors to use a variety of attributes in his *Plantarum historiae universalis* (1680) (cf. Rickett 1958, p. xix). He was a forerunner of Adanson although he had not the same logical approach towards the theoretical basis of his system. Morison tried to write an encyclopedic review of the vegetable world but did not finish it. The circumstance, however, that he founded his system of not less than 108 sections on characters drawn from all parts of the plant and not solely on the fruit (Linnaeus ranged him with the *Fructistae* in his *Philosophia botanica* of 1751) endeared him to Adanson (p. xviii). His method, although not quite clear and in details often very inconsistent, had already a "natural flavor."

Morison, Ray, Magnol, and Tournefort are, for Adanson, the botanists who laid the foundation of the natural system, his major objective.

Adanson felt a great affinity for John Ray (1628-1695) and his *Methodus plantarum nova* of 1682. Ray attempted to establish his groups on combinations of characters taken from all parts of the plant, just as Morison did but more consistently. Adanson's esteem is again expressed arithmetically: of Ray's 125 'sections' (Adanson uses this term in a sense different from that of Ray) forty-three are said to be natural: nearly one in three. "The idea of it [*i.e.* Ray's system] was excellent and the system would



Fig. 20. Caspar Bauhin (1560-1624).

Courtesy, M. Geiger-Huber, Basel

have succeeded better if Ray had been just as great a botanist as he was a learned writer and judicious compiler."

Pierre Magnol (1638-1715) is much admired by Adanson because of the clear and concise method given in his *Prodromus historiae generalis plantarum in quo familiae plantarum per tabulas disponuntur* (1689). This is truly Adanson's natural method, in the first place because it has as its main feature "natural" families, and in the second place because Magnol makes it clear that every family has a combination of characters of its own. Since Magnol provides the key to Adanson's own methods and opinions it is necessary to cite here, in translation, parts of Magnol's preface as quoted with great sympathy in the *Familles des plantes* (p. xxij). Magnol, says Adanson, has been greatly underestimated or even ignored altogether and he owes him an account of the essence of his highly judicious method.

In the same way therefore as one recognizes families among the animals, in the same way we propose them for the plants: we think that one could establish even more [families] than we have done and if we have united a number of plants that could with good reason have formed new families, this has been done only to diminish the number of those families.

This relation between the animals and the plants has given me occasion to reduce the plants to certain families, in comparison with the families of man; and since it has appeared to me impossible to draw the characters of those families only from the fructification, I have chosen the parts of plants where we find combined the main characteristic items, such as the roots, the branches, the flowers and the seeds. There is even in numerous plants a certain likeness, an affinity that does not consist of the parts as considered separately, but as a whole; an important affinity, but which cannot be expressed . . .

I cannot agree with the ideas of those who regard the leaves as incidental parts. What would become of certain mosses which have leaves only, and of most of the ferns of which the beauty and elegance are found in the leaves . . .

We think that all parts which do not serve the fruit are no more accidental than the arms and legs are accidental parts of the animals.

We do not deny, however, that one can draw the main differences of the plants from their flowers and their seeds, because these parts constitute [*i.e.* are characteristic of] the greatest number of families, but without neglecting the other parts which have proved a great help in outlining this work.

It is a pity that when Magnol tried to apply his excellent ideas the result fell short of expectations, a circumstance duly noted by Adanson. We can say, however, that Adanson was inspired by Magnol's ideas and that he adopted from him the notion of families for his main groups. The statements that every family has a combination of characters of its own and that a character important for one family has not necessarily

the same weight in another family were adopted by Adanson in the concepts and descriptions of his families. The essential point about the approaches of Magnol and Adanson to the natural system is not to be found in the way they used the characters, but in their fundamental concept that the knowledge of all parts of the plants would lead them to the supposedly objective divisions extant in nature. This knowledge would lead them to a universal method, universal because independent of the whims of human classifiers, and natural because the system would simply be the one found in nature itself. For Magnol a family was a natural entity. We can be grateful to him for having introduced this term, which carries the flavor of the importance attached to "nature" and "natural" towards the end of the seventeenth century, concepts which played an even more fundamental role in the natural sciences of the eighteenth century. The opposing word "order" was to be used for the same concept by many other authors until deep in the nineteenth century, and although later the differences in concepts became more vague, the authors who used "order" were often the classifiers and adherents of the pragmatic artificial systems, whereas the taxonomists who used the term family for the major category above genus were the adherents of the natural system. Order was something brought about by the human mind, families were found in nature. Linnaeus spoke of *ordines naturales* and did not use the term "family." In the nineteenth and twentieth centuries a similar split occurred over the higher category called *phylum* by the phylogenetic taxonomists and *divisio* by those who based their system on comparative morphology. Magnol's term "family" has proved to be a great success: at present it is generally accepted for exactly the category that he meant.

After having discussed Magnol's system in great detail, Adanson spends a few lines on Georg Eberhard Rumpf, or Rumphius (1627-1702), whose *Herbarium amboinense* was finished in 1690 and printed posthumously from 1741-1755. Rumphius' system is purely pragmatic, but that of Paul Hermann (1640-1695), *Florae Lugduno-Batavae flores*, also of 1690, was more natural, being mainly based on various characters of the fruit and the seed as well as on the presence or absence of a corolla and calyx. The frank effort of the Leipzig botanist Bachmann, known as August Quirinus Rivinus (1652-1725), in his *Ordines plantarum* (1690, 1691, 1699) to find an easy system is also duly acknowledged by Adanson. Rivinus used the regularity or irregularity of the corolla and the number of petals as the basic characters. The system is logical and consistent but does not, in Adan-

son's eyes, contain a single natural class. Linnaeus regarded it as something made mainly from behind a writing-desk. Rivinus' system was widely followed in Germany, for instance (with some alterations) by Christian Gottlieb Ludwig (1709-1773), also from Leipzig, in his *Definitiones plantarum* (1737, 1747). Almost simultaneously with Adanson's second volume another follower of Rivinus, Jakob Wernischek (x-1804) from Vienna, published a *Genera plantarum* in the first half of 1763, again mainly based on the number of petals.

Joseph Pitton de Tournefort (1656-1708) (cf. Fig. 22) is Adanson's prince of botanists. His analysis of Tournefort (p. xxx) is based on the *Éléments de botanique* of 1694, which was later published in a Latin version as *Institutiones rei herbariae* (Paris 1700). "All botanists agree that Tournefort has introduced into botany order, consistency (*pureté*), and precision, by giving the wisest and most certain principles for the establishment of genera and species and by basing on those principles the easiest and most exact method which has been published until today." Tournefort himself admitted that he did not give a universal or natural method, but that his main object was to facilitate classification. His system is well known: after the classical division into herbs and woody plants (rejected by Adanson) the main criteria for subdivision are taken from the structure of the corolla and the disposition of the flowers. Only six of the twenty-two classes received the *epitheton ornans* "natural" from Adanson, but of the 122 sections, based on a great number of other characters, forty-eight are said to be natural. Tournefort's system has had a very great influence on the progress of botany. It was of great didactical value, being simple and clear, and it was easily applicable, being based on a great personal experience and knowledge of plants. Tournefort developed the generic concept and made clear and logical distinctions between the descriptions of his well-defined genera and his species; at present many of his genera are still maintained. This is one aspect on which Linnaeus and Adanson agreed: both accepted largely the Tournefortian genera.

Adanson's treatment of the systems of Boerhaave (1710), Knaut (1716 "Rivinus the other way around"), Ruppius (1718), Pontedera (1720), Magnol (1720, "much inferior"), Buxbaum (1728), Ludwig (1737), and Siegesbeck (1737) is interesting, but of greater importance is his discussion of the Linnaean system of 1737 (p. xxxix). Carl Linnaeus (1707-1778) was Adanson's major opponent. Before the publication of the *Familles des plantes* the two botanists held each other in high esteem and even entertained a correspondence for some time. The name *Adansonia* was given



*Que Morisone viro potuit contingere major
Gloria, Peronum quam superasse genus
Ipse tibi palmam Phoebus concecit Apollo.
Lauraeque est capiti quolibet herba tuo.* *Postulat Archibaldus Pitcairne M. D.*

Fig. 21. Robert Morison (1620-1683). Wm. Sonmans? del., R. White sc.

by Linnaeus to the baobab which had been described by Adanson in his Senegal days. Adanson has thus been honored in botany mainly by the name given by his great opponent Linnaeus to one of the most remarkable trees of the world.

The Linnaean sexual system is the classical example of an artificial system with all its great practical advantages for elementary classification. Adanson expresses his great respect for this system: "... It is ... of all the methods that we know the one that deserves most the name of system, because it tries to reach its object, to establish classes, by basing them on only one part, the stamens." Adanson distinguishes between a system and a method: a system is an arrangement according to one attribute, a method is an arrangement in which many different attributes are used. Adanson criticizes the followers of Linnaeus (e.g. van Royen) who regard the sexual system as of greater importance than the Tournefortian one. When the two are compared it is clear, says Adanson, that the Linnaean one has less natural classes (only two out of twenty-four), that it is a less certain guide because many genera have species with different numbers of stamens which detracts greatly from the system's practical advantages, and that it is definitely more difficult to apply. "If this system does not facilitate the study of botany, it has at least enabled several authors to produce at little cost works under the names of *Flora* and *Hortus*, which are nothing else but catalogues, repetitions of the phrases of Linnaeus and which contribute nothing towards the progress of botany."

Linnaeus' second system, based on the calyx, published in his *Classes plantarum* of 1738, is even worse in Adanson's eyes, a judgment which is quite understandable. It is interesting, however, to see what Adanson thinks of Linnaeus' third method, *Fragmenta methodi naturalis*, also published in the *Classes plantarum*, but amended and provided with names in the *Philosophia botanica* of 1751. This well-known system is a listing of the "natural orders" with the genera contained in them without descriptions. Linnaeus was quite convinced that it was necessary to have a natural classification ("it is the first and last wish in botany" *Phil. bot.* no. 77), but Adanson is amazed that after the thirteen years (1738-1751) that Linnaeus worked at its perfection, the result was still inferior to that of Tournefort who, "although handicapped by his method," had described a greater number of natural groups.

We shall show in our discussion of the second volume of the *Familles des plantes*, that the differences between the Linnaean and the Adansonian

natural classifications are not so considerable as suggested by Adanson: it is easy to point at inconsistencies in the Linnaean "fragments" but its actual result is not so much inferior to that of Adanson. He admits that there are twenty *ordines* out of the sixty-eight given by Linnaeus that are natural, but among the *ordines naturales* not considered natural by Adanson are, for instance, the *Tricocca* which contain only a few more extraneous elements than Adanson's *Tithymali*: both taxa are essentially comparable to the *Euphorbiaceae*. Adanson is even more unfair when he does not accept Linnaeus' *Multisiliquae* as natural: everyone of the eighteen genera included by Linnaeus in this taxon in 1751 is referred to the *Ranunculaceae* by Dalla Torre and Harms. Adanson's *Ranunculi* contain sixteen of the eighteen genera of the *Multisiliquae*, the two remaining ones being *Nigella* and *Garidella* which Adanson erroneously includes in his *Cisti*. Adanson himself has twenty-four genera in the *Ranunculi*, of which three do not belong there: *Alisma*, *Damasonium*, and *Sagitta*, belonging to the *Alismataceae*. In his 1764 system Linnaeus includes in his *Multisiliquae* the genera *Dictamnus*, *Ruta*, and *Peganum*, belonging to the *Rutaceae* and the *Zygophyllaceae*. Similarly unjust is Adanson's treatment of Linnaeus' *Columniferi* which, like Adanson's *Malvae*, are essentially the present suborder *Malvinae*, with the exception of the *Tiliaceae*, but in which both authors placed some extraneous elements. The *Luridae* are also said to be unnatural: this is perhaps more understandable since three of the eleven genera included in them by Linnaeus do not belong to the *Solanaceae*. Linnaeus' *Caryophyllei* are also "unnatural" although only two of the sixteen genera do not belong to the *Caryophyllaceae*, whereas six of the twenty-eight genera in Adanson's *Alsines* do not belong there. A similar situation exists with the *Preciae* which are essentially the *Primulaceae*. From these examples it is clear that Adanson's treatment of the Linnaean fragment of a natural system is anything but fair: he condemns certain Linnaean taxa as unnatural when he finds that they include a small number of extraneous elements, or when he disagrees with the inclusion of elements which we now agree Linnaeus placed correctly. This treatment of the competitive Linnaean system does not show Adanson at his best: here, he is definitely biased.

With Adanson's bias against Linnaeus in mind it becomes somewhat difficult to attach importance to his evaluation of the systems of his predecessors by means of the ratio of natural to unnatural classes. Adriaan van Royen (1705-1779), for instance, gave a *Methodi naturalis praeludium* in his *Florae leydensis prodromus* of 1740, based upon a combination of a

considerable number of characters including vegetative ones. His classes are taken rather widely (there are twenty of them) but as taxa most of them are certainly natural. Notwithstanding this, Adanson gives the epithet "natural" to only four of them (p. xlviii), whereas there are at least ten classes that correspond with present-day families or orders; two others deal with cryptogams, thus leaving only eight classes of phanerogams of somewhat uncertain status. According to Stearn (1959 p. 96), van Royen's system was influenced considerably by Linnaeus' views: the two men met frequently during the latter's stay in Holland. Van Royen's great mistake (for Adanson) was to praise his friend Linnaeus instead of Tournefort, which makes Adanson exclaim: "the peaceful *manes* of the prince of botanists [i.e. Tournefort] will undoubtedly awaken one day at the injustice of such writings."

Albert von Haller (1708-1777), in his *Enumeratio methodica stirpium helvetiae indigenarum* of 1742, and his *Enumeratio plantarum horti regii et agri gottingensis* of 1753, had presented a system different from the preceding ones. It is based on the number of cotyledons, the number of seeds, and on several floral characters. It is rather obscure because of a great amount of overlapping, but in its lower sections Adanson finds much to praise: although difficult to put into practice, all taxa are well described.

The method of the abbé from southern France, Pierre-Augustin Boissier de la Croix de Sauvages (1710-1795), based solely on the leaves (*Projet d'une méthode sur les feuilles des plantes*, 1743, and *Methodus foliorum* or *Méthode pour connoître les plantes par les feuilles*, 1751) is ingenious as an early attempt to classify plants solely by means of vegetative characters. De Sauvages shows a good knowledge of the plants of southern France and Adanson cites his systems at great length. It is not surprising that de Sauvages' classes are all highly artificial, but his original pragmatic approach must be praised. De Sauvages presented his *Methodus foliorum* as a device to facilitate the distinction between species, and advocates the setting up of a multitude of artificial systems in order to be able to classify all species, but he adds "it is true that it [i.e. the *methodus foliorum*] cannot serve for knowing the genera, because it is established by the consent of all nations that the genera of plants are taken only from the flowers or the fruits . . ." This was exactly the mentality against which Adanson protested: why should generic characters be taken only from the flowers and the fruit? De Sauvages dedicated his book to Linnaeus, who in turn held him in high regard (Fée 1832, p. 246; Bryk 1953, p. 68).

An author who is usually entirely overlooked, but not by Linnaeus



Fig. 22. Joseph Pitton de Tournefort (1656-1708). E.-G. Desrochers del.

and Adanson (p. lix), is the Utrecht botanist Everardus Jacobus van Wachendorff (1702-1758), who published an index of the Utrecht botanic garden (*Horti Ultrajectini index*, 1747) in which he lists not less than 4,000 species. Wachendorff's system is an original attempt at a natural system, duly recognized as such by Linnaeus, but not by Adanson who finds only twenty percent of the 250 sections to be natural. Practically all characters of the flower, except those of the ovary, are used by Wachendorff in combination with the number of cotyledons. The disadvantage of the system is that there is a strict subordination of characters and that it is extremely involved. The nomenclature used by Wachendorff, especially for the classes, was hardly engaging: *Pollaplostemonopetalae* are, for example, all the plants with simple stamens of which the number is two to several times that of the petals. Wachendorff's attempt, although methodically sound, did not reach the degree of perfection of, for instance, Linnaeus' *Fragmenta* or van Royen's *Praeludium*.

Adanson briefly discusses also Lorenz Heister (1683-1758), the Helmstedt botanist who drew up one of the most acceptable of the early natural systems (1748), although it was still based on the old major division into herbs and trees. The thirty-five classes are based on combinations of a great number of characters drawn from cotyledons, leaves, general habit, flowers, and fruits, and the system can be described as a successful elaboration of that of John Ray. Adanson acknowledges the natural character by awarding a high ratio of natural versus unnatural taxa. Henri-Louis Duhamel du Monceau (1700-1781) with his *Traité des arbres et arbustes* (1755), who offered not less than three different systems, comes off less favorably, and so does Carlo Allioni (1725-1804) with his *Synopsis methodica horti Taurinensis* of 1760.

Adanson ends his discussion of the general methods in botany with a long account (p. lxxij) of systems based on the medical properties of plants. These systems are to be banned from the medical schools because of their dangerous implications in the hands of those who have an insufficient knowledge of the plants. Through a knowledge of natural relationships it is sometimes possible to find analogous drugs in related species, a method of working which Adanson recommends as extremely useful.

Before summing up, Adanson discusses (p. lxxxj) fourteen methods that deal with special groups, such as Vaillant's treatises on the *Compositae*, Dillen's *Historia muscorum* (1741), and Scheuchzer's *Agrostographia* (1719).

The summary consists of a table of all the methods that have been

discussed, arranged in the order of their "degrés de bonté." This degree of correctness is found in the number of natural classes and sections described by the various authors. Tournefort comes out first with one-fourth of his classes and more than one-third of his sections designated as natural. Bergen and Heister come out second and third, Lobel fourth, Boerhaave fifth, Linnaeus' sexual system 16th, and his natural system 25th.

Systems and Methods (pp. xcii-cij)

The survey of the work of the predecessors is concluded with a discussion of the nature of taxonomic classification (p. xcii). We quote here Adanson's definitions of a system, a method, and the natural method.

To make a *system*, is to make a reasoned plan of an object, a whole of its known constituent parts; or better, a system is an arrangement that reduces a number of diverse or complicated notions to one simple and general notion, based on principles that have not been demonstrated to be absolute or true and that cannot be so, but that are supposed to be so in order to obtain, by means of them, knowledge of what one does not know and of what it is important to know. This is the working method which we call synthesis or method of composition.

The opposite method is analysis, the definition or description of the simple parts. . . . This is what one calls . . . hypothesis or system in physics, this helps us sometimes to discover the truth or some circumstance that has a bearing upon it and that may enable us once to discover the truth; it is only in this respect that one can say that these systems are useful for us: ordinarily they lead us to conjectures, paradoxes, and analogies denied by sense.

A system in the Adansonian terminology is, therefore, the same as an hypothesis, a working method, based on a certain assumption, to arrange certain facts, and used to deduce from these facts certain others that were hitherto unknown.

A *method* is an arbitrary arrangement of objects or facts brought together by agreement or arbitrary resemblances, which one expresses by means of a general notion applicable to all these objects, without, however, considering the fundamental notion of this principle as absolute or generally invariable so that there could be no exception.

The main difference between a method and a system is, therefore, the value given by the author to his principles: they are variable in the method and absolute in a system.

"The *natural method* in botany is that which retains in its distribution all the natural classes, that is classes in which are contained only plants which belong together (*qui . . . conviennent entr'elles*). It is nature that prescribes to the 'author-methodist' the steps to be taken. Following this certain guide the analogy leads him to judge the possibility of the existence of certain plants and the impossibility of the existence of some others; doing this he can discern with certainty the true from the false.

This is the true confession of Adanson as a child of his century. Here we find in the words of Cassirer (1932/51) the new conception of nature which contains both the impulse towards the particular, the concrete, and the factual, and the impulse towards the absolutely universal. This conception combines the elemental impulse to hold fast to the things of this world and the impulse to rise above them in order to see them in their proper perspective. This conception of nature, which had been developed in the seventeenth century by men like Descartes and Newton, gradually penetrated the biological sciences in the course of the eighteenth century. Adanson used the words "nature" and "natural" not with any transcendent implications. Everything is open to research by the human mind, nature is Giordano Bruno's "force implanted in things and the law by which all entities proceed along their proper paths." In order to find this law also in botany we must not project our own ideas into nature (this results in artificial systems): "we must follow nature's own course and determine it by observation and experiment, by measurement and calculation. But our basic standards for measurement are not to be derived from sense data alone. They originate in these universal functions of comparing and counting, of combining and differentiating which constitute the nature of the intellect" (Cassirer).

"Comparing and counting, combining and differentiating": the words might have been written by Adanson. This was his method to discover nature's basic plan. Nothing is unpenetrable to the intellect, everything is open to reason and observation, and provided the mind follows this objective course, it will find in botany the natural lines of division, the natural classes, in short the one and only natural method. Adanson had no *a priori* judgment on the importance of the various attributes which he used in his classification: his method was wholly inductive. It is clear now why Adanson attributed such importance to the natural method: there is a world of difference between *the* natural method and *an* artificial system or method; one is the blueprint of the vegetable kingdom, the other is a mere convenience.

The *artificial method* is that in which the classes are not natural because they bring together genera of plants which are in reality, in nature, far apart and which have not in common the greatest number of similarities although they share the one or few characters on which the class is based. An artificial method is easier than the natural, because it is the author who prescribes to the plants the rule and order that he wants to follow in their distribution [classification]; it is also clear that there can exist only one single natural method whereas the number of artificial methods is truly almost limitless . . .

Every system, as defined above, is artificial because it is based on relations that have not yet been proved. It is possible that these relations, by further research, will be proved and at that moment the system can be regarded to be part of the natural order. Copernicus' system of the orbits of the solar planets is an example; but Adanson states that it is self-evident that no artificial botanical method will ever develop that way.

Classes. The use made by Adanson of the term class is not that used in botany nowadays, i.e. a category between division and order. It is a general term for the first category used in any system. The old botanists did not use such a term, neither did they use the term "method" nor "system": the plants are arranged in "chapters," "books," "pemptades," etc. Tournefort is said (by Adanson) to have used the term "class" for the first time. A class with Tournefort and with the later authors is a group of genera of plants which belong together because they have a character in common taken from the part of the flower or fruit chosen by the author. Classes are subdivided in sections or orders which may be either natural or artificial. A natural class is called family by Adanson (following Magnol); a natural section does not receive a special term. The authors differed in their opinion on which part of the flower or fruit was the most general, constant, or convenient: Tournefort used the corolla, Magnol (in his system of 1720) the calyx, Boerhaave the fruit, Siegesbeck the seeds, Linnaeus the stamens. When further describing the classes, however, various authors used different characters derived from other parts of the plants and the more attributes they used, the greater the chance to describe natural taxa. This is why Adanson found in Tournefort's classification a relatively high number of natural classes, whereas Linnaeus' sexual system was artificial to a high degree.

This diversity of opinion on which part of the plant was the most essential resulted in a great diversity of classifications of which every author advertised the superiority of his own. However, every one of these systems based on a single part had to admit a great number of exceptions. From this it should have been clear, says Adanson, that they were wrong. "It follows that the natural method, which must be based on all parts, has not yet been found."

Authors who presented their methods as natural were, according to Adanson, Morison (1680), Ray (1682), Magnol (1687/89), Knaut (1716), Linnaeus in his *Fragmenta methodi naturalis* (1738/51), van Royen (1740), Haller (1742), and Wachendorf (1747). Adanson denies that these authors had

actually found the natural method, but he acknowledges that he was not the first who had this goal in mind. He does not mention Bernard de Jussieu's system of 1759, but this existed only in manuscript and Adanson was reviewing publications rather than people.

The preference shown for certain systems, says Adanson, has not always been based on their intrinsic merits; national feelings have often played a more important part than the desire to find the truth. Ray's method was followed mainly by the British (Sloane, Petiver, Martyn, Dillen), Rivinus by the Germans (Knaut, Rupp, Ludwig, Siegesbeck). Linnaeus' followers were "simply his pupils," but Tournefort was followed not only by the French (Plumier, Marchant, Dodart, Nissole, Antoine and Bernard de Jussieu, and Vaillant) but also by Pontedera, Monti, and Micheli in Italy, and by other botanists in Germany, England, and Scotland: Adanson himself is not entirely free from the nationalistic feelings which he condemns in others. "Monsieur de Jussieu, whose wide knowledge of botany does not permit us to feel in France the loss of the great Tournefort, has always retained the wise principles [of Tournefort] which we make it our glory to adopt." Adanson feels the danger and adds that he is not glorifying Tournefort because he was French but because his method was the best so far, although not flawless. "We are of no country when we have to decide in matters of science."

Summing up, Adanson states that the methods of his predecessors, including that of Tournefort, have the following shortcomings:

1. All methods have more artificial than natural classes.
2. The more systematic a method, the less natural it is.
3. These methods are abstract rather than general or natural because they are based on one or two attributes.
4. The choice of special parts implies that one often has to admit exceptions.
5. Such methods oppose the progress of science by falsely bringing together objects that do not belong together.

If an artificial method is needed to put our knowledge in order in a rapid and convenient way, Adanson does not hesitate to choose the Tournefortian one: "Tournefort did not pretend to give a natural system, he was satisfied with giving an artificial system and to establish an arbitrary order that would be as perfect as possible" (*le moins défectueux qu'il fût possible*).

THE STATUS OF BOTANY ANNO 1763

Taxonomic Categories (pp. cij-cxvj)

Genera. Adanson quotes Konrad Gesner as the first author to distinguish clearly between genera and species, in letters to Fabricius of 1559, reprinted in his *Opera botanica* (vol. 3, ed. 1753):

... Existimandum est autem nullas propemodum Erbas esse quae non genus ali-quod constituent in duas ad plures species diversas dividendum. Gentianam unam prisci describunt, mihi decem aut plures species notae sunt. (However, one must assume that, properly speaking, there are no plants that do not constitute some genus that can be divided into two or more species. The old writers describe one gentian, but I know of ten or more species.)

These early authors, however, did not really describe their genera separately, and it was not until Morison, Ray, and Rivinus, that the first attempts at generic delimitation were made and Tournefort was the first to give ample generic descriptions and rules for the circumscription.

A genus of plants is an assemblage of various species which belong together because of the resemblance of all parts of the fructification or only of the most essential ones according to Tournefort, and by all six parts according to Linnaeus.

For Tournefort the genera were artificial, because his method was artificial, but Linnaeus considered his genera as natural. "Genus omne est naturale, in primordie tale creatum . . ." (*Phil. bot.* no. 159) (Every genus is natural and created as such in the beginning.)

Adanson does not accept this dogma: Linnaeus' general thesis had not been proven and nobody had as yet been able to give a definition of a natural genus. Of course, he says, there are genera (*Ranunculus*, *Claytonia*) which seem to support this idea, but there are many others for which it is not true. In natural families like the Umbelliferae, Labiatae, Leguminosae, Cruciferae it is extremely difficult to delimit the genera and one is often tempted to combine a great many genera into one big one. A natural genus must be constant and invariable and as long as the delimitation of our genera depends upon our methods and upon our changes in them they cannot be natural. Let us be clear about this, says Adanson, because this is essential and the origin of many mistakes in generic delimitation. The delimitation depends upon the choice of characters in a certain method and when that choice is different the generic delimitation will often also be different. For instance, Tournefort's choice of the characters of the fruit for the delimitation of his sections leads to the establishment of the three genera *Caprifolium*, *Periclimenum*, and *Chamaecerasus*, whereas Linnaeus, who bases the subdivision of his orders on the

styles, combines these genera into one: *Lonicera*. Furthermore genera cannot be constant when species change and for such changes Adanson has several proofs.

Natural genera, if they exist at all, will be the outcome only of the natural method in which all parts of the plant are taken into consideration.

The number of genera since Tournefort had grown as follows:

	DATE	NEW GENERA	TOTAL
Tournefort	1694	698	698
Plumier	1703	96	794
Boerhaave	1710	17	811
Vaillant	1718	30	841
Dillenius	1719	67	908
Micheli	1729	27	935
Houston	1733	15	950
Various other authors		50	1000
Linnaeus up till	1759	174	1174

Species. For the modern authors, says Adanson, species are assemblages of individuals which resemble each other perfectly, but not entirely, in the essential parts and qualities, leaving out of account differences in sex, differences caused by incidental causes, and differences in such minor qualities as color of the flowers.

Ray stressed that specific differences must be stable, not due to cultivation or to the environment: all differences in plants grown from the same seed are accidental and non-specific; specific differences are those which appear only between individuals grown from different seed. For Linnaeus species are constant and natural because they perpetuate themselves through seed or buds and remain constant: specimens die, the species does not die (cf. *Phil. bot.* no. 157).

Adanson takes exception to this statement: one must clearly distinguish between vegetative reproduction and reproduction through seed. Vegetative reproduction produces no variation because it is simply the continuation of the individual plant: this is the clonal concept clearly stated. Propagation through seed, however, is a source of great variation and change. These variations (through hybridization or mutation) are such that in some cases one can speak of new species, especially when they breed true to type. This insight is astonishing; it is clear that some of Adanson's examples are now known not to represent the origin of new species. In later years Adanson tried to find confirmation in experiments and he had to admit that his examples were not strong enough

to support his thesis, for several of the changes proved to be not completely hereditary. In those years, therefore, Adanson did not himself believe any more in the evolutionary ideas expressed in the *Familles des plantes* (cf. Chevalier 1934). The ideas themselves, however, are none the less extremely interesting, and his later amendments are in fact only a shift towards changes by means of little steps instead of big ones. In his article published in the *Histoire and Mémoires de l'Académie Royale des Sciences* of 1769, Adanson speaks of "mutations" which gave rise to small changes resulting at most in new varieties or in monstrosities.

The examples of changing species include the *Mercurialis annua* form found by Jean Marchant (1650-1738) in July 1715 (Marchant 1719), the peloric form of *Linaria vulgaris* as described by Linnaeus, as well as other examples of changes in offspring cited by Linnaeus and Gmelin. These changes are attributed to cross pollination with other species. Many experiments remain to be done in this field, says Adanson, and furthermore, there is also a possibility of changes without such cross pollination: However, without the help of cross pollination in plants which reproduce through seed, similar changes are brought about either by reciprocal fertilization of two specimens differing in some respect although belonging to the same species, or by cultivation, soil, climate, drought, humidity, shade, sun, etc. These changes are more or less prompt, more or less stable, disappearing in each generation, or perpetuating themselves over several generations in accordance with the number, the force, and the duration of the combined causes, and according to the character, disposition, and idiom, so to say, of each plant, because it is interesting to note that one family will vary only in the roots, another in the leaves, in height, indumentum, color, whereas others will change more easily in their flowers and fruits.

Adanson could not yet mention specifically the discovery on 7 July 1763 at Versailles of the simple-leaved strawberry by Antoine Duchesne and his son, one of the first spontaneous mutations observed in plants which repeated itself over several generations.

The offspring of a red tulip fertilized with the pollen of a white one consists of red, white, and red and white ones.

It has therefore been proved sufficiently by the cited facts that "art," cultivation, and even more chance, that is certain unknown circumstances, bring about every day not only varieties in curious flowers such as the tulips, the anemones, the ranunculi, etc. which do not give cause to change the species, but even sometimes new species . . . without counting the numerous other plants which pass for new varieties and which will perpetuate themselves perhaps and form as many species . . .

Hence the difficulty of defining which are the original bodies of creation, which are those that, through successive reproductions, could have been changed or even produced again by accidental causes. This is undoubtedly the reason why we do not

find any more a certain number of plants described by the classical botanists; they will have disappeared either by falling back to their primitive state, or by changing in form to multiply the species.

Adanson's description of the variability of species in the above paragraphs shows that he distinguished between phenotypic and genotypic variations and that the latter could be brought about either by hybridization (on purpose or by chance) or mutation. He conducted experiments in hybridization himself and insisted that observation on living material was essential. The experimental approach of the "new systematics" is found also in Adanson; this confirms fully Mansfeld's statement (1962, p. 43) that experimental systematics are not something belonging exclusively to the twentieth century.

The ultimate consequence of this reasoning, however, is rather disturbing: "For this reason the classical authors were not wrong in describing so few species of the same genus; they did not know any more, and it was time from which issued the new ones. For the same reason the botanists of the future will be swamped with species and obliged in the end to abandon the species in order to restrict themselves to the genera." Such a rapid output as that supposed by Adanson seems to be out of the question, and his later research led him to abandon this rather sweeping statement (Adanson further discusses the species problem with his own method, see p. 182).

Adanson's views on the possibilities of change in species, either by hybridization or by mutation, are remarkable: Guyénot (1941) very appropriately ranges Adanson among the first biologists who had an inkling of phylogeny.

The dogma of the constancy of species no longer had the authority it enjoyed in the earlier decades of the century. Jean-Jacques Rousseau, for instance, whose *Discourse on inequality* of 1755 may well have been known to Adanson, described the evolution of man in terms of the struggle for existence between species increasing in numbers (Lovejoy 1948, p. 23).

Buffon also accepted variability and change in species although he sometimes had to camouflage his rather sweeping ideas; he speaks, for instance, of monkeys as degenerated man. For Buffon, too, species were not constant, and a certain evolution existed. This was also implicit in his opinion, shared by Adanson and other scientists, that fossil shells were remnants from prehistoric seas (a notion strangely enough ridiculed by Voltaire). Antoine-Nicolas Duchesne, in his *Histoire naturelle des fraisières* (1766), described the above-mentioned monophyllous strawberry

and even went so far as to state that "genealogical order is the only one indicated by nature, the only one that fully satisfies the spirit; every other is arbitrary and empty of ideas": in fact a typical nineteenth-century phylogenetic statement.

A *variety* occurs when the difference between the specimens that belong to one species is accidental and short-lived. Adanson says, however, that it is extremely difficult to know when one has to speak of a species and when of a variety: "it is a field in which everyone errs in complete freedom."

Adanson's often quoted estimate of the number of species described by earlier authors is preceded by criticism of Linnaeus' lumping of species described by Ray and Tournefort. The estimate is as follows ("species or varieties"):

DATE	AUTHORITY	NUMBER
	Theophrastus	500
	Dioscorides	600
	Plinius	800
1546	Lonitzer (1551)	879
1552	Dodoens (1557)	884
1570	L'Obel	2,191
1587	Dalechamps	2,731
1596	C. Bauhin	6,000
1694	Tournefort	10,146
1704	Ray	18,655
1762	Linnaeus	7,000

The reference to 884 figures (and species) of plants in Dodoens' work is obscure. On p. 5 Adanson states that Dodoens published 884 figures, and gives as the dates for his first and last botanical publications 1552 and 1644. The dates are correct, but the number of figures must refer to another publication, perhaps to the first French translation of the "Cruyde-boeck," Antwerp 1557, which has 840 illustrations.

It is not clear how Adanson estimated the number of species described by L'Obel as 2,191: the date 1570 refers to Pena et L'Obel 1570; this was perhaps combined with L'Obel 1576, but most probably the number refers to L'Obel 1581.

Characters (pp. cxvij-cxxij)

In the various methods arbitrary rules are followed to characterize the categories so that the species will not be of the same nature as the genera, nor the genera of the same nature as the classes.

Linnaeus distinguished the factitious (accidental), essential, natural, and habitual "character" of a genus, by which he meant the diagnosis or definition (*Phil. bot.* no. 186). The factitious character is arbitrarily chosen to suit an arbitrary (artificial) system. The essential character distinguishes one particular plant from the others by means of a single attribute; the natural character gives the maximum of information on a plant. The "character" may therefore be expressed by citing one or more characteristics or attributes. (The word characteristic stands here for character as generally used in natural history, *nota* in the Linnaean sense, a single attribute or mark used for the description of a taxon. This usage is also accepted in this paper; cf. also Cain 1958, p. 148.)

The characters used to circumscribe the classes are drawn by Linnaeus from the same parts of the plant as those that denote the genera (*Phil. bot.* no. 204). Tournefort drew the characters for his genera of the first order from the flower and fruit. For his genera of the second order, however, he used other parts of the plants as well. These genera of the second order are not unlike our present day genera, but Linnaeus insisted that for genera one had to use the characters of the flower and fruit alone. The genera which were established this way were called natural by Linnaeus, and genera of the first order by Tournefort.

For species Tournefort used characters from all parts of the plant and from its various qualities such as color, flavor, etc., but not from the calyx, the corolla, the stamens, the ovary, the fruit, and the seed. Linnaeus excluded intangible characters such as odor and flavor, but used all visual characters derived from any part of the plant, the flowers and fruits included, provided these characters had not served to circumscribe the genus or class. Adanson objects that certain characters may be invisible but still noticeable: for instance one can use the flowering-time if this is constant over a number of generations.

The *caractère habituel* or the general appearance of the plant is difficult to catch and has to be used with discretion: "we use it always when it presents itself *d'une manière sensible*."

Adanson holds that it is wrong to select certain characters to denote taxa of a certain category. The choice of characters in an artificial system is itself artificial because it ignores the fact that what may be sufficient to establish the genera of certain families may not be sufficient at all in other families: it is not always the same group or the same number of characters that serves to circumscribe various families. There is no single key to establish natural taxa, every plant misses something or other,

one has to consider the combination of all the parts to obtain the characters of the various taxa of various ranks; this goal can thus be reached only in an inductive way.

Nomenclature (pp. cxxij-cxxiv)

Nom; ce que c'est: A name is a simple or compound sign, arbitrarily chosen by man of each society or country, which carries the idea or memory of a thing or a former sensation either by means of a catching sound or by a conspicuous attribute. In general the names designate the objects, either through the voice or through writing, without making any comparison and without expressing their nature, not even their most essential character. This means that names have no meaning as such. Such names are termed vernacular or primitive names.

Although there are of course names (words) which do express a certain main feature of the object they denote, these names constitute a minority. On the whole "primitive names" signify nothing by themselves and obtain their standing only from usage. They do not obey any general rule, which is evident from their differences in various nations, and from the frequent use of the same names to designate different objects. In a living language names change daily: there are always new names and names that are abolished, hence the need of a universal language.

A definition is a short statement of the main characters of an object including its primitive name: in botany these are the so-called phrases.

A description is a detailed summary of all parts and qualities of an object: it includes the definition and furthermore everything that can serve to define the object.

Names of Classes. The classical authors used "primitive names" for some of their classes: Grasses, Mosses, Ferns, Orchids, Palms, Algae. The first botanical author who stated that the name of a class must be simple (not compound) and derived from the name of one of its constituent genera was Adriaan van Royen (1705-1779) in his *Florae leydenensis prodromus* of 1740 (p. 1). This is the correct procedure for Adanson, whose classes were our families, and it still is correct in our time. Many of Adanson's contemporaries, however, adherents of artificial systems, wanted to denote their classes by names that expressed the essential character (Linnaeus, *Phil. Bot.* no. 253: "The names of classes and orders must express their essential character"): such names are in fact definitions: *Umbelliferae*, *Tricoccae*, *Multisiliquae* (Morison), *Asperifoliae*, *Verticillatae* (Ray), *Monandrae*, *Diandrae* (Linnaeus). Other names of classes are agglutinations containing elements of various descriptive terms: *Eleutheromacrostemones* (Wachen-

dorff); or the names are simply definitions and like those of the Tournefortian classes (*Simplices rosacei*, *Arbores papilionacei*).

Names of Genera. Tournefort (1694) took the name of the most common species of a genus to denote the genus itself. Linnaeus, *Phil. Bot.* no. 220: "No sane person introduces 'primitives' as generic names."

Names of Species. The first botanists simply used vernacular names for the species. As soon as they began to name new plants, however, they did so by means of new primitive names and by adding one or more epithets to existing specific names thus making phrase-names. In the beginning these phrases were not very precise and served their essential function as definitions very badly. Later authors, like Tournefort, coined their phrase-names with diagnostic precision and called them specific names. It should be well understood, however, that in a phrase-name like *Scorzonera lusitanica gramineo folio flore pallide-luteo* the word *Scorzonera* represents an original specific name, the name of the most common species adopted by Tournefort as the generic name. These diagnostic *nomina specifica* in the Linnaean sense, however, are open to changes as soon as more species in the same genus are found. Linnaeus therefore developed his *nomina trivialia*, the modern specific names, consisting of the combination of the generic name and a "trivial" epithet which, although it might be descriptive, was not meant to be diagnostic. Adanson did not realize the fundamental importance of this Linnaean innovation; for him it was no innovation at all since the principle of non-diagnostic binary specific names is already found in (for instance) Dioscorides: e.g. *Chamaeleon leukos* and *Chamaeleon melas* (lib. 3, nos. 10, 11). It cannot be denied that many of these primitive Dioscoridean names are indeed hardly diagnostic and just simple binary names (see Saracen's Latin index of 1598, reprinted in Gunther 1934), but it is also evident that the success of the Linnaean binary nomenclature has fully justified its (re-)establishment. By missing the importance of this capital gain in botanical communications, Adanson in fact missed the boat.

Significant Names. All names except the trivial ones (specific epithets in modern terms) have to express a certain "character" in the Linnaean system, even the generic names. Adanson, following Tournefort, objects to this because this "significance" may be misleading, incorrect, ambiguous, or open to change, and comments that it would have been much better if botanists, rather than coining new, etymologically justifiable,

significant names, would have used the names of the older authors. The Linnaean principle that generic names had to be significant, as well as his other rules, led to many name-changes; especially the rule to exclude so-called barbarous or primitive names. By means of his fourteen rules (*Phil. Bot.* nos. 220-233) Linnaeus "has found the secret to reverse and change most of the well-established names in botany and in medicine . . ." It is understandable that the name-changes introduced by Linnaeus irritated Adanson, who had such a high regard for the achievements of his predecessors. The disadvantages of the Linnaean name-changes, however, were outweighed by the great practical advantages of the modern code-system of binary nomenclature, and Adanson's final words in this chapter again reveal how much he misjudged the influence of Linnaeus: "Neither France, nor England, nor any *nation savante* of Europe have recognized those changes by Linnaeus; they have been adopted by only a small number of his pupils and more precisely by those who have made catalogues copied from his works."

Discoveries, Literature, and Summary (pp. cxxxiv-cliv)

Adanson gives an extensive survey of the authors who first made discoveries in specific parts or functions of plants. In addition he discusses the descriptive terminology used by the older authors and by Linnaeus. When discussing the sexuality of plants, for instance, he pays due attention to the opinion of classical authors and to the discoveries by Zaluzianski (1592) and Camerarius (1694).

From the times of classical authors until 1763, Adanson counts nearly 2,000 authors of botanical publications, and 4,000 volumes, of which only 2,000 deal with botany in *sensu stricto*. The number of species or varieties described is 18,000, but only 4,000 of them are sufficiently known: one volume for every two plants! A survey is given of the best translations and commentaries of classical authors, of the authors who provided the best methodical treatment of genera (Tournefort, Linnaeus, Haller), of those who gave good descriptions (e.g. Clusius, Rheede, and also Linnaeus in his *Hortus cliffortianus*), and of works giving synonymy. Adanson is not very enthusiastic about the numerous works called *Flora*, *Hortus*, or *Botanicon*, which are often just enumerations of phrases.

The number of illustrations of plants published before 1759 is estimated at 70,000, illustrating 10,000 species but only 1,500-2,000 satisfactorily. It is a pity, says Adanson, that the rich collection of vellum paintings at the *Cabinet royal des estampes* (the *collection des vélins*), then already consisting of

5,000 paintings, is not made available to the public by good engravings.

The best methodological treatments of botany were given by Joachim Jung (1587-1657), whose works were published in 1678 (*Isagoge phytoscopica*), and by Ray (1682). Adanson points out that Jung established many of the principles listed by Linnaeus in his *Philosophia botanica* of 1751 (this is confirmed by Sprague 1949) and is of the opinion that the *Philosophia* is based mainly, although not consistently, on Jung and on Tournefort's *Elémens* (1694).

Summing up, Adanson pays an exceptional tribute to Gesner:

Although not all Gesner's works are on botany alone, they deserve to be cited here as a most singular feat that a single man at the age of 49 years was able to write such good works and in such quantity. Gesner himself did not blush to state in his *Bibliotheca* that he was obliged to write books in order to earn his living. To make good and bad books to earn one's bread is not extraordinary, but to produce nearly a hundred good and useful ones is extraordinary.

Adanson tries to look at his contemporaries with the eyes of his descendants, just as he looks himself at Theophrastus and Dioscorides. It will then be evident, he says, that the method of Tournefort is the most perfect and the easiest one so far published. Furthermore, he lists as excellent the contributions to the knowledge of genera by Haller and Linnaeus, those of Linnaeus, Ray, Plumier, Haller, Columna, and Scheuchzer to the knowledge of species, that of Caspar Bauhin to synonymy, and the illustrations of Dodart, Tournefort, Aubriet, Dillen, Ehret, and Trew. Of the philosophies he regards those of Jung and Tournefort as outstanding.

At this moment we can perhaps briefly summarize the attitude of Adanson and Linnaeus towards each other. Adanson pays a general tribute to Linnaeus and his achievements, he has praise for his great botanical knowledge and insight, he appreciates his systematic mind and way of presenting information, he holds the *Hortus cliffortianus* in high regard for its excellent descriptions and synonymy. He is critical of the many name-changes introduced by Linnaeus on account of his rules for "significant" botanical names, and he cannot follow Linnaeus where the latter does not accept historical usage. Adanson did not appreciate the true nature of the great innovation of the binary system of nomenclature, he underestimated the direct pragmatic importance of the sexual system, and he was definitely biased against the Linnaean fragment of a natural classification. Adanson was a *philosophe* who was after the true

nature of things as far as it was accessible to the human mind through reason and observation. Linnaeus, although appreciating the need for more thorough botanical research and for more "natural" entities, was in the first instance a practical systematist who preferred arbitrary order to imperfectly known "natural" arrangements, and who was scarcely philosophically disposed (see also Boerman 1953). The approach to botany of these two great scientists was different: for Adanson the knowledge and ideas accumulated in the past were essential parts of today's picture of the universe; for Linnaeus order and practical usage prevailed over reverence for history.

Linnaeus himself was rather vague on the real character of the natural system (cf. Bremekamp 1962, p. 49), and held that it would be impossible to find a sharp delimitation of the natural orders. It is therefore no wonder that he had no appreciation of the concise way in which Adanson tried to circumscribe his families: "none of his classes is [remains] natural, but they are a mixture of everything" and "his natural method is the most unnatural of all" (Fries, 1911, p. 127). Linnaeus even stated in this same letter to Baeck: "Adanson himself has no experience, everything he has written he has compiled from my works, which I can prove. But he bites not many animals." To judge from this latter remark, Adanson had surely bitten Linnaeus. The contradiction between these two statements is evident: if Adanson had copied Linnaeus' natural classes, Linnaeus was unusually hard in criticizing himself by saying that none of them were natural. Sharp criticism by Linnaeus of Adanson's book is found in several of Linnaeus' other letters as well, including those to botanists abroad such as J. Burmann: "certe nulla methodus et [sic] minus naturalis" (27 July 1764, see Hulth et Uggla 1943, p. 171) and to Giseke, quoted by Fée (1833, p. 222): "you say that you have understood the characters of the families of Adanson: you are the only one." Adanson did not realize that Linnaeus was in many ways just as anxious as he was to find a natural classification (cf. *Philosophia botanica* no. 206, and Stearn 1957, p. 34, 1959, p. 93). Bremekamp (*l.c.* p. 48) has shown that Linnaeus "was originally of the opinion that the characters on which his sexual system was based would prove to be an adequate foundation for a truly natural classification." In a roundabout way Adanson acknowledged this, for he states that the sexual system of Linnaeus contains more natural elements than the *fragmenta methodi naturalis*. Adanson's approach, however, was different from that of Linnaeus in being purely inductive. Linnaeus on the contrary "was apparently unable to free him-

self from the notion that the arrangement ought to rest upon some general principle" (Bremekamp, p. 49). That Linnaeus never found this general principle probably accounts for the vagueness of his discussion of the natural method.

Linnaeus used the word "natural" in *ordines naturales* in the context of the Aristotelean philosophy, that is, mainly as an extension of the "essence" of a thing (for a critical discussion of the logic in Linnaeus' works see Cain 1958). Adanson's modern and preponderantly empirical notion of "nature" differed widely from this essentially scholastic concept. The contrast between the two taxonomists is well illustrated by their usage of this same word in entirely different meanings: Linnaeus represented the scholastic past and Adanson the beginning of an inductive future. Adanson's concept of the natural method is based on overall affinity with no strings attached, strictly empirical; Linnaeus, however, restricted the usable characters, on principle, to those of the fructification because of the teleological Aristotelean philosophy which gave prime importance to the organs that serve propagation.

The two men were therefore very different in their scientific outlook and the mutual bias is the more understandable when we take into account their rather difficult characters. It must be admitted, however, that Adanson owed a great deal to Linnaeus: in the discussion of his second volume we shall find that there are remarkable similarities (besides great differences) in the natural systems of the two men. The *préface istorike* can also be seen as stimulated by the *Philosophia botanica*: the execution was different and the ideas even completely divergent, but the general plans of the two works show great similarity.

Summing up, Adanson says that the study of botany has so far been dominated by the idea that everybody could have his own system. Artificial methods are unscientific and arrest rather than promote the knowledge of plants. The successive systems have destroyed their predecessors: those of Morison and Ray were destroyed by those of Tournefort, his ideas by those of Knaut, those of Knaut by those of Magnol, the latter by those of Linnaeus, the Linnaean ones by those of Adriaan van Royen [sic!], those of van Royen by those of Haller; in this way every modern system destroyed the older ones just as the philosophy of Pythagoras made place for that of Socrates, the latter for that of Plato, that of Plato for Aristotle's. Aristotle's philosophy has disappeared before that of Descartes over which that of Newton is nowadays preferred.

Adanson attributes this succession of philosophies and methods to the fact that they all wanted to reduce all knowledge to one single

principle, or a very restricted number of principles. Just as Newton wanted to explain physics in terms of attraction (gravitation), Linnaeus wanted to make knowledge of the stamens and the ovary fundamental. It is just as wrong for physics to accept one single principle as a basis as it is for botany. "One day one will reject all partial systems and adopt the universal method."

ADANSON'S NATURAL METHOD

After having used 154 pages to present the history of botanical knowledge and for a survey of contemporary botanical methods and thoughts, Adanson used the next 160 pages to present his own ideas and methods. Some of his ideas have been touched upon already in the previous comments; it is in this part of the book, however, that they are most explicitly discussed.

Description of the Natural Method (pp. clv-clviii)

Because the botanical methods that consider only one part, or only a small number of the parts of plants, are arbitrary, hypothetical, and abstract, and cannot be natural as we have proved above; because the natural method must be unique, universal and general, that is not subject to any exception, and independent of our will, but must follow the nature of all beings which consists of the whole of their parts and their qualities, it is not doubtful that the only natural method in botany is the one that takes into consideration all parts of plants. One must therefore consider the roots, the branches, the leaves, the flowers, and the fruits, in short all the parts and qualities or properties and faculties of the plants. It is from the figure, situation, and respective proportions of these parts, from their symmetry, from the comparison of their connections, resemblances, differences, and qualities, and from these facts and relations viewed as a whole that we find the affinity which brings plants together and which separates them in classes or families.

The true *physique* of the plants is therefore that which considers the relations of all their parts and qualities, without excepting a single one; it brings together all plants in natural and invariable families, based on all possible relations; it facilitates the study of botany by presenting knowledge from the most general point of view without limiting it. This is the idea that one must have of the natural method; there is no other and there cannot be another, because this method takes into account all aspects to which one can pay attention (*cf.* Fig. 23).

This is Adanson's profession of faith, the faith in the existence of the one objective, natural method, to be discovered by man by thorough analysis and reasoning, taking into account every possible detail without *a priori* attaching greater importance to the one than to the other. He does not claim to be the first to make this basic statement. Buffon (1749,

p. 21) is credited with it for the establishment of families, or, "which is the same," of the natural method.

A precursor of Adanson and Buffon in this respect was Pierre Magnol (cf. p. 164) who had said in 1689 that one had to consider the whole and not one single part, but who did not develop the natural method. Linnaeus, who had given *fragmenta methodi naturalis* in 1738 and 1751, had stressed that one had to consider all the parts of the flower and the fruit, but he had excluded the other parts.

It was during his stay in Senegal, says Adanson, that he realized the insufficiency of the Linnaean and Tournefortian systems. Most of the plants in that hot country simply did not fit in their systems, and this was also the case with the twenty-five artificial systems which he had made himself. Realizing that all these systems were insufficient, he "started to abandon that erroneous way which would even rebuke the most knowledgeable travellers!"

Really, botany seems to change face entirely as soon as one leaves our temperate countries in order to enter the torrid zone: they are still plants, but they are so singular in their form, they have such new attributes, that they elude most of our systems, the limits of which scarcely lie beyond the plants of our climates.

In this respect we must recognize in Adanson a remarkable insight never attained by Linnaeus: the conviction that it is necessary for a botanist to look further afield and to know the vegetation of the tropics. Linnaeus never visited the tropics: he hardly traveled at all (only to Lapland, and to western Europe), but he stimulated travel in his pupils, especially later in life. Adanson, however, also not a born traveler as is evident from the way he explored Senegal, realized that in order to find new plants and especially new forms of life, it would be necessary to go to a tropical country. For this reason he went to Senegal in 1749. He was ambitious and wanted to know and describe more plants than anyone else: such knowledge would help him make a career in botany. He followed the example of his illustrious predecessors Clusius and Tournefort, who had traveled widely, especially in Spain and Portugal. However, the flora of the Mediterranean countries began to be known in the middle of the eighteenth century, and Adanson realized that for new discoveries he had to go farther afield: to Senegal where he obtained a position at the trading post at Saint Louis. The story of the years in Senegal (1749-1754) appears in more detail in this volume by J.-P. Nicolas. Those years greatly influenced the ideas of the young botanist transplanted to an entirely different world and faced with botanical difficul-

1^{er} Article. *Moien de trouver la Méthode naturelle.*

Puisque les Méthodes de Botanique qui ne considèrent que 1 Partie, ou seulement un petit nombre de parties des Plantes, sont arbitraires, hypothétiques & abstraitives, & ne peuvent être naturelles, come il a été prouvé, pag. xcviij; puisque la Méthode naturelle doit être unique, universelle ou générale; c. à. d. ne souffrir aucune exception, & être indépendante de notre volonté, mais se régler sur la nature des êtres, qui consiste dans l'ensemble de leurs Parties & de leurs qualités; il n'est pas douteux qu'il ne peut i avoir de Méthode naturelle en Botanique, que celle qui considère l'ensemble de toutes les parties des Plantes. Il faut donc considérer les racines, les tiges, les feuilles, les fleurs & les fruits, enfin toutes les parties & qualités, ou propriétés & facultés des Plantes. C'est du nombre de la figure, situation & Proportion respective de ces parties, c'est de leur symétrie, c'est de la comparaison de leurs rapports ou ressemblance, & de leurs différences, & de celle de leurs qualités; c'est de cet ensemble que naît la convenance, cette affinité qui rapproche les Plantes & les distingue en Classes ou Familles.

Méthode naturelle; en quoi consiste.

Moien de trouver.

La vraie sifique des Plantes est donc celle qui considère les rapports de toutes leurs parties & qualités, sans en excepter une seule; elle réunit toutes les Plantes en Familles naturels & invariables, fondées sur tous les rapports possibles, & elle facilite l'étude de la Botanique, en présentant les conessances sous des points de vue plus généraux, sans les borner. Telle est l'idée qu'on doit se faire de la Méthode naturelle; il n'i en a & ne peut i en avoir d'autre, puisqu'elle renferme tous les objets sur lesquels on peut porter son attention.

Personne, que je sache, n'a dit, avant M. de Buffon, que c'étoit de la considération de l'ensemble des parties des êtres, qu'il faloit déduire les Familles, ou, ce qui est la même chose,

Indiqué d'abord par M. de Buffon.

Fig. 23. *Familles des plantes*, facsimile, p. clv, of Adanson's description of his "natural method."

ties that were seemingly endless. Through the evident insufficiency of the existing artificial methods and of those he had himself invented (following the routine of the day, that every botanist made his own system), he came to realize that their foundations were too narrow. From one extreme he went to the other: if the systems were insufficient because their base was too narrow he would use the broadest possible one. The flora of the tropics was so entirely different that he discovered entire plant families which were new to him or of which he had known only a few members, such as the palms, whereas on the other hand some families of plants that are very common in Europe, such as the Umbelliferae, were conspicuously absent from west tropical Africa. He became convinced that one had to look for a classification in nature itself, being a child of a time in which the concept "nature" had obtained such an important status. Nature's course had to be followed in science; such a course would lead to the universal method in botany just as it would lead to all universal knowledge in science itself. The idea of abandoning one's own ideas in favor of the universal truth was basic to this pattern of thought: the various personal ideas in botany had led to nearly as many systems as there had been botanists. These old systems were misleading and distorted the picture of nature as if it were seen in a distorting mirror, a mirror given a bias by the human mind. Unbiased observation alone would reveal the master-plan of the universe. Adanson's ideas were not confined to botany alone: it was in these lonely years in Senegal that he conceived his great project of a universal encyclopedia in which all phenomena were to be described from the point of view of this philosophy. Every object or fact in every sphere of knowledge was open to analysis and description along these lines and it would thus be possible to describe the structure of the universe.

It is evident from Adanson's words on the influence on his thoughts of the years in Senegal that they had indeed been decisive. Adanson cannot be understood without the background of his experience in Senegal and of the philosophical scene of the eighteenth century. He relates that, backed by the conviction that it was necessary to take all parts into account, he had started to describe all plants that he met in all their parts. All those descriptions he put together in lists, omitting the common features and thereby singling out their differences. "It was by looking at all those descriptions combined that I found that the plants arranged themselves naturally in classes or families that could not be systematic [artificial] or arbitrary because they were not based on only

one or a few parts which might change in some respects, but on all parts, so that the disappearance of one of those parts was compensated by the addition of another part."

Circumscription of the Taxa (pp. cliij-clxxj)

Adanson's discussion of the nature of species is one of the most interesting parts of his book. Whereas for Tournefort and Linnaeus (before 1761, cf. Bremekamp 1953, p. 242) the species had been created as such (*Philosophia botanica*, 1751 no. 157: *species tot numeramus, quot diversae formae in principio sunt creatae*, we count so many species as in the beginning were created different forms) and needed no definition or criterion, and whereas A.-L. de Jussieu never doubted the constancy of species, Adanson and Buffon were both deeply interested in the theoretical problem of the species. Adanson stresses several times the immense complexity of the world of living beings. His opposition to artificial systems stems also from the conviction that the oversimplification of our picture of the plant world given by such systems is definitely "a cause that has hindered botanical progress." He could have said with Rollins (1958) that "oversimplification has indeed been a deterrent to progress in some areas of scientific investigation." Adanson's concept of nature is one of a multiplicity of relations and of a great complexity; his natural method was an attempt to recognize this complexity and to give an acceptable picture of it. This is not just another vague concept of affinities: it is the approach of a sensitive rationalist to a perplexingly involved problem based on the assumption that insight into it is impossible without accepting all aspects of it. Adanson held that a classification along these lines was the only acceptable ("natural") one and that it would be the only classification that would serve a wide range of purposes: especially with regard to stimulating and facilitating further research into medical and economic properties of plants.

In order to discuss the concept "species," Adanson cites the long definition given by Buffon (1753, p. 385), the essential feature of which is that a species consists of a constant and uninterrupted succession of individuals by means of sexual reproduction. In Buffon's definition it is also stated that the number of individuals or specimens, their resemblance, and their lifetime are immaterial for the definition of a species.

Adanson does not accept this definition. The statement that a species is a succession of destruction and renewal does not hold for species of minerals and he wants to include the mineral kingdom in his reflections

on the nature of species. This succession is constant and uninterrupted, says Buffon, but it had become clear to Adanson that species did change. The axiom: "the individuals die, the species does not die" is untenable: look at the species which we know only as fossils!

The statement that the species exists through sexual reproduction holds only for animals and higher plants, says Adanson. There are many plants and even some animals which reproduce asexually and in which sexual reproduction is unknown; he calls such plants and animals "aphrodites."

Buffon's definition of a species is not general enough and seems to indicate that the only real entities in nature are the individual plants or animals (1749, p. 38): "there exist in reality in nature only individuals and genera, the orders and classes exist only in our imagination" and further, also quoted by Adanson: "nature does not know those so-called families, and contains only individuals" (1753, p. 385). Adanson rightly remarks that in that case the genera are also "abstractions" and not real entities as stated so surprisingly by Buffon, and that, if it is really true that species change, this would indicate that the only reality is a constant stream of individuals, changing and merging with each other without any definite divisions between them. In the last instance there would then be only one universal being. This is essentially still the old scholastic conception of continuity (cf. Bather 1928, p. lxxv) formerly expressed in dogmas as *Natura non facit saltum* (nature does not jump), quoted by Linnaeus in his *Philosophia botanica* (1751, sub no. 77), and that of the *horror vacui* (nature abhors a vacuum).

Such a concept, however, is inadmissible for Adanson. It may well be that nature is one or undivided with respect to the supreme being, it certainly is divided for us "*et cela suffit*." These three words ("and this is sufficient") betray again the modern approach to nature. It is irrelevant whether there is divine unity; what matters is the picture presented to the human mind, to human reason. It is evident, says Adanson, that all those beings that constitute nature are separate, and that the differences are real, although varying in number and character. "It is through those more or less profound shades of difference, which are more conspicuous when seen in combination and which constitute the gaps, that one remarks between the beings those lines of separation of which the number or the total sum remains constant in the totality of beings although they may be open to mutations or changes with respect to every being in particular." Adanson develops here his main theme of lines of separation which are found in nature by comparing as "objectively" as possible

all organisms and by looking in particular at the ways in which they differ or agree in all their parts. In this way it will also become evident that there is place in nature for more organisms than we know, because the lines of separation are more numerous than necessary to divide all known beings. The "missing" organisms are either those that have become extinct and of which we know so many fossil remains, or they may arise in future, but they may as well be in existence already but unknown to us.

These lines of separation between organisms exist in nature, and by following them one follows the steps of nature or, "what is the same, the natural method." The greatest gaps are those between the three kingdoms, smaller gaps ("less important lines of separation") will delimit the classes, and so downward towards the varieties. The classes thus obtained are called families in the animal and vegetable kingdom, but in the mineral world the term remains "class." From the existence of dividing lines of greater or lesser importance it follows that there is a natural system characterized by the lines themselves and by the combinations of characters delimited by them. "The natural method is not a chimaera," which it is for certain authors "who confuse it with the perfect method," but it exists in reality and does not necessarily imply the knowledge of all its components. "If there are classes, genera, and species at all in nature they exist in the natural method," but it is immaterial to us whether they exist in reality or not as long as we are convinced of the existence of the lines of separation. On the other hand as long as one has not found the natural method, one does not know how to delimit classes, genera, and species (nor what they are). The natural method, through these lines of separation, also teaches us which characters are important, and which immaterial and only ballast for the mind. "There is no object in the world on which one man could not spend his whole life without exhausting the possibilities of describing its properties," but this does not mean that we have to do this. The natural method provides us with the criteria and indicates their relative importance.

It is not superfluous to stress here the importance of these Adansonian ideas. It will be clear that it is not true that all properties or characteristics had equal weight for Adanson. To say this is a misinterpretation of his insistence to take all parts of the plants into consideration in order to find the natural method and of his comparison of sixty-five artificial systems out of which his own method grew. To do this, to compare

everything and to be open-minded about additional characters, is not the same as giving equal weight to them. Adanson very clearly states that there are many more *conèssances* to be obtained about plants and animals than necessary for the purposes of the natural method. His lines of separation, obtained by comparison, are a guide towards the value (or weight) of the various characters.

When one tries to define the concept "species," the criteria will differ with the kingdom. A definition based, for instance, on sexual reproduction holds, in Adanson's opinion at least, only for certain animals and plants but not for others. Such a definition is therefore arbitrary and artificial. One has to take all possibilities into account, and consequently the species becomes very difficult to define:

Although it is very difficult, not to say impossible, to give an absolute and general definition of any object of natural history whatever, one could say rather exactly that there are as many species as there are different individuals among them, different in any (one or more) respect, constant or not, provided they are definitely perceptible (*très-sensibles*) and taken from parts or qualities where those differences appear to be most naturally placed in accordance with the particular character (*génie ou les mœurs propres à*) of each family.

When analyzing this definition we find that it all depends on what one calls "definitely perceptible" and "most naturally placed," but we cannot blame Adanson too much for failing to define the indefinable. The interesting parts in the definition are the allowance for variation over the generations and the statement that the differences have to be in accordance with the group character of each family. An attribute that may be important for one family may have no taxonomic value at all in another one. Each family therefore has its own *génie*, its own particular group of characters to be used for generic and specific delimitation but also for the description of the family itself. This is anything but an arithmetical summary of the greatest number of characters all treated the same way; it is a statement on the relative value of all characters: what is important for the one may be less so for another. Adanson really describes here the modern method of distinguishing species by intuition and he shows clearly the notion of the relativity of species. This is shown also by the great importance attached by him to the knowledge of varieties (cf. Guyénot 1941, p. 367). This concept of the group character, called *génie* by Adanson, has much in common with the scholastic archetype, the platonic "idea," without, however, its transcendental connotations. It is here used in the context of contemporary

philosophy for a definite combination of unit characters: Adanson dissociated himself also in this way from scholastic transcendentalism.

It is interesting to compare the above "definition" of a species given by Adanson in 1763 with his later one found by J.-P. Nicolas handwritten in the fifth volume of Adanson's copy of Diderot et d'Alembert's *Encyclopédie*, now at Dakar (p. 954): "*Species*: collection of all objects which nature separates individually from each other as so many isolated entities existing separately and which the imagination or the free and creative opinion of man unites *idéalement* each time that he finds an almost complete resemblance or a resemblance at any rate greater than with any other group, a collection to which he gives the name species." In later years, therefore, Adanson, though still in fact basing his definition on the lines of separation, clearly states that it is the human mind that brings the objects together as species: in other words, while the differences are objectively present in nature, the value attributed to them when grouping the individual objects is subjective and human. In principle this idea is already present in the *Familles des plantes*, but the separation between the objective and subjective parts of the definition is not so clearly made.

The definition given by Adanson of the concept "variety" runs on the same lines. From the fact that species change, Adanson deduces that varieties must be placed under the species; they are subordinated to them and may not be merged with them. By describing and subordinating the varieties one avoids the risk of missing the changes that may occur in a species. Their recognition gives us an impression of the variability of a species and of the character of the differences between the species in question and other species: a modern biosystematist could not ask for more.

Nomenclature and Orthography (pp. clxxj-clxxxij)

Stability in nomenclature will not be achieved as long as classes, genera, and species change in circumscription because of the varying criteria of the different artificial systems. On the other hand, the natural method will lead to stability in the naming of plants, because, says Adanson, there can be only one natural method as outlined above. We find here that Adanson expects rather too much of his natural method; even two hundred years after the publication of his book no taxonomist will be inclined to agree that our present-day natural system will lead to complete stability. In principle, however, Adanson's opinion is based

on the simple assumption that a better knowledge of the plants will tend to stabilize the circumscription of the various taxa and hence their names. In this way his statement is acceptable, not in the extreme words that the "names are fixed by the natural method."

Adanson repeats his statement that the names themselves, being words taken from human language, cannot be natural, that is, they cannot express the entire character of the plant. He comments again on the many Linnaean name-changes, which threaten to throw botany, "that science which is as agreeable as useful," into a barbarous state worse than that in which it was during the long centuries of ignorance. He therefore discusses at some length his ideas on nomenclature and spelling, ideas that are essential to the understanding of the Adansonian method and to the results given in the second volume. It should be realized that Adanson, with his respect for the achievements of his predecessors, supports the principles of priority and of stability in nomenclature by means of the use of well-established names. The nomenclatural innovations of Linnaeus were opposed by Adanson because the former did not respect priority. Linnaeus rejected names that did not agree with his arbitrary rules that they must possibly be significant and not barbarous. For Adanson priority and stability were of prime importance, whereas the requirement of "significance" was rejected by him. The result is that the Adansonian nomenclature is mostly at variance with the Linnaean one; they agree mainly when Linnaeus used Tournefortian names or when he gave names to new taxa. The contrast between Adansonian and Linnaean nomenclature is shown by Table 1 which appears on the following page.

Adanson's rules of botanical nomenclature are as follows:

1. *Names of the classical authors must be retained.* There is no reason, says Adanson, not to adhere to the precious tradition of the use of classical plant names as given by Homer, Hippocrates, Aristotle, Theophrastus, Dioscorides, Pliny, and Galen. These names are known to the non-botanists who use them: the physicians, the apothecaries, and the people who collect herbs in the fields for medical use. Changing names of such economically important plants leads to confusion and is harmful to the mutual understanding of the people who have to use them. This sentiment expressed by Adanson is of current interest: the stability of the nomenclature of economically important plants is still a burning question.

TABLE 1 COMPARISON OF LINNAEAN AND ADANSONIAN GENERIC NAMES

LINNAEUS	ADANSON	ORIGIN AS INDICATED BY ADANSON
Achras	Sapota	Plumier
Adansonia	Baobab	Alpino
Aesculus	Hippocastanon	Tournefort
Aizoon	Veslingia	Heister
Anona	Asimina	<i>Canad.</i>
Atropa	Belladonna	Clusius
Calamus	Rotang	Rumphius
Canna	Katubala	Rheede
Cecropia	Ambaiba	<i>Brasil.</i>
Cheiranthus	Cheiri	<i>Arab.</i>
Chrysophyllum	Kainito	Plumier
Cinchona	Kinkina	<i>Offic.</i>
Cissampelos	Kaapeba	<i>Brasil.</i>
Coffea	Café	<i>Gall.</i>
Dactylis	Amaxitis	Theophrastos
Draba	Gansblum	<i>Germ.</i>
Galanthus	Acrocorion	Plinius
Gerbera	Arnica	<i>Veter.</i>
Geum	Caryophyllata	Plinius
Hamamelis	Trilopus	Mitchell
Hippocratea	Koa	Plumier
Lythrum	Salicaria	Gesner
Melia	Azedarak	Avicenna
Melothrix	Melo	Brunfels
Myristica	Komakon	Theophrastos
Othonna	Aristotela	Adanson
Panax	Ginsen	<i>Sin.</i>
Peganum	Harmala	<i>Arab.</i>
Spigelia	Arapabaka	Plumier
Syringa	Lilac	Mattioli
Toluidera	Cassia	Tragus
Zostera	Alga	Imperato

2. *Reinstatement of the original names.* Because it is necessary to provide stability recent name-changes must be ignored and the older names reinstated: *Jalapa* must be reinstated for *Mirabilis*, *Akrokorion* for *Galanthus*. An even more fatal mistake is to replace classical names by other classical names which are synonyms of entirely different plants: *Salicaria* must not be replaced . . . by *Lythrum*, for the latter is originally a *Lysimachia*.

3. *Vernacular names must be accepted.* Some modern botanists call the *noms de pays*, the vernacular names, barbarous. "They mean, by that term, all foreign names, Indian, African, American, and even [sic] those of some European nations. But if these dogmatic authors would have traveled, they would have seen that in those other countries our European names are treated as barbarous. ..." Adanson takes into consideration all names, irrespective of their origin, and he adopts them unless they are too long, too rude, or too difficult to pronounce. This is one of his main nomenclatural principles: he accepts as scientific names of plants also the so-called vernacular names if they have priority. This means, for instance, that he very often accepts the names of plants from Rheede van Drakenstein's *Hortus indicus malabaricus* (abbreviated H.M. in volume 2), such as *Sialita* instead of *Dillenia*, and *Upata* instead of *Avicennia*.

4. *Terminations are unimportant.* It is not necessary that all names end either in (i)a, um, or us, as if there were no other terminations even in classical plant names, such as *Asclepias*, *Donax*, *Glaux*, *Crambe*, *Elatine*, *Piper*, *Plumbago*. For the Greeks and the Romans the terminations were indifferent, so why should we in botany restrict ourselves to the terminations (i)a, um, and us, which are, says Adanson, exactly the rudest ones in Latin! This serves only to give a false scientific flavor to the names. The terminations of names are of no importance and Adanson uses the names taken from the various languages in their original form: after all botany is discussed in French, German, and English just as well as in Latin. Modern names ending in *ia* can be improved by cutting out the *i*, but Adanson wants to do this only in the most urgent cases, as *Jussieuia* (actually *Jussiaea* in Linnaeus, Sp. Pl. 388. 1753) which has to be *Jussia*. The name *Jussieu* is easy to latinize in agreement with the latinization of *Dieu* (*Deus*, *Dea*) and *Pieux* (*Pius*, *Pia*). The only names that should end in *ia* are the ones derived from personal names ending in *i*: *Monti*—*Montia*.

5. *Simple names to be chosen if possible.* If one can choose between two synonyms, like the ones cited in the *Hortus malabaricus*, where the Malabar and the Brahmi names are often given together, one should choose the simpler ones if there are no older synonyms.

6. *Names that are too long or too rude must be avoided.* Among the new significant names drawn from the Greek those that are too long or too rude should be avoided: *Hypophyllocarpodendron*, *Stachyarpagophora*. Such names do nothing to facilitate the study of botany or to make it agreeable.

7. *Homonyms must be avoided*: *Hippuris* is the Greek homonym of *Equisetum*, *Crinum* of *Lilium*, *Daphne* of *Laurus*, *Achras* of *Pyrus*: they are inadmissible. This is a notion of homonymy which is different from the present one.
8. *Ambiguous names are to be rejected*. It would have been better not to admit both *Fraxinella* and *Fraxinus*, *Alliaria* and *Allium*, *Salicaria* and *Salix*, etc., but the use of these names has been consecrated by long tradition, and Adanson retains them *contre-coeur*. They cannot be abolished without the general agreement of botanists.
9. *The use of comparative names*. Accepted usage is respected but such names as *Helleboroides* and *Lychnidea* should not really have been proposed. They are "significant" and therefore misleading.
10. *Family names*. Since names cannot and should not be significant it is logical to derive family names from the name of the most common or best known genus included in the family. Without further embarrassing memory with yet another name, they bring to the mind the general character of the family as exemplified by the genus from which the name is taken.
11. *Names of genera*. The generic names must be taken, as those of families, from the names of the most common or best-known species, thus following the wise principle of Tournefort, as for instance *Abies*, *Pinus*, *Acer*, *Allium*. When generic names are "significant" the specific names under them often become ridiculous: *Armeniaca sibirica*.
12. *Names of species*. Adanson cites four different ways to form specific names. First there are the phrase-names which are in fact definitions and not proper names. Secondly, species can be designated by numbers. Thirdly, it is possible to derive specific names from the generic name by adding to this name one or two letters taking the five vowels and combinations of the vowels with the consonants in alphabetic order. The first species of the genus *Fonna* (*Lychnidea*) would be *Fonna-a*, the second, third, fourth and fifth *Fonna-e*, *Fonna-i*, *Fonna-o* and *Fonna-u*. The next species would be *Fonna-ba*, *Fonna-be*, *Fonna-bi*, and so on. These three methods of naming species suppose (because of the fixed order in the second and third, and because of the definition in the first) that all species of a genus are known, which is not possible. A further inconvenience is that when changing the generic name, which may happen if the genus had been badly defined, the specific names have to be changed entirely. The three

systems are therefore not very useful and instead Adanson proposes to name species in the same way as classes and the genera, namely by means of a uninomial designation, a single name. Species, like genera and classes, should have a single proper or primitive name without any meaning, and in case one wants to place them in the methodical context one adds this simple name to that of the genus. In this way the first species of the genus *Aparine* would be called *Aparine* because the generic name is the same as that of one of its species, a kind of type-concept. The second species would be called for instance *Aparine-Rubia*, and others *Aparine-Mollugo*, *Aparine-Galion*, *Aparine-Galerion*, etc. This method does not present the above-mentioned difficulties because when the generic name is changed the specific names (*Mollugo*, *Galion*, etc.) are simply recombined with the new generic name. It would also be possible to make one of the species the type of a new genus, e.g. *Aparine-Mollugo* would become in that case the first species *Mollugo* of the genus *Mollugo*.

Adanson insists that his specific epithets, to use the modern term, have to be proper names and that they can be used independently; but, although he does not say so, his method is very close to that of the Linnaean system of combining a generic name and a "trivial" epithet. The Linnaean epithets were not considered "proper names" but the difference between Adanson's method and the Linnaean one is small and mainly to be found in the fact that the same epithet can be used under different generic names, and in the way the first species (the type-species) is named. The Linnaean method had the great advantage of reducing the number of names necessary to denominate the species and was moreover already ten years old when Adanson's book was published; there can be no doubt whose system was the successful one.

13. *Names of varieties*. It is relatively unimportant, says Adanson, whether varieties have proper names or not, but those that exist should be retained.

14. *Synonyms*. Synonyms should be listed in a chronological order, the time at which the plants to which they refer were discovered being also thus indicated. This is done in volume two in the alphabetical list on pp. 511-620. This is an important practical statement for the interpretation of the names accepted by Adanson in his second volume. The synonymy is given in full in the alphabetical index; incomplete synonymy in the main tables (or none) is irrelevant.

15. *Citations*. Phrase-names are not cited in the second volume: their use is so limited and their numbers are so great that Buffon's complaint

comes true that "the study of modern botanical nomenclature takes longer than that of the plants themselves." The references given with the descriptions of the genera are not to phrase-names but only to the oldest (or best) primitive name and to the best illustration of the genus or relevant species.

16. *New names.* New names must be simple and primitive and without any special meaning.

17. *Orthography.* Adanson's proposed spelling reform has done more than anything else to alienate his readers. As a spelling reform, however, it was remarkably early. The entire first volume is written in this simplified spelling, and it is used sometimes in the alphabetical index to the second volume. The orthography of the plant names in the synoptical table of the 1,615 genera included in his fifty-eight families (vol. 2, pp. (8)-(17)) is changed completely to accord with Adanson's views. In the systematic treatment of the genera and families in the second volume, however, the old spelling is retained. Many generic names therefore appear in two different spellings in the *Familles des plantes*: the acceptance of the conventional spelling in the systematic part should be taken as an expression of intent on the side of the author, the orthographic changes in the index and in the first volume constitute an experiment. It is not necessary to regard these orthographic variants as validly published in the sense of the *International code of botanical nomenclature* and it is equally unnecessary to burden botanical synonymy with them.

If it is permissible, when making new names, to write them as we pronounce them, to suppress letters which are mute, to unite those which have the same sound and to introduce new ones, why should it not be equally permissible to bring about these same reforms in existing names.

The most important modifications proposed by Adanson are the following:

Suppression of mute letters. The *h* is a letter which has no sound of its own and which does not modify the sound of its neighbouring vowels. It is an aspirate which lends more force to vowels, and in a "soft" language like French it is superfluous, just as in Italian when it is *istoria* instead of *historia*, *erba* instead of *herba*, etc. In his alphabetical list Adanson keeps the initial *h* in plant names but he prints them in lower case and he arranges such names according to their second letter: *hEmiaria* (printed that way)

will be found under *E*. When names are taken from languages where the *h* is definitely pronounced, Adanson wants to re-introduce the Greek *spiritus asper*.

Reunion of letters with the same sound. The *c* is a letter to be suppressed in Latin and French because it is pronounced either as a *k* or as an *s*. This reform has not been brought about in the index, but we find in the text for instance *prononser* instead of *prononcer*, but not *ékrire* instead of *écrire*. The *q* has not yet been abolished in plant names although it sounds like the *k*, but Adanson would have preferred to do so, and writes e.g. *botanike* and *istorike* in the text. The *x* is retained because it is a short symbol for a double *k*, but *ph* being longer than *f* is abolished in favor of the latter. The *g* when pronounced as a *j* is abandoned: *abrêjer* and not *abrêger*, *usaje* instead of *usage*. The *y* in plant names should be changed to *i* in those which are French (*Mirte* for *Myrte*) and to *u* in those which are Latin or Greek in accordance with classical usage (*Ophioxulon* instead of *Ophioxylon*).

Diphthongs must disappear when they stand for the single sound of one of the vowels *a*, *e*, *i*, *o*, *u*; those that have a different sound should be written as a single vowel with a diacritic sign. *Ph* becomes *f*, *ch* becomes the Greek *x*, the *gn* in those cases where the *n* modifies the *g* becomes the Spanish *ñ* (*español*, *chateñer*).

Adanson does not consistently apply his orthographic reforms in the first volume but they are sufficiently common to change the face of his French considerably: he speaks of *la réforme des noms des plantes qui i ont doné lieu*, and of *réformer dabord l'ortografe, or de comencer par les étumologies*, and *lètres qui pegnent aux ieux l'ensamble des diferanses*.

The Adansonian Families (pp. clxxxvij-ccj)

My families, says Adanson, are not systematic (artificial) because they are circumscribed by the gaps and interruptions observed in nature by taking into account all parts of plants. "If they are not natural, they are pretty close to it." The arrangement of the families in the second volume and of the genera included in them is such that the families that are most nearly related are put the closest together. The same is true of the genera; the first genus mentioned under a family is that which is most nearly related to the previous family; the last is closest to the next family. Information was not always sufficient to do this in a satisfactory way, but the attempt is made to the best of Adanson's knowledge.

The Adansonian families are different from those of Magnol because they are based on a new working method. The main features of Adan-

son's method are that he tries to "follow nature" in the arrangement of his families in one linear system, a "series or gradation based on all possible relations," and that he circumscribes his fifty-eight families by means of the above-mentioned lines of separation. The families are therefore different from those previously published, the combination of characters used to circumscribe them excluding the possibility of making such groups as *gamopetalae* and *dialypetalae* because such groupings are artificial. The petals are united in a number of entirely different families and it is wrong to single out this character and give it too much weight. Most of the previous botanists who tried to find the natural method have looked only at the flowers and fruits, others simply ignored a great many important details and combinations of characters, and Adanson is therefore convinced, quite rightly, that his working method is new. All relevant characters are thoroughly discussed in an ample description. Here Adanson certainly sets a pattern: previous authors circumscribed their classes or orders very succinctly. The "natural systems" hitherto produced, especially the *fragmenta methodi naturalis* of Linnaeus and the 1759 Trianon system of Bernard de Jussieu, lack descriptions of their *ordines naturales*.

Adanson, otherwise so dissociated from scholastic philosophy, betrays his links with the past in one respect: his arrangement of the families in a linear system is in fact a repetition of the concept of the *scala naturae*, the single natural series in which objects are arranged in the order of creation. This series is not held to be continuous, as in the scholastic concept, but discrete: there are lines of separation. However, this adherence to the concept of a single series is a scholastic relic and is responsible for a number of "unnatural" features in Adanson's method; several families are now linked together which, in a multi-dimensional arrangement, would have been at the end of a "series." Adanson was aware of some of these incorrect associations, but attributed them, sometimes indeed correctly, to our lack of knowledge of intermediary forms.

The description of the genera follows that of the families, but in tabular form. The generic descriptions follow, of course, the *g nie* or *les moeurs de chake famille*; they are in accordance with the group character of each family, as outlined above. Adanson also explains that the various parts of the plants can be arranged in an order of decreasing generality: seed, ovary, branches, roots, leaves, stamens, calyx, corolla: there are more plants with seeds than there are, for instance, plants with leaves. The order is from general to special, but this does not mean that the

more general parts of the plants automatically yield the more important characters. This is certainly not the case and the characters to be chosen for the arrangement of the plants are those that show the greatest variation. Here again, Adanson states definitely that some characters are more important for classification than others and that they are different in different groups. The corolla and the calyx provide (in those groups that have them, of course) more characters and especially combinations of characters than the stamens, mainly because of their position. The reason that the Tournefortian artificial system is so superior to the Linnaean is not that Tournefort chose the corolla as such, but that he did not single out just the number of elements of which the corolla consists. The Tournefortian characters are derived from the position of the corolla with respect to the other parts of the flower as well as from the structure of the corolla itself. The Linnaean sexual system is based mainly on numbers. Adanson stresses the great taxonomic importance of the relative position of all parts of the flower and cites as an example his treatment of the Rosaceae, which is based on the general structure of the flower (the relative position of 16 parts) rather than on the single character of the attachment of the calyx to the fruit.

Absolute perfection of the arrangement of plants is impossible; just as impossible, says Adanson, as the finding of the philosopher's stone, the squaring of the circle, or the real distance between two fixed stars. Our methods are human and hence imperfect, and the same is true of his families. Notwithstanding this, however, he trusts that the method provides a maximum degree of stability and certainty, a certain universality, conciseness, and usefulness. It is interesting to find that Adanson stresses again and again the usefulness of the natural classification and the variety of purposes for which it can be used. His statement differs very little from that of the twentieth-century author J. S. L. Gilmour (1940 p. 472), who describes the natural method as follows: "A natural classification is that grouping which endeavours to utilize *all* the attributes of the individuals under consideration and is hence useful for a wide range of purposes. In so far as it is theoretically possible to envisage a classification on these lines, which does in fact embody all the attributes of the individuals being classified, it can be said that one final and ideal classification of living things is a goal to be aimed at. In practice, however, this aim would never be attained, owing both to the limitations of our knowledge and to the differences of opinion between taxonomists." Adanson would have found nothing objectional in this statement

although he would have warned us not to overestimate the importance of the differences of opinion between taxonomists.

Stability is ensured when all relations and combinations of attributes known to us have been taken into account: the more artificial a method, the more exceptions there are to its rules, the greater the uncertainty. The Adansonian method tries to be universal because it also takes into account plants from the tropical regions; it will not be difficult to insert new plants in it.

Another advantage of the natural method put forward by Adanson is its predictive value, especially with respect to the various pharmaceutical properties of plants. If the plants are arranged in a natural way most of the plants of a certain family will show similar pharmaceutical properties. The method can therefore be used, for instance, to find suitable drugs and medicines in unknown regions by taxonomic analogy: if the Euphorbiaceae are known to be good purgatives in Africa, they may prove to be so, too, for travelers in unknown parts of America. We find a similar statement by Linnaeus in his *Philosophia Botanica* (1751, no. 334).

After having discussed at some length the various advantages of his method, Adanson also discusses in detail its imperfections. He realizes that the results are still far from perfect even though he is convinced that his method is correct. Apart from the mistakes that he has made himself he has had to rely partly on the information given by his predecessors: sometimes he may have copied mistakes. For the descriptions of genera that he had not seen he had relied mainly on the most accurate authors, generally recognized as such: Tournefort and Linnaeus. He realized that especially in the case of tropical genera, Linnaeus had sometimes described mixtures, and he stresses that research on living plants in the field, especially in the tropics, is essential.

Adanson is not satisfied with the degree of completeness of his descriptions. In many cases more information or more precise information is required. In the descriptions of his families he gives a summary of the exceptions in addition to the general characters. For instance if *Orobanche* and *Cuscuta* have indeed one cotyledon, this does not mean that they have to be placed with the other monocots, for their other characters place them definitely in the dicots. This is one more example that one must not rely too much upon one single attribute: it may be exceptional and one must always take into account the combination of characters.

The imperfections in the present work may perhaps be remedied in the general work on natural history and physics which Adanson has in

mind. He conceived this work during his years in Senegal, but he does not want to discuss it explicitly in the present book. Adanson refers here to his great project of an encyclopedic treatment of all natural phenomena as described in his *Plan et tableau de mes ouvrages* of 1775. This gigantic project, on which Adanson spent the greater part of the rest of his life without finishing it, has been discussed in more detail by J.-P. Nicolas in this volume. It was to be an encyclopedia of natural history, physics, chemistry, ethnology, philology, and related subjects, in which all these sciences were to be treated in the same way as botany in the *Familles des plantes*: in accordance with the natural method. It is a project characteristic of the unrealistic idealism of Adanson, who did not see its practical impossibility. The contrast between the achievement of the *Familles des plantes* as a successful and original effort to describe and delimit the families of the plant kingdom, giving in addition a neat compendium of information on the genera, and the chimaera of his private *Encyclopédie* illustrates the great tragedy of Adanson's life.

Summing up the discussion of his families Adanson repeats that botany is not a science of names, but of facts. He compares it with geometry and this comparison shows that the modern computer-taxonomists who use the word *Adansonian* as an epithet for characters in numerical taxonomy have reason in so doing, provided it is realized that Adanson never professed that all characters were of equal importance. He does note, however, that taxonomy, just like geometry (he does not say arithmetics!), is a science of quantities, either numerical and discrete or continuous. This statement refers to the taxonomic characters that are numerical (numbers of sepals, petals, stamens, carpels, etc.) and to those that are truly geometrical: shape of the receptacle (the importance of the disk, for instance) and the disposition of the individual parts of plants (phyllotaxis, arrangement of floral parts). Adanson calls Tournefort and Bernard de Jussieu the Descartes and Newton of botany because they applied these principles, but undoubtedly also, with respect to Tournefort, because he was indeed imbued with the true Cartesian spirit of an unbiased approach to nature.

Adanson's Systems (pp. ccj-ccciv)

The chapter in which Adanson gives a precise account of the sixty-five artificial systems that provide the material for his natural method begins with a short statement outlining Adanson's own contributions to taxonomy, "not out of vanity" but because he wants to continue his history

of the progress of botany given above. Adanson sees his own contributions as follows:

1. Many genera of uncertain taxonomic position are given a definite place in one of his families. Other genera are more precisely circumscribed: 900 out of the 1,174 genera treated in his book are "corrected" in the light of his own researches, and Adanson says with Linnaeus (*Phil. bot.* no. 209, p. 140): *Ego examinavi haec omnia genera ad leges artes, characteres reformavi, et tanquam nova condidi* (I have examined all those genera according to the principles of the "art," I have reformed the "characters" and I have defined them anew).
2. Not less than 441 new genera are added to the 1,174 adopted from previous authors.
3. The 800 names of the species of plants described by Dioscorides, Theophrastus, and Pliny are re-established or placed in their proper context.
4. The sexuality of plants is described in a new way.
5. The disk is used as an important character and recognized as part of the receptacle.
6. The sixty-five systems. We have already noted that for Adanson a system is an arrangement according to one single part or quality with respect to position, form, number, proportions, duration, and substance.

Adanson set up his first systems in 1741, at the age of fourteen, when he started his botanical studies in the Jardin du Roi. These first systems were based on the sex, the number of stamens, and the number of styles. The young Adanson was admittedly influenced by the first publications of Linnaeus. He had made twenty-five different systems in 1747, when he came to the conclusion that this was not the right way to describe the vegetable kingdom, and during his years in Senegal he started adding to the number of systems with the intention of using them ultimately for his natural method. Each system is consistently based on only one part or quality. Together the systems provide a concise summary of all attributes used by Adanson to set up his families. Each of the systems shows that it is impossible for such systems based on single characters to accommodate all genera: there are always numerous exceptions.

Table 2 is Adanson's list of the systems with the years in which he made them, the number of classes and sections, and the number of natural sections that he recognizes in them.

TABLE 2 ADANSON'S SYSTEMS

NUMBER	YEAR	SYSTEM BASED ON	CLASSES	SECTIONS	NATURAL SECTIONS
1	1753	general <i>habitus</i>	11	164	9
2	1753	length or size	11	277	0
3	1753	diameter	13	272	0
4	1754	duration	10	224	0
5	1754	habitat	41	417	0
6	1755	substance	7	108	7
7	1755	saps	19	166	59
8	1755	pigments	9	92	37
9	1755	color of flowers	8	174	17
10	1755	taste	10	91	12
11	1755	fragrance	7	113	10
12	1755	use	38	314	229
13	1751	roots	7	102	31
14	1752	leaf-buds	8	82	44
15	1752	twigs, general shape	8	96	29
16	1752	branches, position	5	109	20
17	1751	leaves, shape	8	115	21
18	1749	leaves, position	5	145	17
19	1750	leaves, development	15	137	14
20	1750	leaves, duration	3	91	23
21	1750	foliage	5	85	34
22	1749	stipules, position	4	84	28
23	1750	stipules, number	4	81	30
24	1750	tendrils	7	72	48
25	1750	thorns	12	124	24
26	1748	hairs and glands	11	140	8
27	1748	flowers, position	9	151	8
28	1748	inflorescence	9	256	3
29	1750	scales near flowers	5	93	21
30	1741	sex, position	7	124	21
31	1747	calyx, position	5	106	25
32	1746	calyx, shape	7	109	26
33	1744	calyx, number	3	80	30
34	1742	calyx, number of parts	14	185	23
35	1748	calyx, duration	5	89	33
36	1748	corolla, position	8	90	32
37	1746	corolla, shape	9	105	25
38	1744	corolla, number	3	85	37
39	1743	corolla, number of petals	15	164	30
40	1748	corolla, duration	4	83	36
41	1747	stamens, position	20	86	37
42	1746	stamens, respective shape	7	75	44

NUMBER	YEAR	SYSTEM BASED ON	CLASSES	SECTIONS	NATURAL SECTIONS
43	1741	stamens, number	14	283	8
44	1749	number in prop. to cal./cor.	4	131	13
45	1749	stamens, rel. length	6	76	40
46	1747	anthers, position	3	67	48
47	1746	anthers, shape	5	74	45
48	1746	pollen, shape	12	93	28
49	1747	ovary, position	6	68	53
50	1744	ovary, number	7	93	45
51	1741	styles, number	8	130	33
52	1742	stigmata, number	8	174	15
53	1749	fruit, substance	6	113	17
54	1745	fruit, number of locules	8	218	13
55	1747	seed, position	4	62	54
56	1743	seed, number	8	211	12
57	1750	seed, number of "locules"	6	85	48
58	1749	seed, substance	6	92	28
59	1750	seed, receptacle	17	116	20
60	1750	embryo, curving	5	76	37
61	1745	embryo, cotyledons, number	3	65	55
62	1746	embryo, cotyledons, shape	7	92	29
63	1750	receptacle	22	101	24
64	1750	disk, position	4	63	48
65	1750	ovary, specific situation	10	93	35

We cannot discuss here in detail the criteria followed by Adanson in the establishment of his systems. This part of the book, however, is easily accessible and speaks for itself.

We might perhaps expect Adanson to cite the genera contained in the classes, but he states that this would make his treatment too long. It should also be realized that the sections mentioned in the above table are *not* given and that it is therefore impossible to discover Adanson's criteria in this respect. For each system the classes are provided with a short description. The plants listed under each class are cited either as entire families ("*Labiées*," "*Mirtes*") or, when only some of the genera of a family belong in a class, the number of those genera is given followed by the family name (22 Onagres, 4 Rosiers, Quel(ques) Vervènes, La plûp[art des] Ombellifères).

The systems are given with some historical and morphological comments. We have to assume that Adanson first listed all the genera under the classes of his systems and that the presentation in the book is sec-

ondary. There is no indication at all, however, that Adanson made a statistical analysis of his systems in order to find his lines of separation. It has been assumed that he did so but it is extremely doubtful whether Adanson really acted as a computer *avant-la-lettre*. The work of comparing statistically nearly 1,700 genera according to 65 systems divided in circa 600 different classes would seem to surpass even Adanson's tremendous energy, especially since this work was complicated by the huge number of sections. Adanson never claimed to have made such a statistical analysis: he claimed to have taken into consideration all characters available to him at the moment. This was done on the basis of the sixty-five systems, which gave him an excellent tabular survey of all information. When we look at the descriptions of his families in the second volume it becomes clear that Adanson, just like Linnaeus and Bernard de Jussieu, set up his families against the general background of his knowledge of combinations of characters, using the natural groups described by other authors after having tested them against his documentation and setting up new ones if there appeared to be a need for them. The extreme diligence with which he composed his systems has created the impression of a statistical method. The fact that he based systems on characters derived from leaves, stipules, branches, etc. misled later authors, but not, for instance, his contemporary Antoine-Laurent de Jussieu. De Jussieu himself attached a greater general importance to some characters than to others, but he did not say that Adanson had given equal weight to all his characters. Adanson, too, as we have seen, was convinced that some characters were more useful, more important, and more significant for natural relationships than others. But contrary to A.-L. de Jussieu, Adanson's approach is wholly inductive; he attributes different weights *a posteriori*, and per group, whereas de Jussieu was more deductive and postulated *a priori* a subordination of characteristics which was to be applicable throughout the plant kingdom. Giving equal weight to all attributes would have been in logical contradiction with Adanson's Cartesian and inductive method. Such an arbitrary procedure would have meant an *a priori* evaluation of the characters, a line of thought completely at variance with Adanson's ideas; what he really did was not to exclude certain attributes, but instead, in Cartesian terms, to analyse them all as far as possible, consider them in his synthesis, and evaluate them in his "enumeration" or method.

The young Antoine-Laurent de Jussieu praised Adanson's method as early as 1773 (A.-L. de Jussieu 1777) "M. Adanson in his *Familles des plantes*

follows a plan which is different from that of the Trianon (i.e. that of Bernard de Jussieu), but which comes closer to it than that of Linnaeus. It does not behoove me to praise those authors . . ." In his 1774 memoir (A.-L. de Jussieu 1778), however, de Jussieu states: "M. Adanson does not admit any essential and primitive character. . . ." This is the beginning of the misunderstanding, a beginning obviously based on the human weakness of rivalry. The stress with Adanson was on the *génie et moeurs de chaque famille*; what is important for the one may be irrelevant for the other. Jussieu defended an almost absolute subordination, Adanson a relative one.

The explanatory paragraphs preceding most of the systems contain a wealth of interesting facts and notes, often taken from other authors, especially the classical ones. When we look at the list of systems we find that twenty-six of the sixty-five are based on characters derived from other parts than the flower and the fruit. Thirty-nine systems are based on the elements used exclusively by the previous authors for the delimitation of classes and genera. Even if Adanson had worked statistically, and had given equal weight to all his characters, those of the structure of the flowers and fruits would still have outweighed the others. For Adanson this is not surprising: he himself states that it is undoubtedly true that the flowers and fruits provide more characters than the rest of the plants; he sees no reason, however, to ignore the others on that account.

As an example of Adanson's systems we quote here that (no. 48) based on the shape of the pollen, giving only examples from the taxa included in his twelve classes. This is perhaps one of the first pollen-morphological systems, admittedly very crude:

CLASS	POLLEN	EXAMPLES
1	absent	Fucus, fungi
2	globular, smooth	Polygonaceae, Ranunculaceae
3	ovoid, smooth	Aristolochiaceae, Cruciferae
4	cylindrical	some Scrophulariaceae
5	cylindrical with constriction	an Umbellifer
6	bi-globose	a Boraginaceae
7	parallelopipeds	a Geraniaceae
8	angular	Orchidaceae
9	globular with excrescences	Malvaceae
10	branched	a Verbenaceae
11	cross-shaped	a Tilia
12	spidery	Pinus

WHAT REMAINS TO BE DONE

Adanson is convinced that he stands only at the beginning of the development of scientific taxonomy. The knowledge is far from complete and, notwithstanding his own contributions, much remains to be done. It is perhaps just because of his thorough study of all aspects that may be relevant for taxonomic purposes that Adanson realized the many gaps in the botanical knowledge of his day. Other families than those described by him may be discovered, the knowledge of the established families must still be perfected, a great number of new genera may still be discovered, other genera may be corrected, more precisely circumscribed, or added to. As far as the species are concerned, he expects that in addition to the 18,000 known species (considerably more than those recognized by Linnaeus) perhaps as many new ones may be discovered. Great parts of the tropics remain to be explored. There is a great need for a monographic treatment of the plant kingdom down to the specific level especially after exploration of the regions that are botanically unknown.

Adanson concludes his *Préface istorike de la botanike* with a *remarque* in which he states that although he may have criticized the works of certain botanists, this does not mean that he had wanted to attack them personally or to detract from the reputation they enjoy. He hopes to meet the same criticism of his work as he has offered of that of his colleagues: "this work, the fruit of twenty-two years of sitting up at night and of very assiduous labor, which I publish only with the intention of showing the way which has been most successful for me and which seems to me the most proper one to bring botany, in a short time, to the point of perfection of which it is capable."

CONCLUSION

After the *préface istorike* of 325 pages, numbered with roman numerals, Adanson provides, in the part numbered with arabic numerals, a chronological table of botanical authors, a survey of the most recent knowledge of morphology, anatomy, and physiology, as well as a detailed subject index.

In the chronological table of botanical authors Adanson cites 302 botanists with some of their works (often the first and the last), adding information on nationality, years of birth and death, the number of plants treated by them, and the number and quality of illustrations. The table provides a key to part of the rather cryptic abbreviated references

used by Adanson in the second volume. The first author cited is Zarathustra (Zoroaster) said to have lived 6,500 B.C. (actually ca. 660-583 B.C.), with his publications *De satione plantarum* and *De plantis magicis*, both said to be quoted by Pliny. These quotations are a little obscure. Pliny discusses Zarathustra (book 30, chapter 2), expressing great doubt about his identity and querying the date adopted by Adanson. He assumes that there may have been several Zarathustras. Adanson had less doubts in this respect than Pliny himself; I have not been able to trace the titles of Zarathustra's works cited by him in the Littré edition of Pliny or in Adanson's own copy of the 1631 Geneva edition of Pliny (cf. Margadant AD 103). Pliny himself cites Orpheus as the first botanical author (lib. 25, chapter 5). The fourth author is Moses, a Hebrew born 1,588 B.C., with a botanical work called *Genesis* ("Ex Bibliâ Sacrà"). The last publication of the list is Jacquin's *Enumeratio stirpium . . . in agro vindobonensi* of 1762.

The chapter on morphology, anatomy, and physiology contains an interesting survey of these branches of botany in Adanson's time. It would lead us too far to review this essay, which contains reports on a great many observations and experiments by Adanson himself in addition to a review of the literature. Adanson was very much interested in ecology, in meteorology, and in growing plants himself, as has been related by J.-P. Nicolas in this volume. Great attention is paid also to the diseases of plants of which twenty-three are described in some detail. Anatomy is discussed succinctly, but Adanson does not use it for his classification. None of his sixty-five systems is based on anatomical characters. The processes of fertilization are discussed and experiments with artificial sterilization are described. Adanson's ideas on this process are that the embryo exists already before fertilization and that its development is started by a "vapeur," "a kind of volatile spirit for which the *matière prolifique* serves only as a vehicle." This latter substance leaves the pollen grain and spreads out over the pistil. The *vapeur* is then transmitted through the style and the funiculus to the ovule which thus receives its first stimulus.

V FAMILLES DES PLANTES, VOLUME TWO

THE FAMILIES

In the second volume Adanson presents his families in accordance with the principles outlined in the first part of his work. It is not feasible here to discuss the taxonomic merits of his system at great length. When we analyse his fifty-eight families we have to realize that the first five

and the last contain what was known of the cryptogams at the time, and that the remaining fifty-two comprise the phanerogams. One of these contains the gymnosperms, so that fifty-one families contained what was known in 1763 of the angiosperms. Nowadays it is estimated that there are some 300 families of angiosperms divided among seventy-five to eighty-five orders. Although we must take into account that there has been an enormous increase in the knowledge of plant forms since Adanson's day, we shall find that several of Adanson's families more nearly approach the corresponding orders of today. The Adansonian *Liliaceae* provide an example. When we look at the present taxonomic position of the genera included in Adanson's families, we find that many of them contain extraneous elements. When Adanson's families are compared with the *ordines naturales* of Bernard de Jussieu and Linnaeus, however, it cannot be said that one arrangement is much better than the others. Sometimes Adanson shows a remarkable insight and novelty of approach, but in perhaps a similar number of cases we shall find his views to have been erroneous. It should be realized, however, that a major factor in the heterogeneity of some of his families was his insistence on giving as many genera as possible a place in his system, even those that were imperfectly known. Adanson often discusses such cases in the introductory paragraphs on the families. The important part of the book lies in the ample descriptions of the families. In these descriptions Adanson critically examines the various characters and properties as well as the taxonomic relationships. The families are not only defined diagnostically [this is done on pages (1)-(7)], but they are amply described in a modern way. Since Adanson based most of his family names on the name of the most representative genus, his names often have priority over the present conserved ones listed in the *International code of botanical nomenclature*. Adanson's families are listed in Table 3 below with their modern nomenclatural (or closely taxonomic) equivalents. It is not possible to give precise taxonomic equivalents, but since Adanson followed the type-concept the names can very well be compared, although the circumscriptions may differ. The names marked L or J occur also in Linnaeus (1751) and Bernard de Jussieu (1759/89), sometimes in a different spelling.

TABLE 3 ADANSON'S FAMILIES

NUMBER	FAMILY	SECTION(S)	I OR J	EQUIVALENT NAME
1	Byssi	I-II	—	
2	Fungi	I-VII	L, J	
3	Fuci		—	
4	Hepaticae		—	
5	Filices	I-II	L, J	
6	Palmae		L, J	Palmae A. L. de Jussieu 1789
7	Gramina	I-IX	L, J	Gramineae A. L. de Jussieu 1789
8	Liliaceae	I-VIII	L, J	Liliaceae A. L. de Jussieu 1789
9	Zingiberes		—	Zingiberaceae Lindley 1835
10	Orchides		L, J	Orchidaceae A. L. de Jussieu 1789
11	Aristolochiae	I-II	J	Aristolochiaceae A. L. de Jussieu 1789
12	Elaeagni		—	Elaeagnaceae A. L. de Jussieu 1789
13	Onagrae	I-II	J	Onagraceae A. L. de Jussieu 1789
14	Myrti		L, J	Myrtaceae A. L. de Jussieu 1789
15	Umbellatae	I-VIII	L, J	Umbelliferae A. L. de Jussieu 1789
16	Compositae	I-X	L	Compositae Giseke 1792
17	Campanulae		L, J	Campanulaceae A. L. de Jussieu 1789
18	Bryoniae		—	(Cucurbitaceae A. L. de Jussieu 1789)
19	Aparines	I-II	—	Rubiaceae A. L. de Jussieu 1789
20	Scabiosae	I-II	—	(Dipsacaceae A. L. de Jussieu 1789)
21	Caprifolia	I-II	—	Caprifoliaceae A. L. de Jussieu 1789
22	Vaccinia	I-III	—	Vacciniaceae S. F. Gray 1821
23	Apocyna	I-II	J	Apocynaceae A. L. de Jussieu 1789
24	Borragines	I-II	J	Boraginaceae A. L. de Jussieu 1789
25	Labiatae	I-III	J	Labiatae A. L. de Jussieu 1789
26	Verbenae	I-II	J	Verbenaceae Jaume St.-Hilaire 1805
27	Personatae	I-IV	L	Scrophulariaceae A. L. de Jussieu 1789
28	Solana		J	Solanaceae A. L. de Jussieu 1789
29	Jasmina	I-III	J	(Oleaceae Hoffmannsegg et Link 1809)
30	Anagallides		—	(Primulaceae Ventenat 1799)
31	Salicariae		J	Lythraceae Jaume St.-Hilaire 1805
32	Portulacae	I-II	—	Portulacaceae A. L. de Jussieu 1789
33	Seda		—	(Crassulaceae A. P. De Candolle 1805)
34	Alsines	I-II	—	(Caryophyllaceae A. L. de Jussieu 1789)
35	Blita		—	(Chenopodiaceae Ventenat 1789)
36	Jalapae		J	Nyctagynaceae A. L. de Jussieu 1789
37	Amaranthi		—	Amaranthaceae A. L. de Jussieu 1789
38	Spergulae		—	(Molluginaceae Hutchinson 1926)
39	Persicariae		—	Polygonaceae A. L. de Jussieu 1789
40	Thymelaeae	I-II	J	Thymelaeaceae A. L. de Jussieu 1789
41	Rosae	I-III	J	Rosaceae A. L. de Jussieu 1789
42	Zizyphi		—	(Rhamnaceae A. L. de Jussieu 1789)
43	Leguminosae	I-VI	J	Leguminosae A. L. de Jussieu 1789

NUMBER	FAMILY	SECTION(S)	I OR J	EQUIVALENT NAME
44	<i>Pistaciae</i>	I-II	—	(<i>Anacardiaceae</i> Lindley 1830)
45	<i>Tithymali</i>	I-II	—	<i>Euphorbiaceae</i> A. L. de Jussieu 1789
46	<i>Anonae</i>		J	<i>Annonaceae</i> A. L. de Jussieu 1789
47	<i>Castaneae</i>	I-III	—	<i>Fagaceae</i> Dumortier 1829
48	<i>Tiliacae</i>	I-II	J	<i>Tiliaceae</i> A. L. de Jussieu 1789
49	<i>Gerania</i>		J	<i>Geraniaceae</i> A. L. de Jussieu 1789
50	<i>Malvae</i>	I-III	J	<i>Malvaceae</i> A. L. de Jussieu 1789
51	<i>Capparides</i>		J	<i>Capparaceae</i> A. L. de Jussieu 1789
52	<i>Cruciferae</i>	I-IV	J	<i>Cruciferae</i> A. L. de Jussieu 1789
53	<i>Papavera</i>		J	<i>Papaveraceae</i> A. L. de Jussieu 1789
54	<i>Cisti</i>	I-III	—	<i>Cistaceae</i> A. L. de Jussieu 1789
55	<i>Ranunculi</i>	I-II	J	<i>Ranunculaceae</i> A. L. de Jussieu 1789
56	<i>Araceae</i>	I-III	J	<i>Araceae</i> A. L. de Jussieu 1789
57	<i>Pinus</i>		—	
58	<i>Musci</i>	I-II	L, J	

The names in parenthesis are not straightforward nomenclatural synonyms, but they are names figuring in the list of conserved family names which are based on genera which are very closely allied to the Adansonian type genus.

In a few cases it is not quite correct to cite even such equivalent names. The *Blita* of Adanson (mainly *Chenopodiaceae*), for instance, are based on *Blitum* Tournefort, which for Adanson is a nomenclatural synonym of *Amaranthus* Linnaeus, whereas Adanson's *Amaranthi* (mainly *Amaranthaceae*) are based on *Amaranthus* Tournefort, which in Adanson's circumscription is a straightforward nomenclatural synonym of *Celosia* Linnaeus. Taxonomically it is to be noted that both Adanson families are extremely heterogeneous.

The circumscription of some of the Adanson families is such that another family name (as conserved) would apply; for instance, Adanson includes *Erica* in his *Vaccinia*, and the name *Ericaceae* would have to be substituted for such a circumscription at this moment.

Thirty-two of the Adanson names were also used by Bernard de Jussieu in his then unpublished Trianon system of 1759, and twelve by Linnaeus in 1751; Adanson kept the names used by his predecessors if these fitted in with his own method, provided they were based on names of genera. However, he maintains some "primitive" or "significant" names when they are well established: e.g. *Gramina*, *Umbellatae*, *Compositae*, *Leguminosae*, *Cruciferae*, and even the Linnaean *Personatae*, which shows again that in some ways Adanson's nomenclature was essentially conservative.

THE TYPIFICATION OF THE ADANSONIAN GENERA

The typification of the Adansonian genera is usually not very difficult because of the precise synonymy given in the alphabetical index. The synonyms cited in the taxonomic treatment are not to be taken as representative: in many instances these synonyms and references serve only to guide the reader towards good illustrations of the genus; Adanson says this in so many words in his first volume. In addition to these references to illustrations Adanson sometimes gives Linnaean synonyms, especially where he reinstates an older name. The full synonymy, however, is given in the alphabetical index. For the genera listed on the first 112 pages of the taxonomic treatment no synonyms are given at all, a circumstance explained by Adanson on p. (17) of *Familles des plantes*. For those genera we find the synonyms only in the alphabetical list.

Adanson nearly always cites the Linnaean equivalents, unless Linnaeus had adopted an earlier, mostly Tournefortian, name. The citation of a Linnaean name as a synonym of an Adansonian one should always be checked against the entry in the alphabetical index of the Linnaean name itself, because in some instances the Linnaean genus as a whole is referred to another genus, whereas the citation under the Adansonian name refers to one or two species only. This is, for instance, true of *Tissa* Adanson, Fam. 2: 507, 611. On the latter page *Spergula* Lin. is given as a straightforward synonym of *Tissa*. It would seem that *Tissa* was just a superfluous nomenclatural synonym for *Spergula* Linnaeus. However, under the entry *Spergula* (on p. 607) we find that Adanson kept the Linnaean genus (on p. 271) for its first species. A similar case is that of *Malvaviscus* Adanson: on p. 574 *Hibiscus* Linnaeus is given as a synonym, but on p. 565 Adanson refers *Hibiscus* to *Ketmia*. On p. 399, "*Hibiscus* 8 Lin. Sp. 694," which is *Hibiscus malvaviscus*, is cited under *Malvaviscus* Adanson. *Malvaviscus* Adanson must be typified by *H. malvaviscus* Linnaeus, and *Ketmia* Adanson by the type of *Hibiscus* Linnaeus.

Apart from such little pitfalls, however, the typification of the genera is rarely very difficult. When the synonyms include pre-Linnaean and Linnaean names, we must typify the genus by the Linnaean synonyms; the Adansonian names are then often straightforward superfluous nomenclatural synonyms. In other cases, when a certain Linnaean species is mentioned, typification should preferably be by that species unless the pre-Linnaean synonyms and the description are clearly at variance with such a choice.

AN ADANSONIAN FAMILY OF PLANTS: THE MALLOWS

The fiftieth family, *Les Mauves* (the *Malvæ*) is chosen here as an example of the way in which Adanson described his families and treated his genera. It is not possible here to give such a review of all families, but this particular one may serve to demonstrate Adanson's method and to compare his results with those of his contemporaries and with the knowledge of today. It should be realized that although this is given as an example, similar treatment of other families might give different results. Some families are bad mixtures, even as seen in the light of the knowledge of the day; others, however, might show Adanson's method at a greater advantage.

The Description

We compare in Table 4 Adanson's description with that of the present-day *Malvaceæ* as treated by Lawrence (1951). The description by Adanson is not given completely; only its relevant parts are compared with the description by Lawrence.

TABLE 4 THE MALLOWS AS DESCRIBED IN 1763 AND 1951

ADANSON	LAWRENCE
<i>Annual herbs, shrubs, or trees with four types of hairs:</i> (1) conical or liver-shaped, (2) spindle-shaped, (3) tuft-shaped, (4) stellate with a different number of rays, the most common;	<i>Herbs, shrubs or trees</i> the vestiture often lepidote or stellate;
<i>mucilage</i> abundant, a watery sap with dispersed gum;	<i>sap</i> often mucilaginous;
<i>leaves</i> alternate, simple, palmate or digitate, stipulate;	<i>leaves</i> alternate, simple, entire or variously lobed, usually palmately veined, stipulate;
<i>flowers</i> hermaphrodite, except that a species of <i>Napaea</i> seems to have only male flowers on some plants because of abortion in the hermaphrodite ones, [regular];	<i>flowers</i> bisexual (rarely unisexual and the plants then generally dioecious as in <i>Napaea</i>), actinomorphic;
axillary or terminal, solitary or in a corymbus;	basically in cymes or cincinni but often solitary in axils;

ADANSON

calyx simple in some genera, double in others. The exterior calyx sometimes monophyllous, but in other cases with distinct leaves, sometimes of a stipular character; sepals 5-7, distinct or connate (especially in the genera with an exterior calyx),
[.....];

the *petals* 5-7, equal, touching the base of the staminal cylinder and therefore seemingly monophyllous although free in fact, convolute to the left or to the right, as in the *apocyna*;

stamens 5-700, equal or unequal; filaments basally connate forming a cylinder inserted on the calyx under the ovary, which it touches, and adnate to the base of the petals which it thereby unites;

[tops of *filaments* free];

anthers 2-celled, ovoid or curved in a semicircle, versatile, longitudinally dehiscing;

the *pollen grains* opaque and spiny yellow globules;

pistil 1, the ovary superior, touching the interior of the staminal tube; 1-35 locules, in one tier or in 2-3 tiers in *Malacoides* (= *Malope*);

the *placenta* is nothing but the axis itself which unites the locules;

the *ovules* 1-several in each fruit or in each of its locules, lens-shaped, ovoid, or shaped like a kidney of a hare, ascending, horizontal or pendulous;

the *style* 1, hollow, apically branched with as many branches as there are locules in the ovary;

LAWRENCE

the perianth typically biseriate but the *calyx* frequently subtended by an involucre (epicalyx) of distinct or connate bracts (sometimes interpreted as an involucre of bracteoles or as stipules); sepals 5, distinct or basally connate, valvate;

the *petals* 5, distinct, often basally adnate to the androecium, convolute or less commonly imbricate;

stamens very numerous, in 2 whorls (the outer whorl usually absent), hypogynous, monadelphous;

the *filaments* apically distinct;

anthers 1-celled, reniform, dehiscing longitudinally;

the *pollen grains* distinctive, usually spiny and large;

pistil typically 1, the ovary superior, 2-many-loculed and -carpelled with the locules usually in a ring or infrequently superposed (as in *Malope* or *Kitaibelia*);

the *placentation* axile;

the *ovules* 1-many in each locule, anatropous, ascending to pendulous (as in *Sidinea*);

the *style* 1 and apically branched, or as many as carpels;

ADANSON

the *stigmas* as many as there are branches of the style, sometimes capitate, consisting of cylindrical hairs, in other cases long furrows imprinted on the interior side of the branches;

fruit a woody or membranous capsule, sometimes opening longitudinally along the middle of the locules [loculicidal] each wing consisting of the two halves of neighbouring locules, sometimes dividing into as many capsules as there are locules, sometimes a berry (*Malvaviscus*), or [loculicidal and septiphragous];

seed with two envelopes, the exterior one very hard, cartilaginous, the other one membranaceous, in direct contact with the embryo; the latter sometimes curved, with two cotyledons each with 3-5 longitudinal nerves, the radicle cylindrical and rather long.

LAWRENCE

the *stigmas* as many or twice as many as carpels and often capitate to discoid or introrsely decurrent;

fruit typically a loculicidal capsule or the mature carpels of the ovary separating from one another and from the axis, sometimes a berry (*Malvaviscus*) or a samara;

seed often pubescent or comose (as in *Gossypium*), the embryo straight or curved, the endosperm mostly present and often oily.

The only differences of importance between the two descriptions are in the anthers which are one-celled (two, says Adanson) and in the presence of the pubescence on the seed in some genera. When we take into account that Adanson included some genera now usually considered to be *Sterculiaceae*, *Bombacaceae*, or *Theaceae*, and that since 1763 the knowledge of the family has increased enormously, especially because of forms found in the American tropics which were practically unknown to him, it is remarkable to see how closely the two descriptions agree. Lawrence does not say so but it may be assumed that he did not use Adanson's description when drawing up his own. [The assumption is correct! Ed.]

Adanson's description is longer and more detailed than the part cited above, but most of these details are concerned with special cases and exceptions. These exceptions are usually genera from the first section, now mostly referred to *Bombacaceae*, *Sterculiaceae* ["The *Malvaceae* are related to the *Sterculiaceae*, *Bombacaceae* and *Tiliaceae*," Lawrence 1951, p. 593], and *Theaceae*. The general parts of the description refer to the genera of sections two and three. It should be borne in mind that Adanson considers the genera in middle of his family as the most typical.

An important part of the description in Adanson is taken by the special characters of the baobab (*Adansonia*, Bombacaceae) which Adanson correctly places very close to his true mallows. The family as described by Adanson comes very close to Engler's and Diels' suborder *Malvinae*, containing the *Tiliaceae*, *Malvaceae*, *Bombacaceae*, and *Sterculiaceae*. The *Tiliaceae*, however, are a separate family which Adanson placed close to his mallows (the *Tiliae* are no. 48, the *Malvae* no. 50). Adanson says that the *Malvae* are intermediate between the *Gerania* and the *Capparides*, a statement which is difficult to understand.

The knowledge of the family has greatly increased in the course of the twentieth century and for a good evaluation of Adanson's family concept it is best to compare his *Malvae* with the *Malvaceae* (or the suborder *Malvinae*) as described in 1895 by K. Schumann in Engler's and Prantl's *Natürliche Pflanzenfamilien* vol. 3(6). Schumann states, speaking of the systematic position of the family, that the relations of the *Malvaceae*, the *Bombacaceae*, the *Sterculiaceae*, and the *Tiliaceae* are so close that one can scarcely object to uniting these four families. Since 1895, however, new methods and new plants have come forward and have greatly changed the picture of the group on the family level. In our evaluation of Adanson's *Malvaceae* we therefore prefer to compare them with the group as treated by Schumann (1895) and by Dalla Torre et Harms (1900-1907).

The Name

Under the *International code of botanical nomenclature* Adanson's name *Malvae* (to be corrected to *Malvaceae*) would have priority over the one now in use: *Malvaceae* A.-L. de Jussieu 1789, if the latter had not been conserved. For purposes of the conservation of family names of angiosperms the *Genera plantarum* of A.-L. de Jussieu (1789) is taken as the starting point. This is the reason why for many well-established family names, A.-L. de Jussieu or other later authors are cited as the authorities for certain family names that had been already validly published by Adanson. Adanson was very successful in antagonizing his contemporaries, and he still seems to antagonize our own contemporaries as well. Many of his names of genera and families are rejected by special legislation because his book was so long ignored. This is understandable for the generic names because they very often had priority over well-established names and their acceptance would have overthrown general usage. This is not true, however, of the family names, because here there would have been no change of names at all in many cases. Thirty-three of Adanson's

BERNARDI DE JUSSIEU
ORDINES NATURELES
IN LUDOVICI XV HORTO TRIANONENSI DISPOSITI

Anno 1759.

FUNGI.	Sphagnum.	Cypripedium.
Mucor.	Porella.	Epidendrum.
Peziza.	Lycopodium.	CANNAE.
Helvella.	Ophioglossum.	Canna.
Clavaria.	Isoetes.	Amomum.
Clathrus.	NAIADES.	Costus.
Phallus.	Naias.	Alpinia.
Lycoperdon.	Callitriche.	Maranta.
Hyinum.	Myriophyllum.	Curcuma.
Boletus.	Ceratophyllum.	Kämpferia.
Agaricus.	Hippuris.	Thalia.
ALGÆ.	Trapa.	MUSC.
Byssus.	Proserpinaca.	Mufa.
Conferva.	ARISTOLOCHIÆ.	Bromelia.
Chara.	Pistia.	Galanthus.
Spongia.	Alarum.	Leucoium.
Ulva.	Aristolochia.	Hypoxis.
Tremella.	FILICES.	Vallisneria.
Fucus.	Pilularia.	Stratiotes.
Lichen.	Lemma J.	Hydrocharis.
Riccia.	Osmunda.	IRIDES.
Marileca.	Onoclea.	Sifyrinchium.
Blasia.	Acrostichum.	Ferraria.
Anthoceros.	Asplenium.	Ixia.
Jungermannia.	Trichomanes.	Gladiolus.
Marchantia.	Adiantum.	Antholyza.
Equisetum.	Polypodium.	Meriana Trev.
Vilcum ?	Lonchitis.	Watsonia Mill.
MUSC.	Hemionitis.	Iris.
Hypnum.	Blechnum.	Crocus.
Bryum.	Pteris.	Gethyllis.
Mnium.	ORCHIDES.	NARCISS.
Buxbaumia.	Orchis.	Narcissus.
Polytrichum.	Saryrium.	Amaryllis.
Splachnum.	Ophrys.	Pancreatum.
Fontinalis.	Serapias.	Citium.
Phalcum.	Limodorum.	Hæmanthus.
	Arethusa.	Hemerocallis.

Fig. 24. Bernard de Jussieu's system for arranging the plants at Trianon (1759), published by A.-L. de Jussieu in his *Genera plantarum* (1789), pp. lxiiij-lxxij. (Only the first page shown here.)

family names (out of the fifty-one names of his angiosperm families) figure in the list of *nomina familiarum conservanda*, attributed to various other authors, mainly Antoine-Laurent de Jussieu. Some of these names may have been validly published as family names between 1753 and 1763 but they must be few. A.-L. de Jussieu based his system mainly on that of his uncle Bernard as it had been adopted in 1759 for the Trianon garden, but this 1759 system was published for the first time only in 1789 on pp. lxiii-lxx of Antoine-Laurent's own *Genera plantarum*. There is a great resemblance between the systems of Adanson and Bernard de Jussieu, but there is one big difference: that of Bernard de Jussieu consists of lists of names only, without any comment or description of the "*ordines naturales*" (cf. Fig. 24); Adanson's system is well documented, described, and presented and it was published as early as 1763. The name *Malvae* was also used by Bernard de Jussieu, whereas Linnaeus used the name *Columniferi* in 1751 for the "natural order" containing *Malva*.

The reason that Adanson's family names have been left out of account in the present Code is to be found in the article by A. A. Bullock on which the list of conserved names is based (Bullock 1958 p. 2). He states that for family nomenclature 1753 is an impossible commencing date and that the difficulties of interpretation at this early period convinced him that Jussieu's *Genera plantarum* was the earliest work in which modern families become recognizable. In a footnote Bullock adds: "In his *Familles* (1763) Adanson frequently used modern family names, but here the resemblance of his families to the modern concept ended." This statement certainly does not hold for Adanson's *Malvae*, as we have shown above. It would lead us too far to make a similar analysis for all Adanson's families but we should undoubtedly come across some for which Bullock's statement is understandable. However, the argument is irrelevant, since we work with the type-method under the present Code. The difficulties of interpretation encountered by Bullock are to be found more on the taxonomic than on the nomenclatural level. The decision to start with A.-L. de Jussieu (1789), however, was certainly wise, because it avoided a very difficult search in the early literature which would have resulted in the addition of more *nomina rejicienda* to Bullock's list. However, the thirty-three names of important angiosperm families that were used for the first time by Adanson would then have been attributed correctly to its original author. For sentimental reasons, some persons will regret this, and once more we must say that time has worked against him.

The Circumscription

The Adansonian *Malvae* can easily be compared with the *Malvae* of B. de Jussieu as published in 1789, the *Malvaceae* of A.-L. de Jussieu himself (1789), and the *Columniferi* of Linnaeus (1751) (cf. Fig. 25). They could be listed as Stearn listed the *Junci* (1961, p. xcv) but for a good comparison it would also be necessary to consider which other genera were included by the other authors. The synonymy is not always clear, however, and one author sometimes does not even list a genus mentioned by the others: such a comparison becomes, therefore, rather involved. If we take the treatment in Dalla Torre and Harms (1900-1907), admittedly somewhat out of date at the moment, as our standard, we can compare the four systems as in Table 5.

TABLE 5 THE *Malvaceae* AS CIRCUMSCRIBED BY ADANSON, LINNAEUS, B. AND A.-L. DE JUSSIEU COMPARED WITH THE CIRCUMSCRIPTION GIVEN BY DALLA TORRE ET HARMS

AUTHOR	DATE	NUMBER OF GENERA	GENERA AS PLACED BY DALLA TORRE ET HARMS					
			NUMBERS				PERCENTAGES	
			MALVAC.	MALVIN.	THEAC.	OTHERS	MALVAC.	MALVIN.
Linnaeus	1751	19	10	15	2	2	53	79
B. de Jussieu	1759	19	10	16	3	..	53	84
Adanson	1763	22	12	18	3	1	55	82
Linnaeus	1764	33	10	27	2	4	30	82
A.-L. de Jussieu	1789	39	19	36	2	1	49	92

The percentages make it clear that the four authors in fact circumscribed the suborder *Malvineae* of Engler with the exclusion (except Linnaeus 1764) of the *Tiliaceae*. This suborder consists of the *Malvaceae*, *Bombacaceae*, *Sterculiaceae* (including the *Byttneriaceae*) and the *Tiliaceae*. All four authors included genera of the *Theaceae* (*Camellia*, *Stewartia*, and *Gordonia*) in their family: Adanson and B. de Jussieu included all three of them whereas *Stewartia* is placed with the *Tiliaceae* by A.-L. de Jussieu. A detail like this supports our conviction that, notwithstanding their independent ways, the four authors owed each other quite a bit. The extraneous element in Adanson is one genus of the *Lythraceae*: *Tsjinkin*, placed at the end. In Adanson's method this indicates the genus that is least related to the type-genus. Linnaeus and A.-L. de Jussieu also include

77. METHODI NATURALIS Fragmenta studiose inquirenda sunt.

Primum & ultimum hoc in Botanicis desideratum est.

Natura non facit saltus.

Plantæ omnes utrinque affinitatem monstrant, uti Territorium in Mappa geographica.

Fragmenta, quæ ego proposui, hæc sunt:

1. PIPERITÆ.	Phœnix	Satyrion
Arum	Coix.	Serapias
Dracontium	3. SCITAMINA.	Herminium
Calla	Musa	Neottia
Acorus	Thalia	Ophrys
Saururus	Alpinia	Cypripedium
Pothos	Costus	Epidendrum
Piper	Canna	Limodorum
Phytolacca.	Maranta	Arethusa.
2. PALMÆ.	Amomum	5. ENSATÆ.
Corypha	Curcuma	Iris
Borassus	Kempferia.	Gladiolus
Coccus	4. ORCHIDÆ.	Antholyza
Chamærops	Orchis	Ixia
		Silyrin.

Fig. 25. Facsimile of first part of Linnaeus' "Methodi naturalis fragmenta" from his *Philosophia botanica* (1751), p. 27.

one or two such extraneous elements, but Bernard de Jussieu's concept of the *Malvæ* is spotless in this respect. The conclusion can be that the *Malvæ*, *Malvaceæ*, and *Columniferi* of our four authors are very similar and that their family can nowadays best be given a higher taxonomic rank, i.e. that of a suborder.

Linnaeus, in his 1764 system, added a considerable number of genera to his *Columniferae*, all but two belonging to the *Sterculiaceæ*, *Bombacaceæ*, or *Tiliaceæ*.

In Table 6 we give the result of an analysis along the same lines of 204 genera placed by Adanson in eight families, including the *Malvaceæ*. Table 7 shows the names given to these families by the four authors as well as the numbers of genera concerned. The standard is again Dalla Torre and Harms.

We have not included the 1764 system of Linnaeus in this comparison because the ultimate result does not differ very much. For the present

purpose the 1751 system is the more important one, because it is the one discussed by Adanson in his *préface istorique*.

The main conclusion is that the four authors placed a similar percentage of their genera in the correct family or order. A.-L. de Jussieu has a special category of *genera incertae sedis* at the end of each family. These genera have not been taken into account in our comparison; this is the reason that his percentage of plants placed in the correct order is the highest. Apart from this single item, all four authors achieved the same result; Adanson's and Linnaeus' percentages of genera placed in the correct family are slightly but not significantly higher than those of the others. When we look at the details of the four systems it is often striking that the four authors, or several of them, had the same extraneous elements in their families: *Frankenia* L. (Frankeniaceae) is included in the Caryophyllaceae by Adanson, Bernard de Jussieu, and Linnaeus; this is also the case with *Lechea* L. (Cistaceae), by Adanson and Bernard de Jussieu, and with *Elatine* L. (Elatinaceae), by Adanson and A.-L. de Jussieu. These are only a few examples of the many that could be given to indicate that there was indeed a great deal of mutual influence.

None of these conclusions is really very surprising: all four authors were out after the natural system. Their basic material was more or less the same although A.-L. de Jussieu had the benefit of the knowledge of an important number of new tropical taxa. This analysis confirms that Adanson's system is not based on a simple statistical treatment, but also on an evaluation of the various characters. The four authors used, in fact, mainly their intuition, and since they were all born botanists with an exceptionally good knowledge of plants, their results are much the same, irrespective of their methodological statements. Adanson's result is neither better nor worse than that of Linnaeus or that of the two de Jussieus. Adanson, although a pupil of Bernard de Jussieu, was too independent-minded to have slavishly followed his former teacher, and the same can be said of Bernard de Jussieu with respect to Linnaeus; but there was a great deal of mutual influence all the same. The systems are an expression of the taxonomic climate of the day. The fact that several families would now be given a higher rank is not surprising in view of the increase in the number of taxa since their time and is of little importance anyhow. The enlightening element in this analysis is that it shows this basic similarity in the work of these great taxonomists. It also shows that Adanson's insistence on taking all relevant characteristics into account is itself somewhat irrelevant; evidently this was

done by all four and not only by Adanson. The latter's insistence that for a natural system it is essential to take into account all parts of the plant was of greater theoretical than practical value.

TABLE 6 COMPARISON OF NUMBERS OF GENERA PLACED IN "CORRECT" FAMILIES AND ORDERS

AUTHOR	YEAR	NUMBER OF GENERA	NUMBER OF GENERA IN CORRECT:		IDEM% IN CORRECT	
			FAMILY	ORDER	FAMILY	ORDER
Linnaeus	1751	142	118	131	83.1	92.2
B. de Jussieu	1759	172	138	157	80.2	91.2
Adanson	1763	204	170	182	83.3	89.2
A.-L. de Jussieu	1789	225	183	218	81.3	96.8

TABLE 7 FAMILIES USED FOR TABLE 6 WITH NUMBERS OF GENERA PLACED IN EACH TAXON BY EACH AUTHOR

	ADANSON 1763	B. DE JUSSIEU 1759	LINNAEUS 1751/1764 ²	A.-L. DE JUSSIEU 1789
Malvaceae	Malvae (22)	Malvae (19)	Columiferi (19) (33)	Malvaceae (39)
Apocynaceae	Apocyna (15)	Apocina (13)	Contorti (14) (17)	Apocineae (24)
Solanaceae	Solana (10)	Solaneae (15)	Luridae (11) (18)	Solaneae (18)
Labiatae	Labiatae (57)	Labiatae (41)	Verticillatae (38)	Labiatae (42)
Ranunculaceae	Ranunculi (24)	Ranunculi (18)	Multisiliquae (18) (21)	Ranunculaceae (24)
Euphorbiaceae	Tithymali (32)	Euphorbiae (17)	Tricocca (19) (27)	Euphorbiae (33)
Caryophyllaceae	Alsines (28)	Caryophylleae (32)	Caryophyllei (16) (29)	Caryophylleae (30)
Primulaceae	Anagallides (16)	Lysimachiae (17)	Preciae (7) (12)	Lysimachiae (15)

²The second number indicates the number of genera included in 1764; in this system Linnaeus spells Columniferae, Contortae, Tricoccae.

The Genera

A treatment of Adanson's second volume along the same lines as those followed by Merrill (1935) in his commentary on Loureiro's *Flora cochinchinensis* is still awaited. Such a study will have to take into account the plants in the Adanson herbarium now at the *Laboratoire de Phanérogamie* of the *Paris Muséum National d'Histoire Naturelle*. The treatment of the genera of the *Malvæ* given below is intended to give the present-day equivalents of the names used by Adanson, to provide an example of typification, and to explain some of Adanson's many cryptic abbreviations.

Adanson subdivides his *Malvæ* into three sections: (1) with a single calyx, (2) with two calyces of which the outer one is polyphyllous, (3) with two monophyllous calyces. This subdivision of the family according to a single character shows that Adanson sometimes used "artificial" taxa himself, and since the result is quite understandable this can be taken as another indication that Adanson really weighted his characters; (cf. Fig. 26).

Apart from *Napaea* and *Abutilon* the first section contains genera now considered as *Bombacaceæ* or *Sterculiaceæ* in addition to the three theaceous genera *Stewartia*, *Lasianthus* (*Gordonia*), and *Tsubaki* (*Camellia*) to which I have referred above. The second section contains the type-genus *Malva* and in Adanson's method this is, therefore, also the most typical section. This second section contains only genera which are still in the *Malvaceæ* according to Dalla Torre and Harms. This is also true of the third section with the exception of the last genus *Tsjinkin* (*Lagerstroemia*) which belongs to the *Lythraceæ*. If Adanson, like A.-L. de Jussieu, had admitted under each of his families a section *genera incertae sedis*, *Tsjinkin* would have been inserted in it, because his knowledge of the plant was incomplete as is shown in his table, whereas he also stresses its special position in the text of his accompanying explanation.

The treatment of Adanson's genera can be seen from Fig. 26 which reproduces (pp. 398-399) part of Adanson's chapter on the *Malvæ*. In Table 8 the Adansonian names appear with their type-species (if possible), the legitimate synonym in case the Adanson name is illegitimate, the taxonomic position of the genera as considered by twentieth-century authors, and the synonymy given by Adanson in the text and in the alphabetical index, together with suitable explanations. In this list "DTH" indicates Dalla Torre et Harms (1900-1907) and "Edlin" refers to the "Critical revision of certain taxonomic groups of the Malvales" given by H. L. Edlin in 1935 (for citations, cf. pp. 250-251).

le plus grand, & après le *Baobab*, peut être le plus gros des arbres connus de l'Univers, pour faire des progres ou des canots d'une grandeur demeurée, & capable de porter voile sur la mer.

PREMIERE SECTION.

A 1 seul Calice.

<i>Fleurs.</i>	<i>Calice.</i>	<i>Etamines.</i>	<i>Fruit.</i>	<i>Graïnes.</i>
<i>Waltheria</i> , Lin. <i>monophylla</i> , Juss. Ab. d. 1773. t. 14. P. 55. 6.	5.	20 à 30 cylind.	Capule à 11 loges, à val- ves.	1 ovoïde.
<i>Dayena</i> , Adf. Cinn. 1644.	1 à 5 axill.	1 cylind. court. id.	5 log. fer- mées, qui se séparent.	Id. dans chaque log.
<i>Napaea</i> , Lin. Médic. Herm. t. 2. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.	1 à 5 axill.	1 cylind. court. id.	5 log. fer- mées, qui se séparent.	Id. dans chaque log.
<i>Abutilon</i> , Tour. 1713. Dit. 1. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.	1 à 5 axill.	1 cylind. court. id.	5 log. fer- mées, qui se séparent.	Id. dans chaque log.
<i>Yelago</i> , Nym. P. 55. 6.	1 à 5 axill.	1 cylind. court. id.	5 log. fer- mées, qui se séparent.	Id. dans chaque log.
<i>Stewartia</i> , Lin. Cer- t. 1. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.	1 à 5 axill.	1 cylind. court. id.	5 log. fer- mées, qui se séparent.	Id. dans chaque log.
<i>Lufaninus</i> , Lin. P. 55. 6.	1 à 5 axill.	1 cylind. court. id.	5 log. fer- mées, qui se séparent.	Id. dans chaque log.

Fleurs. *Calice.* *Etamines.* *Stigmas.* *Fruit.* *Graïnes.*

<i>Tjilackia</i> , Kumpf. 1711. Médic. 1. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.	1 à 5 axill.	1 cylind. court. id.	5 log. fer- mées, qui se séparent.	Id. dans chaque log.
<i>Durio</i> , Lamour. 1713. Médic. 1. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.	1 à 5 axill.	1 cylind. court. id.	5 log. fer- mées, qui se séparent.	Id. dans chaque log.
<i>Baobab</i> , R. Ad. 6. Médic. 1. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.	1 à 5 axill.	1 cylind. court. id.	5 log. fer- mées, qui se séparent.	Id. dans chaque log.
<i>Celiba</i> , Plin. 66. 3. P. 55. 6.	1 à 5 axill.	1 cylind. court. id.	5 log. fer- mées, qui se séparent.	Id. dans chaque log.

II. SECTION.

*A 2 Calices, dont l'extérieur est de plusieurs pièces.**Le calice intérieur est monophylle à 5 divisions égales.*

<i>Fleurs.</i>	<i>Calice.</i>	<i>Etamines.</i>	<i>Stigmas.</i>	<i>Fruit.</i>	<i>Graines.</i>
<i>Martynia</i> , Duf. Médic. 1. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.	Sollic. axill.	5 à 10 feuilles membr.	30 à 40. 10 phé- log.	Baye à 5 loges.	1 ovoide dans cha- que loge.
<i>Kermia</i> , Tour. 1. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.	1d.	1d.	1d.	Capicule à 5 loges 5 valv.	4 à 5, id.
<i>Lufaninus</i> , Lin. P. 55. 6.					

TABLE 8. THE GENERA IN ADANSON'S MALVAE

The names and references are given as in Adanson without change of spelling or punctuation; explanations are in parentheses; n.v. indicates an unchecked reference.

- (1) *Waltheria*. Lin. (Linnaeus, Sp. Pl. 673. 1753), legitimate.
 LT.: *W. americana* Linnaeus (cf. M. L. Green, Prop. Brit. Bot. 172. 1929).
 Taxonomic position: accepted as a separate genus by DTH in the Bombacaceae, by Edlin in the Byttneriaceae.
 Synonymy in Adanson:
 (p. 398) *Monospermalthaea*. Isn. Act. Ac. 1721. t. 14. (Danty d'Isnard, Mém. Acad. Sci. Paris 1721: 277-284. 1723).
Betonica. Pluk. t. 150. f. 5, 6. (Plukenet, Phytographia, pars tertia, 1692).
- (2) *Dayena*. Adans. (Adanson, Fam. 2: 398. 1763; see also Fig. 27), illegitimate substitute name for *Chaetaea* N. J. Jacquin 1760, later homonym of *D'Ayena* P. Miller 1756.
 T.: the type of *Chaetaea* N. J. Jacquin: *C. aculeata* N. J. Jacquin.
 Taxonomic position: placed in the synonymy of *Byttneria* Loeffling 1758 by DTH and Edlin: *Sterculiaceae* (DTH) or *Byttneriaceae* (Edlin).
 Synonymy in Adanson:
 (p. 398) *Chetaea* Jacq. (*Chaetaea* N. J. Jacquin, Enum. Pl. Carib. 2, 17. 1760).
 NOTE: The name *Dayena* commemorates Louis de Noailles, Duc d'Ayen, later maréchal de Noailles, an amateur gardener and forester who inspired Louis XV to set up his Trianon garden. The *Histoire naturelle du Sénégal* was dedicated to Louis de Noailles: one of the few influential patrons Adanson ever had [cf. Margadant, AD 258].
- (3) *Napaea*. Lin. (Linnaeus, Sp. Pl. 686. 1753), legitimate.
 LT.: *N. dioica* Linnaeus (cf. M. L. Green, Prop. Brit. Bot. 172. 1929).
 Taxonomic position: accepted as a separate genus in the *Malvaceae* by DTH and Edlin.
 Synonymy in Adanson:
 (p. 398) *Malva*. Herm. L. B. t. 23. (Hermann, Horti academici Lugduno-Batavi catalogus 22, plate on p. 23. 1687, sub *Althaea Ricinifolio* Virginiana; the name *Malva* is erroneous: Adanson copies an error from Linnaeus, Sp. Pl. 686. 1753).
Abutilon. Ehret. ic. 7, 8. (Ehret, Plantae et papilionae rariores 1748-59).
- (4) *Abutilon*. Tour. t. 25. (Tournefort, Institutiones rei herbariae 1: 99. 1700). = *Abutilon* P. Miller 1754, legitimate.
 T.: no lectotype chosen.
 Taxonomic position: generally accepted as a separate genus in the *Malvaceae*, treated as a synonym of *Sida* by Linnaeus.
 Synonymy in Adanson:
 (p. 398) Dill. Elt. t. 2, 5, 6. (Dillenius, Hortus Elthamensis, 3, 6, 7. t. 2, 5, 6. 1732, sub *Abutilon*).
Malvinda. Dill. Elt. t. 171, 172. (*idem* 211-217. t. 171, 172).

Sida. Lin. (Linnaeus, Sp. Pl. 683. 1753).

(p. 512) *Abutilon*. Avic. (Avicenna, Canon de la medecine lib. 2, cap. 6, ca. 1000; Adanson quotes from C. Bauhin, Pinax 316. 1623.)

Ibiscos. Theoph. (Theophrastus, Historia plantarum, ed. Tarvisii 1483 (n.v.), not in 1644 edition; Adanson quotes probably from C. Bauhin, Pinax 316. 1623.)

Malveola. Heist. (Heister, Systema plantarum, 1748) (n.v.).

NOTE: The names of Theophrastus cited by Adanson are based on the Latin version of the *Enquiry into plants* as given by Theodore Gaza, first printed at Treviso (Tarvisium) in 1483. Hort (1916) pointed out that this version was an emended one, because Gaza adopted freely Pliny's versions of Theophrastus. Several of the names attributed by Adanson to Theophrastus will therefore not be found in the critical edition given by Hort.

- (5) *Velaga*. Herm. (Hermann, Musaeum Zeylanicum 3 "Welagha." 1717). = *Velaga* Adanson, illegitimate substitute name for *Pentapetes* Linnaeus 1753, which is cited without qualification. Formerly listed as a nomen rejiciendum versus *Pterospermum* Schreber 1791.

T.: the type of *Pentapetes* Linnaeus 1753 (*P. phoenicea* Linnaeus).

Taxonomic position: the synonymy indicates that Adanson intended to keep up the Hermann usage, which would have made it a synonym of the later but conserved *Pterospermum* Schreber 1791 (*Sterculiaceae* DTH, *Byttneriaceae* Edlin). Nomenclaturally, however, the name is an illegitimate substitute for *Pentapetes* Linnaeus of the same family.

Synonymy in Adanson:

(p. 398) *Pterospermadendrum*. Amm. Act. Petr. 8. t. 14-17.

(*Pterospermadendron* Amman, Commentarii Academiae Scientiarum Imperialis Petropolitanae 8: 215. t. 16-17. 1741, ad annum 1736).

Pentapetes. Lin. (Linnaeus, Sp. Pl. 698. 1753).

(p. 617) *Velaga* Zeil. (of the Ceylonese).

Pterospermadendron. Amm. (see above).

- (6) *Stewartia*. Lin. (Linnaeus, Sp. Pl. 698. 1753), legitimate.

T.: *S. malacodendron* Linnaeus.

Taxonomic position: now generally accepted as a genus of the *Theaceae*.

Synonymy in Adanson:

(p. 398) Catesb. 3. t. 13. (Catesby, Natural history of Carolina, vol. 2, Appendix, p. 13. t. 13. 1747 sub *Stewartia*).

Malacodendron. Mitch. Gen. 16. (recte *Malachodendron* Mitchell, Acta Acad. Nat. Cur. 8: 216. 1748, genus no. 16).

(p. 607) *Stewartia*. Lin. (reformed spelling).

Malacodendron. Mitch. (see above).

NOTE: The citation of Catesby's Appendix as volume 3, and of Mitchell's "Gen. 16" suggest that Adanson copied these references from Linnaeus.

- (7) *Lasianthus*. Lin. (Linnaeus, in *Hypericum lasianthus*) = *Lasianthus* Adanson, legitimate, nom. rej. vs. *Lasianthus* W. Jack 1823 (nom. cons.) and identical with *Gordonia* Ellis 1771 (nom. cons.).

T.: *Hypericum lasianthus* Linnaeus.

Taxonomic position: *Gordonia* (= *Lasianthus*) is generally accepted as a genus of the *Theaceae*. Adanson's name had priority over *Gordonia*.

Synonymy in Adanson:

(p. 398) *Hypericum* 3. Lin. Sp. 783. (*Hypericum lasianthus*, Linnaeus, Sp. Pl. 783).

Alcea. Pluk. t. 352. f. 3. (Plukenet, *Amaltheum botanicum* 1705) Catesb. i. t. 44. (Catesby, *Natural history of Carolina* p. 44 (*Alcea floridana*). t. 44 (*Althea floridana*). 1731).

(p. 568) *Kampelia* Quorumd. (quorumdam, of some authors).

- (8) *Tsubaki*. Kaempfer. 851. (*Tsubakki* Kaempfer, *Amoenitatum exoticarum* 850, 851. 1712). = *Tsubaki* Adanson, an illegitimate substitute name for *Camellia* Linnaeus 1753.

T.: the type of *Camellia* Linnaeus (*C. japonica* Linnaeus).

Taxonomic position: generally accepted as a genus of the *Theaceae*.

Synonymy in Adanson:

(p. 399) *Camellia*. Lin. (Linnaeus, Sp. Pl. 698. 1753).

(p. 614) *Tsubaki*. Japon. (of the Japanese, i.e. as used by Kaempfer).

- (9) *Durio*. Rumph. i. t. 29. (Rumphius, *Herbarium Amboinense* i: 99-104. t. 29. 1741). = *Durio* Adanson, legitimate.

T.: *D. zibethinus* Murray (in Linnaeus, *Syst. Veg.* ed. 13. 581. 1774).

Taxonomic position: generally accepted as a genus of the *Bombacaceae*.

Synonymy in Adanson:

(p. 399) *Jaca*. Ind. (*Jaca indica*, taken from Bauhin, see below).

(p. 551) *Durio*. Acost. (C. Acosta, *Tractado de las drogas y medicinas de las Indias orientales* cap. 29. 1578) (orig. ed. n.v.).

Jaca Ind. J. B. i. 115 (*Jaca indica* Joh. Bauhin, *Historia plantarum universalis* i: 115. 1650).

Baran. Ind. (*Indorum*, of the Indians).

Tsiaka. H. M. 3. t. ... (Rheede, *Hortus Indicus Malabaricus* 3: 17-20. t. 26-28.

1682 sub *Tsjaka-maram* sive *Jaca* vel *Jaaca*).

Pilau. Mal. (Malabar name, taken from Rheede).

Ponossou. Bram. (in *Brahmi*).

- (10) *Baobab*. P. Alp. 67. (Prosper Alpino, *De plantis Aegypti liber* 27, 28 [sic, non 67] 1592, also as *Bahobab*), Adans. *Act. Ac.* 1759. t. 1, 2. (Adanson, *Hist. Acad. Sci. Paris* 1761: 77. 1763; *Mém. Acad. Sci. Paris* 1761: 218. 1763), an illegitimate substitute name for *Adansonia* Linnaeus, *Syst. ed.* 10. 1144. 1759.

T.: *Adansonia digitata* Linnaeus.

Taxonomic position: generally accepted as a genus of the *Bombacaceae*.

Synonymy in Adanson:

(p. 399) *Adansonia*. Lin. (see above).

(p. 524) *Abavo*. Belli. (H. Belli in Clusius, *Exoticorum libri decem* 21. 1605).

Goui. Seneg. (Senegal name).

Roui. Seneg. (*idem*).

Pain de Singe. Gall. (in French, monkey-bread).

- (11) *Ceiba*. Plum. Gen. 32. (Plumier, Nova plantarum americanarum genera 42. t. 32. 1703) = *Ceiba* Adanson, an illegitimate name for *Bombax* Linnaeus 1753.
T.: the type of *Bombax* Linnaeus 1753 (*B. ceiba* Linnaeus).
Taxonomic position: generally accepted as a genus of the *Bombacaceae*.
Synonymy in Adanson:
 (p. 399) *Panja*. H. M. 3. t. 49, 50, 51. (Rheede, Hortus Indicus Malabaricus 3: 59-60. t. 49-51. 1682).
 (p. 534) *Cyna*. Plin. (Plinius, Historiae mundi libri 37, lib. 12, 22. 1631).
Gossampinus. Plin. (*idem*, lib. 12, 21 Gossypinos).
Samouna. Brasil. (Brazilian).
Panja. Malab. (Malabar name).
Bombax. Lin. (Linnaeus, Sp. Pl. 511. 1753; this unqualified synonymy makes *Ceiba* Adanson an illegitimate name for *Bombax* Linnaeus).
Fenten. Seneg. (Senegal name).
Fromajer. Gall. (Fromager, French).
Lit.: For a review of the literature on the *Bombax*-*Ceiba* problem see e.g. A. Robyns, 1961.
- (12) *Malvaviscus*. Dill. Elt. t. 170. (Dillenius, Hortus Elthamensis 210-211. t. 170. 1732) = *Malvaviscus* Adanson, legitimate. Might be regarded as a later usage of the questionably valid (and perhaps even pre-Linnaean) *Malva-viscus* Guettard, Mém. Acad. Sci. Paris 1749: 403. 1753.
T.: *M. arboreus* Cavanilles (Diss. 131. 1787) (*Hibiscus malvaviscus* Linnaeus).
Taxonomic position: generally accepted as a genus of the *Malvaceae*.
Synonymy in Adanson:
 (p. 399): *Hibiscus*. 8. Lin Sp. 694. (*Hibiscus malvaviscus* Linnaeus, Sp. Pl. 694. 1753: type species).
 (p. 574): *hibiscus*. Lin. (This reference is obviously only to *Hibiscus malvaviscus* Linnaeus, because on p. 565 under *hibiscus* Adanson refers to *Ketmia*, and under *Ketmia* (p. 399, 536) he cites *Hibiscus*).
- (13) *Ketmia*. Tour. t. 26. (Tournefort, Institutiones rei herbariae 1: 99. 1700) = *Ketmia* Adanson 1763. The name was also used by Guettard, Mém. Acad. Sci. Paris 1749: 403. 1753, but this publication is questionably valid and perhaps even pre-Linnaean. Illegitimate because a superfluous name for *Hibiscus* Linnaeus 1753.
T.: the type of *Hibiscus* Linnaeus 1753 (*H. trionum* Linnaeus).
Taxonomic position: *Hibiscus* Linnaeus is accepted as a genus of the *Malvaceae* (DTH) or the *Bombacaceae* (Edlin).
Synonymy in Adanson:
 (p. 399) *Althaea*. Mor. S. 5. t. 18. f. 2. (Morison, Plantarum historiae universalis, vol. 2, p. 530 (sub no. 2) sect. 5, tab. 18, fig. 2. 1680).
Hibiscus Lin. (Linnaeus, Sp. Pl. 693. 1753). This unqualified synonymy makes *Ketmia* superfluous.
 Adanson cites *Hibiscus* 8. Lin (*H. Malvaviscus*) under his *Malvaviscus*, and *Hibiscus* 3, 4 Lin. (*H. populneus* and *H. tiliaceus*) under his *Pariti*. The remaining Linnaean species (incl. the type species) are brought under *Ketmia*.
 (p. 536) *Ketmia*. Syr. (Syrian name).

Trionon. Teofr. (Theophrastus).
Bamia. Arab. (Arabic name).
Abelmosk. Aegypt. (Egyptian name).
Sabdarifa. Turk. (Turkish name).
Munchusia. Heist. (Heister, *Systema plantarum*, 1748) (n.v.)
Kingombo. Guin. (Guinean name).
Bisab. Seneg. (Senegal name).
Gombo. Gall. (French).
Rose de Chine. Gall. (*idem*; Rose of China).

- (14) *Lass*. Seneg. (Senegal name) = *Lass* Adanson 1763, legitimate, nom. rej. vs. *Pavonia* Cavanilles 1786 (*nom. cons.*).

T.: *Hibiscus spinifex* Linnaeus (Syst. Nat. ed. 10. 1149, also based on *Abutilon* Plum. ic. 1).

Taxonomic position: a taxonomic synonym of *Pavonia* Cavanilles 1786, *nom. cons.*, and listed as to be rejected against it in case of union. *Pavonia* is generally accepted as a genus of the *Malvaceae*.

Synonymy in Adanson:

(p. 400) *Abutilon*. Plum. ic. 1. (Plumier, *Plantarum americanarum*, ed. Burman, 1. t. 1. 1755).

- (15) *Malva*. Tour. t. 24. (Tournefort, *Institutiones rei herbariae* 1: 94. 1700) = *Malva* Linnaeus 1753, legitimate.

LT.: *M. sylvestris* Linnaeus (*cf.* M. L. Green, *Prop. Brit. Bot.* 173. 1929).

Taxonomic position: type-genus of the *Malvaceae*.

Synonymy in Adanson:

(p. 400) *Pluk.* t. 44. f. 3. (*Malva*, Plukenet, *Phytographia*, pars prior, 1691).

Alcea Tour. t. 24. (Tournefort, *Institutiones rei herbariae* 1: 97. t. 25. [*sic*]. 1700).

(p. 574) *Malva*. Brunf. (Brunfels, *Herbarum vivae eicones* 1: 197. 1530, 2: 74-75. 1536).

Malache. Diosk. (Dioscorides, *Descriptiones plantarum* [2, 144], 1478).

Alkea. Diosk. (*idem* [3, 164]).

Antema. Putag. (Pythagoras).

Diadesma. Zoroastr. (Zarathustra).

Chokorta. Aegypt. (Egyptian name).

Aigospelen. Magis. (?).

Mauve. Gall. (French; Mallow).

- (16) *Malacoides*. Tour. t. 25. (Tournefort, *Institutiones rei herbariae* 1: 98. 1700) = *Mala-*
coides Adanson, an illegitimate substitute name for *Malope* Linnaeus 1753.

T.: the type of *Malope* Linnaeus 1753 (*M. malacoides* Linnaeus).

Taxonomic position: *Malope* Linnaeus is generally accepted as a genus of the *Malvaceae*.

Synonymy in Adanson:

(p. 400) *Malva*. Mor. S. 5. t. 17. f. 11. (Morison, *Plantarum historiae universalis*, vol. 2, p. 522, sect. 5, *tab.* 17, fig. 11).

Malope. Lin. (Linnaeus, *Sp. Pl.* 692. 1753; this unqualified synonymy makes *Mala-*
coides a superfluous name for *Malope* Lin.).

- (17) *Lavatera*. Tour. Act. Ac. 1706. t. 3. (Tournefort, Mém. Acad. Sci., Paris 1706: 86. t. 3. 1707) = *Lavatera* Linnaeus 1753, legitimate.
 LT.: *L. trimestris* Linnaeus (cf. M. L. Green, Prop. Brit. Bot. 173. 1929).
Taxonomic position: generally accepted as a genus of the *Malvaceae*.
Synonymy in Adanson:
 (p. 400) *Malva*. C. B. Prod. t. 137. (C. Bauhin, Prodomos theatri botanici 1620, ed. 2. 1671, plate and text on p. 137 sub *Malva folio vario*), Mor. S. 5. t. 17. f. 9. (Mori-son, Plantarum historiae universalis, vol. 2, p. 522, sect. 5, tab. 17. fig. 9).
Althaea. Dill. Elt. t. 9. (Dillen, Hortus Elthamensis 1732, citation erroneous, Dillen describes no *Althaea*).
 (p. 568) *Anadendromalache*. Gal. (Galenus; Adanson cites from C. Bauhin, Pinax 315. 1623).
Althaea albia. Lob. (Lobel, Kruidtboeck 800. 1581).
- (18) *Althaea*. Tour. (Tournefort, Institutiones rei herbariae 1: 97. 1700) = *Althaea* Linnaeus 1753, legitimate.
 LT.: *A. officinalis* Linnaeus (cf. M. L. Green, Prop. Brit. Bot. 172. 1929).
Taxonomic position: generally accepted as a genus of the *Malvaceae*.
Synonymy in Adanson:
 (p. 400) *Alcea*. Tour. t. 24. (Tournefort, Institutiones rei herbariae 1: 97. 1700), Baml. ic. 1169 (erroneously for Barrelier, Plantae per Galliam . . . observatae 8. t. 1169. 1714).
 (p. 515) *Althaea*. Rom. (of the Romans).
Altaia. Teofr. (Theophrastus, Historia plantarum, ed. Tarvisii 1483; lib 9, 15. 5).
Altiokon. Diosk. (Dioscorides, Descriptiones plantarum (*Althaea*, 3, 163), 1478).
Ibiscos. Diosk. (*idem*, but not in Gunther ed.; quoted prob. from C. Bauhin, Pinax 315. 1623).
Malope. Plin. (Plinius, Historiae mundi libri 37, lib. 37, 84. 1631).
Aristalthaea. Caes. (Cesalpini, De plantis libri XVI. 560. 1583; attributed to Pliny by C. Bauhin).
Bismalva. Ger. (Gerard, The Herball 789. 1583, ed. Johnson 934. 1633).
Guimauve. Gall. (French).
- (19) *Urena*. Dill. Elt. t. 319. (Dillenius, Hortus Elthamensis 430. t. 319. 1732).
 = *Urena* Linnaeus 1753, legitimate.
 LT.: *U. lobata* Linnaeus (cf. M. L. Green, Prop. Brit. Bot. 173. 1929).
Taxonomic position: generally accepted as a genus of the *Malvaceae*.
Synonymy in Adanson:
 (p. 400) *Malvinda*. Burm. Zeyl. t. 69. (J. Burman, Thesaurus Zeylanicus 150. t. 69. 1737, refers probably only to fig. 2).
 (p. 616) *Uren*. Malab. (Malabar name, from Rheede, Hortus Indicus Malabaricus 10: 3-4, t. 2. 1690).
- (20) *Pariti*. H. M. 1. t. 30. (Rheede, Hortus Indicus Malabaricus 1: 53-54. t. 30. 1678).
 = *Pariti* Adanson, a superfluous name for *Bupariti* Duhamel 1760, and a nomenclatural synonym of *Thespesia* Solander ex Correa 1807 (*nom. cons.*).
 T.: *Hibiscus populneus* Linnaeus.

Taxonomic position: *Thespesia* Solander ex Correa is accepted by some as a genus of the *Malvaceae*, by Edlin of the *Bombacaceae*.

Synonymy in Adanson:

(p. 401) *Bupariti*. H. M. 1. t. 29. (Rheede, Hortus indicus Malabaricus 1: 51-52. t. 29. 1678) = *Bupariti* Duhamel 1760.

Hibiscus. 3, 4. Lin. Sp. 694. (*H. populneus* and *H. tiliaceus* in Linnaeus, Sp. Pl. 1753).

(p. 588) *Pariti*. Malab. (Malabar name).

Bupariti. Malab. (*idem*).

hibiscus. Lin. (*Hibiscus* Linnaeus: this reference to be interpreted as referring only to the species 3 and 4).

- (21) *Gossypium*. Pluk. t. 188. f. 1, 3. (Plukenet, Phytographia, pars tertia, 1692) = *Gossypium* Linnaeus 1753, legitimate.

LT.: *G. herbaceum* Linnaeus (cf. M. L. Green, Prop. Brit. Bot. 173. 1929).

Taxonomic position: often accepted as a genus of the *Malvaceae*, by Edlin as a genus of the *Bombacaceae*.

Synonymy in Adanson:

(p. 401) *Cudu pariti*. H. M. 1, t. 31. (Rheede, Hortus Indicus Malabaricus 1: 55-56. t. 31. 1678, Cudù-Pariti).

Xylon. Tour. t. 27. (Tournefort, Institutiones rei herbariae 1: 101. 1700).

(p. 563) *Gossypion*. Lat. (Latin; already in Plinius, lib. 19, 2).

Gossypion. Teofr. (Theophrastus, Historia plantarum, ed. Tarvisii 1478; see ed. Amsterdam 1644, p. 425).

Erioforon. Teofr. (*idem*, lib. 4, 7. 7-8).

Xylon. Plin. (Plinius, Historiae mundi libri 37, lib. 19, 2. 1631).

Lanifera. Plin. (not in Littré ed.; name occurs in Clusius, Exot. libri decem 12. 1605).

Karpas. Cels. (Celsius, Cornelius Aulus, Medicinae libri octo? per Plinius?) (n.v.).

Bambagia. Caesalp. (Cesalpini, De plantis libri XVI. 565. 1583).

Kudu pariti. Malab. (Malabar name, Cudù-Pariti, see above).

Outeim. Seneg. (Senegal name).

Coton. Gall. (French; Cotton).

- (22) *Tsjinkin*. Rumph. 7. t. 28. (Rumphius, Herbarium Amboinense 7: 61-62. t. 28. 1775) = *Tsjinkin* Adanson 1763, a superfluous name for *Lagerstroemia* Linnaeus 1759.

T.: *L. indica* Linnaeus.

Taxonomic position: *Lagerstroemia* Linnaeus is generally accepted as a genus of the *Lythraceae*.

Synonymy in Adanson:

(p. 401) *Lagerstromia*. Lin. (*Lagerstroemia* Linnaeus, Syst. nat. ed. 10. 1076, 1372. 1759).

This table shows why so many of Adanson's names have fallen into oblivion. Of the twenty-two names used by Adanson only two, *Durio* and *Malvaviscus* are still used and accepted to-day. Other names were either Linnaean (*Waltheria*, *Napaea*, *Stewartia*) or are nowadays attributed to Linnaeus although published by previous authors (*Gossypium*, *Lavatera*, *Althaea*, *Urena*). Only one name is claimed by Adanson as one of his own

(*Dayena*), and another (*Lass*) is used in print for the first time by him. Several of his names (*Baobab*, *Tsubaki*, *Velaga*) are now illegitimate because Linnaeus adopted later names, or because someone else did so between 1753 and 1760 (*Pariti*). Two of Adanson's names would have to be accepted under the present rules if they had not been rejected officially in favor of later names (*Lasianthus*, used as a specific epithet by Linnaeus, and *Lass*, a Senegal name for what is now *Pavonia* Cavanilles).

This result is characteristic of the fate of the names accepted or proposed by Adanson. The choice of Linnaeus' *Species plantarum* as the starting point for botanical nomenclature has made most of his names later synonyms unless he accepted names that were used by Linnaeus also. In many cases, however (for example *Lass*), Adanson was the first author after 1753 to recognize genera now known and accepted under later names. His book was so generally ignored that many of his names have had to be rejected in favor of well-known later names by special legislation (*Lass* is rejected in favor of *Pavonia*). There are ninety-six such cases in the present list of *nomina conservanda*, and according to W. T. Stearn (1961) this "is both a tribute to his taxonomic judgment and originality in distinguishing the genera concerned and a condemnation of his linguistic unorthodoxy." The latter factor was certainly an important reason for the neglect of Adanson's book, but not the only one. On the other hand there are only seven Adanson names in the list of *nomina conservanda* that are conserved because they are well known but would have to be replaced by earlier ones (*Belamcanda*, *Entada*, *Mucuna*, *Jambosa*, *Manilkara*, *Nicandra*, *Silybum*). In addition to Adanson's one-sided record of rejection, there are twenty of his names that are listed as rejected earlier homonyms. This record of ill-treatment of an author by the system of conservation of names is surpassed only by that of Rafinesque, even more of whose names were doomed to oblivion by special legislation. Adanson and Rafinesque had much in common; both were highly erratic and at variance with the established taxonomic authorities. Their productions were generally ignored.

Adanson's Baobab

The history of the baobab was written by Adanson and with it the history of his *Malvaceae*. The tree is now known as *Adansonia* because of that same disregard for older names by Linnaeus that has thrown so many Adanson names into oblivion. The story of the name illustrates the relations between the three great botanists Carolus Linnaeus, Ber-

nard de Jussieu, and Michel Adanson, relations that were certainly cordial and honest and that were characterized by a great mutual respect. The circumstance that Adanson and Linnaeus differed in their opinions on the natural system, and that Adanson chose his own way to put into practice the botanical lessons received from Bernard de Jussieu may have obscured for later generations the fact that the three men were really on very good terms and that they shared a deep knowledge of plants. The essential similarity in their ideas is also evident from our analysis of their natural systems. The relations between Linnaeus and Adanson, however, became strained after the publication of the *Familles*.

Adanson saw the baobab in Senegal and was greatly struck by its appearance. He wrote to Bernard de Jussieu in Paris about it and supplied him with a description requesting him to send the description to Linnaeus who was then working on his *Species plantarum*. During his Senegal days Adanson had no direct contact with Linnaeus; the first letter from Adanson to Linnaeus is dated 28 June 1754 and was written from Paris. De Jussieu must indeed have written to Linnaeus about this tree which he called *Adansonia*, for Linnaeus states in a letter to Adanson, dated 1 October 1754, "*Adansoniæ ex tuis seminibus dudum accepi a D. Bernh. Jussieu; quæ etiam satis bene crescit; . . .*" Linnaeus published the name *Adansonia* in his *Species plantarum* (p. 1,190. 1753) and in the fifth edition of his *Genera plantarum* (p. 497. 1754). The entry in the latter book is restricted to "1094 *Adansonia* Obs. Affinis *Hibisci*, characterem propediem dabit B. Jussieu." The publication in the *Species plantarum* can hardly be taken as valid either because it consists only of references to previous publications. The first valid publication is by Linnaeus in his *Systema naturæ*, 10th ed., vol. 2, p. 1,144 (1759). In his letter of 2 October 1758 to Linnaeus (see for this and the previous letters Hulth vol. 1, Fee 1831, and Smith 1821 vol. 2), Adanson explains that he had already communicated to the *Académie des Sciences* (in 1756) a complete description of the "Baobab, which Bernard de Jussieu has named *Adansonia*, and of which I had long ago given a description before your letter (that of 1754?) reached me. B. de Jussieu had refrained from sending you this description during my absence, that he might not deprive me of the opportunity of giving you pleasure." He therefore sends Linnaeus "the essential parts of the character which you ask for, taken from the Memoirs of the Academy intended for publication, or rather from my own Latin manuscripts, according to the plan of your *Genera plantarum*, as I mean to give them to the public" (translation of J. E. Smith).

Dayena, abau, 50. fam. Maury

Fluo grande, vii in Delfa

istigmata cylindric.

5 anthers fully
on base of a column
you form a column -
5 filaments

Flour grande mû en deffou

corolle 5, 2 états
en filots / 10 états de
la base de la colonne
5 états terminaux
et terminaux en
galète qui vient
joindre au haut de la
colonne.

calice 5 div. purp.

capitule p. h. epinuse 5-6 logy
ferm. chaux à 1 graine.

Rosa, cypria (1 *petiolo*) foliis coriatis, glabris. *Sp. Pl.* 1756, p. 23 (2. *f. m.*)
incomplete

Gen. amig. anteq.

градеви @ 1/2pi - a 1/2pi. 2 a 3/4pi.

Fig. 27. Adanson's drawing of *Dayena*, from his file of botanical illustrations [cf. Margadant, AD 128].

This communication of 1756 to the Academy was not published until 1763 in the *Histoire* and the *Mémoires* for the year 1761. Adanson had become a member of the *Académie des Sciences* in 1759, and the mills of publication of the Academy ground slowly.

The 1763 publication consisted of two parts, as usual: an abbreviated account in the *Histoire de l'Académie* on pp. 77-85 in the impersonal style of a report, and a more detailed treatment accompanied by two plates (see Figs. 28, 29) in the *Mémoires* on pp. 218-243.

The account in the *Histoire* is an extract from the one in the *Mémoires*. The extraordinary shape of the tree is described: the trunk of the tree is not very high (12-15 feet) but in many specimens the diameter is considerably larger (25-27 feet). Since the branches are almost horizontal and touch the ground at the end, there may be a solid hemispherical mass of foliage of 120-130 feet in diameter. The extract concludes with a note not found in the *Mémoires*: "Homer [Odyss. 1: e. xxiii] relates that Odysseus had made himself a complete bedpost from the trunk of an olive-tree still attached to its roots, around which he built a room. If the Prince had had, in the perimeter of his palace, a baobab tree, he could have pushed this singularity further by making the room and all the furniture by cutting them out of the same piece of wood."

The *Mémoire* is more explicit, and starts with a chronological enumeration of the previous authors who mentioned the baobab, which is more detailed than the synonymy given in the *Familles des plantes*:

Arbre du cap-vert à feuilles de figuier [Cape Verde tree with fig-leaves] Thévet, *Singularités de la France antarctique*, chap. 10. [André Thévet, Les singularitez . . . 17-19. 1558]
Baobab. *Prosp. Alp. de Plant. Aegypt. cap. 17*. [P. Alpino, De plantis Aegypti liber 27, 28. 1592, also as Bahobab]

Guanabanus *Jul. Caes. Scalig. de Subtilitate, lib. VI*. [n.v.]

Abovo vel Abavi *Clus. Exotic. Lib. II, cap. 1*. [Exoticorum libri decem 21. 1605]

Guanabanus Scaligeri forte Baobab Prosperi Alpini verius. *Clus. Plant. Indic. Lib. II, cap. 11*. [Exoticorum libri decem 231. 1605]

Fructus quidam ex Guineâ, Guanabanus forte Scaligeri. *Gesn. Hort. Germ.*

Abavo arbor radice Tuberosâ, *C. B. Pin. Lib. 11, cap. 10*. [C. Bauhin, Pinax 434. 1623]

Baobab Lippi M.S. [manuscript]

Adansona *Juss. Hort. Reg. Paris*. [Jussieu in Royal Botanic Garden Paris]

Adansonia *Lin. Gen. 1094*. [Linnaeus, Genera plantarum ed. 5. 497. 1754]

The Ouolof inhabitants of Senegal call this tree *Goui* and its fruit *Boui* [sic, Roui in FP 2: 524]. The French of Senegal call this tree *Calebassier* and its fruit *Pain de Singe*.

Adanson describes verbosely the size and shape of the tree and gives a precise account of its flower and fruit. When comparing this description with other plants, he wrote

... it will be clear that the baobab is narrowly related to those plants that one usually calls malvacées, especially because of the shape and the insertion of the petals and the stamens; however it is known that the malvacées mostly have a double calyx and that we hitherto know only of three genera of this group with a simple calyx, that is the *Abutilon* of Tournefort, which M. Linnaeus calls *Sida*, the *Monospermalthea* of Isnard, called *Waltheria* by M. Linnaeus, and the *Napaea* to which we must add eight other genera of which I shall speak in a general work on botany to be called *Familles des plantes*: those genera are *Dayena*, *Velaça*, *Stewartia*, *Lasianthus*, *Tsubaki*, *Durio*, and the baobab which forms a genus of plants which differs greatly by its calyx which is shed as soon as the fruit starts growing, by the number and insertion of its stamens, which instead of being dispersed around a cylinder, are united to form a pompon at its end, and by its woody fruit with 10-14 locules filled with seeds wrapped up in a white spongy dry flesh.

Adanson then gives the essential characters of the *Malvaceae* as we have given them above from his *Familles des plantes*, followed by a discussion of the three sections.

Adanson discusses the age of some baobabs that he has seen. He had encountered two trees in which European names had been carved: some of these names dated very distinctly from the fifteenth and sixteenth centuries, others *assez confusément* from the fourteenth century. The trees that he found on the Ile des Madeleines (Ile aux Serpents, a small island opposite Dakar) are probably the same specimens Thevet saw on his expedition of 1555; they have now disappeared (Adam 1962, p. 33). The inscriptions occupied about one-eighth of the circumference of the trunk, which proves that the trees were no longer very young when the inscriptions were made. Taking the fifteenth-century inscriptions, which were clear, as a basis, the tree that had a diameter of about six feet would have grown no more than those six feet in two centuries at the most. It was known that the trees grew rather fast in youth but that the rate of growth decreased considerably. Trees twenty-five feet in diameter are not rare: they must therefore be very old, probably some thousands of years. According to Leroy (1960) the name baobab means thousand-year tree, which agrees with Adanson's opinion of the origin of the name (*fide* oral communication from J.-P. Nicolas). Other recent authors, however (R.-P. et F.-J. Nicolas 1955 and Adam 1962), mention the possibility of the name's being derived from the Arabic *bu hibab*, meaning fruit with many seeds). Adam (1962) discusses also the possible age of the largest baobabs, but cannot give a precise estimate because their stems are always hollow. He agrees, however, that it is quite possible that the tree may reach an age of over one thousand years.

The tree was originally limited to West Africa but it had already been imported into the West Indies by the slaves. The slave-trade still flourished in Adanson's time and he explains how negroes took seeds of useful plants with them

[in the] second pocket of their tobacco pouch, which they carried across their back hanging from the neck, or they put them in their loin-cloth, they constitute for them a sort of treasure which they do not lose sight of. The seeds that they ordinarily take with them are the baobab, which the Oulofs call *goui*, some species of *Corchorus* which they use if the baobab fails; the *Ketmia* (*Kiarhate*) which one calls *gombo* [probably a corruption of the Dutch gomboom, gum-tree] on the Gold-coast and by that same name in America; . . .

All those plants which have no American names yet had been transplanted to America and some of them had even become naturalized. This example, says Adanson, teaches us to pay attention to the phenomenon of plant introduction through man, a good European example of which is given by the goldenrod (*Solidago*).

The mucilaginous sap of the baobab, especially in its bark and leaves, is emollient. The leaves are dried in the sun and ground to a powder called *lalo*. This powder can be used to make an infusion which is allegedly a good remedy for malaria. The negroes put the powdered *lalo* on their couscous before eating it, not as pepper but as a drug which serves to *calmer la trop grande ardeur du sang*. Adanson reports that in the malaria season, only he himself and one of his friends, who also took this infusion regularly, were free of this illness from which all other Europeans suffered. Perhaps one of the reasons that the other Frenchmen did not take Adanson's infusion was that one had to abstain from drinking wine during that period, or was it perhaps that they disliked the anti-aphrodisiac qualities ascribed to it?

The baobab fruits, which can be eaten and which have the same properties as the leaves, were exported from Senegal to the other parts of Africa. The Arabs brought them to Egypt where Prospero Alpini encountered them. The dried pulp was sold there as *terra Lemnia* also to be used for making an infusion that was said to cure various diseases. The name *terra Lemnia* refers to the island of Lemnos and more especially to the story of the Lemniades, the women who neglected the cult of Aphrodite. The use of the *terra Lemnia* in Egypt had therefore something in common with the use of the *lalo* with respect to the *ardeur du sang*.

The most curious use of the baobab, reported by Adanson, is that made by Senegalese negroes who carved holes in the trunks of living

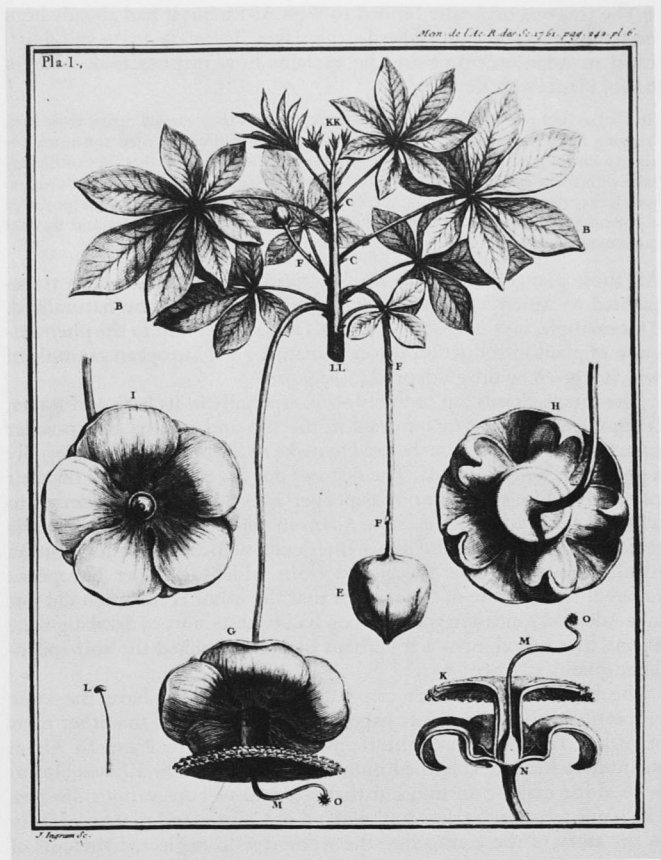


Fig. 28. Plate I of the baobab tree (*Adansonia digitata*), accompanying Adanson's account in the *Mémoires de l'Académie des Sciences* 1761 (published in 1763).

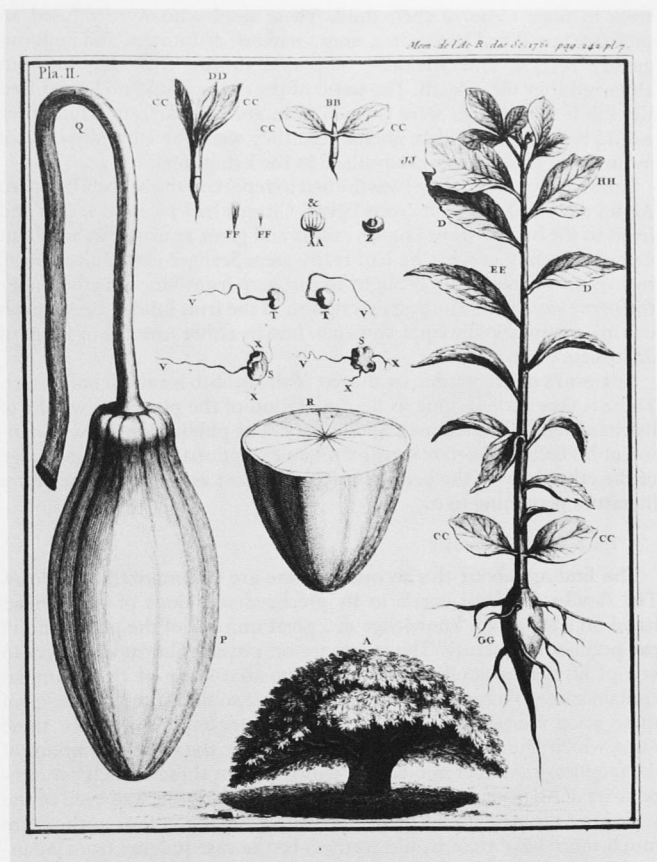


Fig. 29. Plate II of the baobab tree (*Adansonia digitata*), accompanying Adanson's account in the *Mémoires de l'Académie des Sciences* 1761 (published in 1763).

trees to bury some of their dead. These dead who were refused an ordinary burial had been poets, music-makers, drummers, and buffoons greatly revered and anxiously respected during their lifetime, but abhorred after their death. The water of the rivers would no longer feed the fish if their bodies were thrown in it, and the earth in which they would be buried would be enchanted: they were therefore disposed of in this way. Their bodies mummified in the living trees.

André Thevet (1503/4-1592) was the first to report on the baobab. Prospero Alpini described the fruit from Egypt. Clusius had received leaves and fruits of the baobab from English sailors and gives, as usual, an excellent description only of what he had really seen. Scaliger (*De subtilitate lib. 6*) reports on a baobab fruit brought to Antwerp from Moçambique under the name *guanabanus*. The best description of the fruit known to Adanson was in a manuscript by Lippi, shown to him by either Antoine or Bernard de Jussieu.

Adanson's monographic treatment of the baobab is a model of its sort. There is very little lacking in his description of the plant as a whole, of its characters, affinities, uses, and history. The publication shows Adanson at his best as a keen observer with an exceptionally good knowledge of the ethnology of the peoples using the plant as well as of the entire literature pertaining to it.

The Mallows: Summary

The findings about this second volume are summarized as follows. The *Familles des plantes* excels in its precise descriptions of the families based on a thorough knowledge of a great number of the plants and of the pertinent literature. The insistence on putting almost all genera in one of fifty-eight families was the reason that some of these families contain some extraneous elements, the more so since the knowledge of these *genera incertae sedis* was often very incomplete. Apart from these cases, which often are mentioned as exceptions, the circumscriptions of the families often does not differ essentially from those of such contemporaries of Adanson as Linnaeus and Bernard de Jussieu, and even of the younger Antoine-Laurent de Jussieu. The ideas of the four authors are much more alike than would seem to be the case judging from Adanson's comments in his first volume. Adanson's second volume surpasses the work of Linnaeus and Bernard de Jussieu in its descriptions and reasoned circumscriptions of the families based on essentially the same criteria as their fragmentary systems, presented without discussion.

Adanson's ideas of nomenclature were, alas, such that he never obtained a grasp on his contemporaries or on later authors: his insistence on the use of vernacular names as scientific ones resulted in a system of nomenclature which was too much out of step with the highly successful and practical Linnaean system. His sound but impracticable ideas of orthography kept others from reading the first volume. In the same way botanists were deterred from using the second volume and from accepting his names because of this erratic insistence on using all available names whether "barbaric" or not. Posterity has not been kind to Adanson; the sound ideas contained in the first volume were later professed by others and attributed to them, the sound elements of the taxonomy contained in his second volume were not recognized until it was too late to accept them in such a way that they could be attributed openly to him by using his names.

VI PUBLICATION AND REVIEWS

The two volumes of the *Familles des plantes* were published separately, the second in August, or perhaps in July, 1763, the first in the beginning of March, 1764.

Adanson made some annotations on the history of the publication of the *Familles des plantes* in a copy of this book now at the Paris *Muséum National d'Histoire Naturelle*, quoted by Chevalier (1934) and also reproduced in the so-called second edition of the book published in 1864.

On 14 November 1759 Adanson read a paper before the *Académie des Sciences*, giving an outline of his *Familles des plantes* (Margadant AD 263). On p. i of the first volume Adanson states that the book went at once to the printers. It is possible that the manuscript was sent to the printers as early as that, but the list of authors in the first volume contains on p. 30 references to several works published in 1762. Furthermore, several names are included from Linnaeus' *Species plantarum* 2nd ed. vol. 1, published in September 1762 and received in Paris by Bernard de Jussieu before 30 January 1763 (letter from Alströmer to Linnaeus, Fries 1909 p. 70). These new Linnaean names were obviously included later than September 1762.

Printing of the book was authorized on 1 September 1762 as may be seen in the text on the three unnumbered pages in the second volume inserted between page (24) and page 1. This authorization is an extract from the registers of the *Académie des Sciences* dated 1 September 1762 which runs as follows:

Messieurs de Jussieu and Le Monnier, physician, who had been appointed to examine a work by M. Adanson entitled *Famille* [sic] *des Plantes*, having made their report, the Academy has judged that work worthy of printing. To testify this I have signed the present certificate. Paris, 2 September 1762, Grand-jean de Fouchy, Perpetual secretary of the Royal Academy of Sciences.

The printing of this extract in the second volume proves that this volume was printed first. The *Académie Royale des Sciences* had been given the privilege of publishing its own communications, memoirs, and proceedings, as well as the works of its members. One of the terms of this privilege, given by the king, was that each work submitted for publication under the auspices of the Academy had to be examined by the Academy in order to judge whether it was worthy of publication. This privilege also meant that these publications were not submitted to a royal censor. Adanson himself was one of the royal censors from 1758 onward, under the general direction of de Lamoignon-Malesherbes, the director of the publishing trade, himself an ardent amateur botanist.

The book was ready in July or August 1763, according to a few contemporary reviews or notes in publishers' journals. The fact that it was the second volume, with the systematic treatment, that came out first must be responsible for the circumstance that the book was scarcely mentioned at the time of its publication: most journals awaited completion before reviewing the work. The *Catalogue hebdomadaire*, for instance, a weekly publication of lists of new books, mentions the *Familles des plantes* only in its number of 10 March 1764, announcing the two volumes at the same time.

The book-reviews, notes, and other data are the following:

VOLUME 2

1. 2 September 1762, latest date in volume (certificate).
2. 30 January 1763, letter Clas Alströmer to Linnaeus (Fries 1909, p. 69): "Adanson is quite a hard-working man. He is writing a new *systema naturale plantarum*, which is already printed. Only the preface is lacking."
3. June 1763, Adanson sends a copy to The Royal Society (see Nicolas, p. 47).
4. *Mercur de France* 1763 (Aug): III. Aug 1763 (approbation 31 juillet 1763).
5. *Journal encyclopédique*, Bouillon, 1763 (6): 144. 15 Sep 1763 (approbation 1 Oct 1763).
6. *Histoire de l'Académie Royale des Sciences* 1763: 33. 1766.

VOLUME I

7. *Catalogue hebdomadaire* 1764 (II): (I) (*sub art.* 3). 10 Mar 1764.
8. Manuscript note Adanson at Hunt Botanical Library dated 21 Mar 1764 that a review copy was sent on that day to the *Journal de Médecine*. At about the same time copies were sent to the *Gazette littéraire*, the *Mercur de France* and the *Journal de Verdun* (cf. Margadant AD 264).

9. *Journal encyclopédique*, Bouillon 1764 (4¹): 31. 15 Mai 1764 (approbation 30 Mai 1764), 1764 (4²): 57. 1 Jun 1764 (approbation 15 Jun 1764).
10. *Göttingische Anzeigen von gelehrten Sachen* 1764 (2): 843. 1 Sep 1764; 862. 3 Sep 1764.
11. *L'Année littéraire*, Fréron, 1764 (2⁵): 318-333. 1764 (Nov-Dec).
12. *Mercure de France* 1764 Jun 1764 [not seen].
13. In a letter dated 21 May 1764 to Linnaeus (cf. Fries 1909, p. 106, note) Friedrich Charles Baer (1759-1797) announces sending a copy of the *Familles des plantes* which he had bought on behalf of Linnaeus.

The publication of the second volume can be dated as either July or August 1763. The review in the August number of *Mercure de France* was read by the censor Guiroy on 31 July 1763, which implies that one copy at least must have been ready by that time. We do not know whether the copy sent to The Royal Society was a complete one, and it is also unknown whether any other copies were available in June or July. The next review is that in the *Journal encyclopédique* for 15 September, published after 1 October 1763. The previous number of the *Journal encyclopédique* gave news from Paris dated 12 September 1763, so either the journal was slow in reporting publication or the review copy was sent rather late. It seems best to deduce from these two data that the book was available to the public in August and perhaps already in July. This is of importance with respect to the publication of the second part of Linnaeus' *Species plantarum* 2nd ed., which is usually considered to have taken place in July 1763. The Linnaean book would then just have priority, although this is by no means certain.

The *Mercure de France* note mentions the publication of the second volume in advance of the first because "M. Adanson felt he had to comply with the request made to him to have at least what one can call the practical part of the Science during the botany course at the Royal Garden." A short note follows stating that the essence of Adanson's method is to take the system from nature itself. The botany course of 1763 had been started on Monday 6 June by Le Monnier, the regular professor of botany. These lessons were given each morning at six o'clock except on Wednesdays when Bernard de Jussieu took the students out in the field. Adanson himself never taught botany at the Jardin du Roi although in 1771-1774 he gave public courses, but in natural history, not at the garden (cf. Nicolas, p. 65). In the absence of a good taxonomic textbook Le Monnier may well have used Adanson's book, although this is doubtful. The announcement of the botany course in *L'Avant-coureur* (1763, no. 24, on p. 372) speaks only of the Tournefortian and Linnaean systems. The editor of the journal comments in a footnote that there

is an excellent natural classification followed by de Jussieu in the Trianon garden.

The announcement in the *Journal encyclopédique* of 1763 is similarly short. The same phrase as in the *Mercur de France* is used to explain why the second volume comes first: probably Adanson himself supplied the text for these notes.

When the first volume was ready in March 1764, Adanson provided the review copies with an abstract made by himself. A manuscript note of this abstract is among his papers at the Hunt Botanical Library (cf. Margadant AD 263). The abstract was sent with the excuse that it was only his "intention to spare you the trouble to read two such thick volumes." The *Année littéraire*, for instance, published parts of this abstract and added a comment on the orthography: "the ideas themselves are not new, they have been proposed long ago, and been fought against and destroyed. The Abbé de Saint-Pierre, M. Duclos, M. de Voltaire, and some others have preceded M. Adanson."

The full review of the book in the *Journal encyclopédique* also starts with a critical note on the orthography, but the anonymous reviewer is rather mild and quotes Cardinal Pietro Bembo (1470-1547) of whom it was said that he never read the Bible because he was afraid of spoiling his Ciceronian Latin. This is perhaps the most elegant excuse ever made for not reading Adanson. However, the review of the book itself is very favorable and independent-minded and speaks of an "excellent work." The German review, however, in the *Göttingische Anzeigen* is very critical, perhaps because Adanson had erroneously put the Göttingen botanic garden under Prussia. The list of botanical publications is said to be very incomplete and Adanson's judgment on the qualities of many of the botanical illustrations is not shared by the reviewer.

VII THE FAMILLES DES PLANTES: ITS FATE

The reception of the *Familles des plantes* by Adanson's contemporaries may appear somewhat reserved. We have seen that only a few reviews were published and that some of them were just mere repetitions of the prefabricated review submitted by Adanson himself. We should not conclude from this that the book was ignored from the beginning: the treatment was about the same as that given, for example, to the second edition of Linnaeus' *Species plantarum*, the second part of which appeared almost simultaneously with Adanson's second volume. There was not yet an established custom of widespread reviewing of botanical books

and most reviews appeared in journals of a very general character: *Mercure de France*, *Année littéraire*, *Journal encyclopédique*. Even the learned journals were very general: *Journal des sçavans*, *Göttingische Anzeigen von gelehrten Sachen*: there were no exclusively botanical journals yet. The first of them, Römer et Usteri's *Magazin für die Botanik*, appeared in 1787. The reception of the book left not much to complain of, but its subsequent history was one of disappointment for Adanson during the remaining forty-three years of his life. The neglect started with the bibliography of natural history publications pertaining mainly to France and its overseas territories, posthumously published in 1771 by Louis-Antoine-Prosper Hérissant (1745-1769). This important bibliography mentions only Adanson's meteorological tables, published in the *Journal de Médecine* (1756-1766), but ignores his natural history of Sénégal and his *Familles*; through ignorance or intentionally? From the account given by J.-P. Nicolas in this volume it can be seen that Adanson received due recognition as a scientist, soon after his return from Senegal, by election to membership in the Academy of Sciences in 1759. The road to a really influential career, however, was closed to him in 1758, when Le Monnier was appointed successor to Antoine de Jussieu as professor of botany at the Jardin du Roi with Bernard de Jussieu remaining second-in-command as sous-démonstrateur. Le Monnier kept this position until 1785, when it was given to R.-L. Desfontaines. Bernard de Jussieu, who died in 1774, was succeeded by his nephew Antoine-Laurent in 1779. The group of scientists at the Jardin du Roi formed a very influential group and the fate of the *Familles des plantes* would have been different had Adanson been appointed to one of those posts.

The development of the natural system was clearly started by Adanson: he was the first who laid down rules for it. Several attempts had been made before him but the principles had never been clearly expounded. Since Adanson published very little after 1763, it fell to others to develop these ideas and to bring the natural system to a greater perfection. The main rôle in this process was played by Antoine-Laurent de Jussieu, a great botanist, whose greatness, however, never led him to appreciate publicly Adanson's contribution. On the contrary, in later years Adanson's work was consistently ignored by him.

Bernard de Jussieu had dictated his Trianon system in April 1759 to Claude Richard (1705-1784), the gardener at the Trianon, to M. de Bombarde, the wealthy amateur-botanist, and to Adanson. This system was used for the actual arrangement of the plants in the garden; it was not published, as we have seen, until 1789 by A.-L. de Jussieu in his *Genera*

plantarum, and later on pp. 36-39 of the second edition of Adanson's *Familles des plantes*. The system as presented was an enumeration of generic names divided over sixty-five *ordines naturales* without descriptions. We have seen in our treatment of Adanson's *Malvæ* that the natural units of Bernard de Jussieu, of Linnaeus, and of Adanson agree in many respects but that Adanson was the only one of the three authors to give full monographic treatment instead of an enumeration.

Antoine-Laurent de Jussieu was a pupil of his uncle Bernard de Jussieu. In his publication on the *Renoncules* of 1777, A.-L. de Jussieu discusses the principles of natural classification and refers to his three predecessors, Linnaeus, Adanson, and his uncle, with equal respect. The publication by A.-L. de Jussieu on the *Ranunculaceæ* as a family can be compared with Adanson's paper on the baobab and the *Malvaceæ* of 1763: both authors give a treatment of one particular family as a forerunner to their later general publication. In this 1777 publication de Jussieu follows Adanson's terminology and speaks of the family of the *Ranunculi*. He cites the treatment by Adanson with approval and points out, for example, that Adanson had very appropriately compared the nectaries of *Helleborus* with the petals of *Ranunculus*. Adanson, in his report to the Academy on this article (cf. Hamy 1909 p. 62) praised it in general, but carefully pointed out the difference in the methods followed by A.-L. de Jussieu and himself. In this paper de Jussieu clearly states the principle of subordination of characters. We have seen that Adanson applied this principle in practice and *a posteriori* but that he was more concerned with what he called the *génie* of each family, in other words the particular combination of certain characters which led him to circumscribe the families. Adanson certainly attributed different weight to the characters, but he pointed out more especially that a character that might be important for one family could be irrelevant for the circumscription of another. A.-L. de Jussieu stated explicitly that some characters were more important for classification than others. In his paper of 1774 (publ. 1778) he developed these ideas fully in an account of the principles used by him in a new arrangement of the plants in the Jardin du Roi. Adanson is mentioned only incidentally and his system is condemned in a general phrase in which A.-L. de Jussieu states that his uncle's Trianon system was more natural than the methods that had hitherto (1774) been published.

Adanson has fifty-eight families which he considers to represent the fundamental lines of separation in nature. If we refrain from taking into account the cryptogams, so imperfectly known at his time, we find that

Adanson's families can still be recognized in our present systems.

A.-L. de Jussieu, however, constructed above his families fourteen classes (fifteen in 1789) according to the system given in Fig. 30 which is taken from his 1774 publication. His families show many affinities with those of his uncle and of Adanson and are equally recognizable in our present systems. Aside from the cryptogams, we find that traces of his remaining thirteen classes are difficult to find in modern classifications. The difference between Monocotyledones and Dicotyledones (introduced by Ray) is still a regular feature of modern systems, but not all authors agree that the Monocotyledones are a natural group.

It is a pity that A.-L. de Jussieu, in his *Genera plantarum* of 1789, pays no tribute at all to Adanson's work on the family level. It is understandable that the nephew wanted to pay tribute to his uncle and teacher, but why not also to the fundamental work by Adanson? The latter was then alive and active at the sessions of the Academy. His acrimonious remarks may not have made him popular, but his book had been duly published, so why ignore it? In subsequent years Adanson's work was completely obscured by de Jussieu's far more successful *Genera plantarum*. This excellent

ACOTYLÉDONES.....		1.
MONOCOTYLÉDONES.		
{ Étamines attachées au support.....		2.
{ au calice.....		3.
{ sur le pistil.....		4.
DICOTYLÉDONES.		
{ Apétales {	Étamines attachées au calice.....	5.
	au support.....	6.
{ Monopétales {	corolle attachée au support.....	7.
	au calice.....	8.
	sur le pistil {	anthères réunies 9.
		distinctes 10.
{ Polypétales. {	Étamines & corolle attachées sur le pistil.	11.
	au support.	12.
	au calice..	13.
{ Irrégulières, étamines séparées du pistil.....		14.

Fig. 30. Facsimile of A.-L. de Jussieu's delineation of his fourteen classes of plants. Reproduced from *Mémoires de l'Académie des Sciences* 1774: p. 190. 1778.

book deserves all the fame it has: it is clear, the descriptions are concise, and the knowledge shown is impressive. The excellence of this work, however, should not devalue that of Adanson, which is what happened. In his later publications A.-L. de Jussieu rarely mentioned Adanson, and for many generations he and his uncle were regarded as the real founders of natural classification.

A.-P. De Candolle in his *Théorie élémentaire de la botanique* (1813) was the first to put forward the idea of a pseudostatistical Adanson. We have seen that A.-L. de Jussieu very appropriately distinguished between primitive or essential characters as adopted by him and characters with a variable degree of universality as adopted by Adanson. De Candolle, however, states that Adanson thought that the plants that were placed near each other in the greatest number of systems showed the greatest natural affinity. It is only a subtle difference perhaps, but Adanson did not say so. He used these systems as a basic documentation to draw up his families, he insisted that all characters should be considered, but the practical result of his comparison shows that he did not base his families on statistical research. De Candolle realized this also and concluded his paragraph on Adanson by saying correctly "One must nevertheless recognize that the families that he has indicated, but that he has perhaps formed just as much by way of grouping as by his own method, are in general avowed by nature and worthy of the attention of the observers."

Later authors have often stressed De Candolle's first words on the numerical nature of Adanson's method, but rarely the last paragraph in which he acknowledges the natural character of Adanson's families. One of the most influential publications in this respect was the article on Taxonomie by the youngest botanist of the de Jussieu family, Adrien (1797-1853), in d'Orbigny's *Dictionnaire universel d'histoire naturelle* (1848). Adrien de Jussieu speaks of "an arithmetical method" and of Adanson's "calculations," thus providing the definite basis for the story of the pseudostatistical Adanson.

One of the first authors to pay tribute to Adanson's achievements was Cuvier (1807) who, in his *éloge historique* of Adanson read before the *Académie des Sciences* on 5 January 1807, gave an excellent outline of Adanson's importance for plant taxonomy. He discusses Adanson's method with a good feeling for shades of meaning but again lays too much stress on the difference in approach between Adanson and de Jussieu, a difference which was negligible at the family level. He points out the affinities between Bernard de Jussieu and Adanson and cites as the latter's im-

provements over the system of the former, for instance, the establishment of the "family" of the hepatics, the close relationship between the *Campanulaceae* and the *Compositae*, and his disentanglement of the *Nyctaginaceae* from the *Amaranthaceae*.

A second revised edition of the *Familles des plantes* was published in 1864 (title-page date is 1847) by Alexandre Adanson and Jean-Baptiste Payer (1818-1860) under the title *Familles naturelles des plantes de Michel Adanson* with the subtitle *Histoire de la botanique et plan des familles naturelles des plantes de M. Adanson, seconde édition préparée par l'auteur et publiée sur ses manuscrits par MM Alexandre Adanson et J. Payer*. This new edition contains many of the manuscript notes made by Adanson on his book after 1763. The second edition remained practically unnoticed and is now often more difficult to find than the 1763 original. An extensive review of it was published by D. F. L. von Schlechtendal in 1866.

Recognition of Adanson's achievements by a modern botanist came with Henri Baillon (1827-1895) in 1876 who speaks of him in the preface to his *Dictionnaire des plantes* (vol. 1), as follows:

The more I read his work again and especially the first part of his *Familles des plantes*, the more I consider Adanson the greatest botanist of our country, comparable to the giant baobab which he studied with predilection, which received his name and which is the colossus of the vegetable world.

Baillon points out that Adanson was a lonely man without a family heritage, or pupils and followers, to spread his ideas and he contrasts this with the enormous advantages of the dynasty of the de Jussieu.

When Otto Kuntze started his nomenclatural purge in the eightennineties he soon discovered that many of Adanson's names had priority over well-established but considerably later names of more "accepted" authors. This was true, not only on the family level, for many of Adanson's generic names would have to be taken up if the principle of priority was strictly applied. The list of *nomina generica conservanda et rejicienda* incorporated in the Code was a defense against Otto Kuntze's rigorous application of the rules of nomenclature. We have already pointed out that Adanson is second only to Rafinesque as far as the number of his rejected names is concerned: rather late tribute to his keen taxonomic judgment.

The twentieth century has brought more recognition for Adanson's *Familles des plantes*. The first author with an unbiased view on Adanson in this century was Edward Lee Greene (1842-1915) who, in his *Landmarks of botanical history* (1909 p. 16), devoted some enlightening appraisals of him.

Adanson appears to have realized that no one part of botany is alienable from any other part; that the history of a part of it can not be written as disconnected from that of the other parts; and therefore, connectedly with the presentation of whatever had been done before his time towards a natural correlating or grouping of genera, he brings into view not only that line, but others along which botany has made progress; paying due respect to every kind of effort that makes for a fuller knowledge of the plant world.

Greene's praise for Adanson as a true historian of botany is great; neither Sprengel (1807-08) nor Sachs (1875) had the breadth of view that Adanson possessed, and the fundamentally sound approach to the history of botany through (1) the history of the grouping of genera as classes or families, (2) the history of accepted criteria of affinity, (3) the progress in discovery of new types, and (4) the development of phytography and its terminology. Since Greene, several authors have dutifully given some space to Adanson in their books on the history of botany, but none of them has pointed out so clearly the great importance of the *préface istorique*, in which Adanson laid a foundation for the history of the ideas and methods of botanical classification as well as for the natural system of classification itself.

Contemporary authors who have discussed the great merits of Adanson's work and who have given him credit for the development of the natural classification as well as for his views on the variability of species are Auguste Chevalier, mainly in his biography of Adanson (1934), and more recently in a very elegant way René Guyénot in his *Les sciences de la vie au XVII^e et XVIII^e siècles* of 1941. Dughi (1957), Cain (1958), and Gilmour (1962) have stressed the methodological and philosophical soundness of Adanson's "natural method."

Recognition in Paris came late: the *Botanische Zeitung* of 1856 (14: 832) contains a short note saying that a marble bust of Adanson had been placed in the botanic garden in Paris. This marble bust can now be seen in the Laboratoire de Phanérogamie, a department of the *Muséum National d'Histoire Naturelle*. This institution, from which Adanson was kept away so consistently during his life, now houses the important Adanson herbarium (since 1924), and it recognizes Adanson's importance in the title of one of its periodicals: *Adansonia*.

ACKNOWLEDGEMENTS

Many colleagues helped me with the compilation of the material for this article or with the writing of it. Among them three should be mentioned in the first instance: H. W. Rickett and J. S. L. Gilmour with

whom I discussed Adanson's methods and who, as so often, took great care to safeguard the interests of the English language, and G. H. M. Lawrence who provided me with many documents, especially the illustrations, and who is responsible for the final editing. I thank my co-authors of this volume, J.-P. Nicolas and W. D. Margadant, for the many valuable items of information on Adanson and his literary heritage as preserved at the Hunt Botanical Library. The director of the Biohistorical Institute at Utrecht, F. Verdoorn, kindly put at my disposal his library and the ample documentation on Adanson brought together in his Index Botanicorum files. B. Peterson of Lund and Miss Adelaide Stork of Stockholm helped me with the translation of some Swedish texts and so did K. Sneyders de Vogel of Utrecht with some Latin phrases. I furthermore express my sincere thanks to all staff members of the Hunt Botanical Library, at Pittsburgh, and of the Biohistorical Institute, the University Library, and the Botanical Museum at Utrecht who helped me in many ways.

REFERENCES

- ACOSTA, C.—*Tractado de las drogas y medicinas de las Indias orientales* Burgos 1578 (orig. edit. not seen; consulted ital. transl. *Trattato etc.* Venice 1585; latin transl. e.g. in Clusius, *Exot. libri decem* 1605).
- ADAM, J. G.—Le Baobab (*Adansonia digitata* L.). *Notes Africaines* 94: 33-44. 1962
- ADANSON, M.—Description d'un arbre d'un nouveau genre, appelé Baobab, observé au Sénégal. *Hist. Acad. Sci. Paris* 1761: 77-85. 1763
- . Description d'un arbre d'un nouveau genre, appelé Baobab, observé au Sénégal. *Mém. Acad. Sci. Paris* 1761: 218-243. 1763
- . Examen de la question: si les espèces changent parmi les plantes; nouvelles expériences tentées à ce sujet. *Mém. Acad. Sci. Paris* 1769: 31-48. 1772
- . Plan et tableau de mes ouvrages manuscrits et en figures, etc. *Obs. Phys. Hist. Nat. Arts* 5: 257. 1775
- ALEMBERT, [JEAN LE ROND] D' et DIDEROT, D.—*Encyclopédie, ou dictionnaire raisonné des sciences et des arts; par une Société de Gens de Lettres* 35 vols. Paris et Neuf-Châtel. 1751-1780
- ALLIONI, C.—*Synopsis methodica stirpium horti taurinensis* Torino. 1760
- ALPINI, P.—*De plantis Aegypti liber* Venice. 1592

- AMMAN, J.—Quinque nova plantarum genera. *Comm. Acad. Sci. Petrop.* 8: 211-219. 1741
- ARBER, A.—*Herbals*. Ed. 2. Cambridge. 1938
- ATKINSON, G.—*Les relations des voyages du xviii^e siècle et l'évolution des idées* n.p. 1924 (n.v.)
- AVICENNA [IBN SINA]—*Canonis medicinae libri 1-5*, trad. lat. Gerardus Cremonensis, editio princeps. Strasbourg, ante 1473 (printer Adolf Rusch); Gesamtkatalog Wiegendruck (GKW) no. 3114.
- BAILLON, H.—*Dictionnaire de botanique* Vol. 1. Paris. 1876
- BARRELIER, J.—*Plantae per Galliam, Hispaniam et Italiam observatae* Paris. 1714
- BASSI, F.—De Ambrosina novo plantae genere. *Comm. Acad. Bonon., Opusc.* 5(1): 82-86. 1767
- BATHER, F. A.—Biological classification: past and future. *Quart. Journ. Geol. Soc. London* 83: lxii-civ. 1928
- BAUHIN, C.—*Phytopynax seu enumeratio plantarum ab herbariis nostro saeculo descriptarum*, etc. Basel. 1596
- . *Prodromos theatri botanici* Basel. 1620, ed. 2. 1671
- . *Pinax theatri botanici* Basel. 1623; ed. 2. 1671
- BAUHIN, J. et CHERLER, J. H.—*Historia plantarum universalis* vol. 1. Ebroduni (Yverdon). 1650
- BECKER, G.—Isagoge in rem herbarium [auct. Tournefort], traduit du Latin. In Becker et al., *Tournefort* Paris. 1957, pp. 239-306
- BECKER, G. et al.—*Tournefort* Paris. 1957
- BERTIN, LÉON et al.—*Bvffon* Paris. 1952
- BIDAL, A.-M.—Inventaire des Archives du Muséum National d'Histoire naturelle, première partie, série A.: Archives du Jardin du Roi. *Archives du Muséum sér.* 6. 11: 175-230. 1934
- BOCK, H. ("Tragus")—*New Kreutterbuch* Strasbourg. 1539 (n.v.)
- . *Kreuterbuch* Strasbourg. 1546
- BOERHAAVE, H.—*Index plantarum quae in horto academico lugduno batavo reperiuntur* Leiden. 1710

- BOERMAN, A. J.—*Carolus Linnaeus als middelbaar tussen Nederland en Zweden* Utrecht. 1953
- . *Carolus Linnaeus, a psychological study.* *Taxon* 2: 145-156. 1953
- BOURDIER, F.—Principaux aspects de la vie et de l'oeuvre de Buffon. In L. Bertin et al. *Buffon* Paris. 1952
- BREMEKAMP, C. E. B.—A re-examination of Cesalpino's classification. *Acta Bot. Neerl.* 1(4): 580-593. 1953
- . Linné's significance for the development of phytography. *Taxon* 2: 47-54. 1953
- . Linné's views on the hierarchy of the taxonomic groups. *Acta Bot. Neerl.* 2(2): 242-253. 1953 (*Meded. Bot. Mus. Utr.* no. 117)
- . The various aspects of biology. *Verh. Kon. Ned. Akad. Wet. Afd. Natuurk.* ser. 2. 54(2): 1-199. 1962
- BRUNFELS, O.—*Herbarium vivae eicones* 3 vols. v. 1, Strasbourg. 1530; (repr. 1532, 1539); v. 2, 1531 (repr. 1536); v. 3, 1536.
- BRYK, F.—Linné und die Species plantarum. *Taxon* 2: 63-73. 1953.
- . Bibliographia Linnaeana ad Species plantarum pertinens. *Taxon* 2: 74-84. 1953
- . Promiskuität der Gattungen als artbildender Faktor. *Taxon* 3: 165-173. 1954
- BUC'HOZ, P.-J.—*Traité historique des plantes qui croissent dans la Lorraine et les trois Evêchés* Vol. 2. Nancy. 1763
- . *Liste chronologique des ouvrages publiés par M. Buc'hoz.* Nancy. n.d. [1787]
- BUFFON, G. L. LECLERQ DE—*Histoire naturelle, générale et particulière, avec la description du Cabinet du Roi* Vol. 1, Paris 1749; vol. 4, Paris 1753; vol. 10, Paris 1763.
- BULLOCK, A. A.—*Indicis nominum familiarum angiospermarum prodromus.* *Taxon* 7(1): 1-35. 1958.
- BULTINGAIRE, L.—Michel Adanson. In J. Balteau et al., *Dict. Biogr. Franç.* 1: 505. 1933
- BURMAN, J.—*Thesaurus zeylanicus* Amsterdam. 1737
- BUXBAUM, J. C.—*Plantarum minus cognitarum centuriae complectens plantas circa Byzantium et in Oriente observatas* Cent. 5, St. Petersburg. 1728-40 (n.v.).
- CAIN, A. J.—Logic and memory in Linnaeus's system of taxonomy. *Proc. Linn. Soc. London* 169: 144-163. 1958

- . Deductive and inductive methods in post-linnaean taxonomy. *Proc. Linn. Soc. London* 170(2): 185-217. 1959
- CANDOLLE, A.-P. DE—*Théorie élémentaire de la botanique* Paris. 1813; ed. 2. Paris. 1819
- CAP, P. A.—*Le Muséum d'Histoire Naturelle* Paris. 1854
- CASSIRER, E.—*The philosophy of the enlightenment*. Translated by Fritz C. A. Koelln and James P. Pettegrove. Princeton. 1951
- CATESBY, M.—*The natural history of Carolina, Florida and the Bahama Islands. Histoire naturelle de la Caroline, la Floride, & les Isles Bahama* London. 1731-1743; ed. 2. 1754
- CESALPINO, A.—*De plantis libri XVI* Florence. 1583
- CHEVALIER, A.—Adanson mutationniste et évolutioniste. *C.R. Acad. Sci. Paris* 197: 789. 1933
- . *Michel Adanson* Paris. 1934
- CLUSIUS, C. (CHARLES DE L'ESCLUSE)—*Rariorum aliquot stirpium per hispanias observatarum historia* Antwerpen. 1576
- . *Exoticorum libri decem* Antwerpen. 1605
- COBBAN, A.—*A history of modern France* Vol. 1: 1715-1799. Harmondsworth. 1957
- CUVIER, G.—Éloge historique de Michel Adanson. *Mém. Cl. Sci. Math. Phys. Inst. Nat. France* 7(1): 159-188. 1807. (Translated as, Biographical Memoir of Michel Adanson, *Edinb. New Phil. Journ.* 1827 (Apr.-Jul.): 1-21.)
- DALECHAMPS, J.—*Historia generalis plantarum in libros XVIII per certas classes arteficiose digesta, etc.* Lyon. 1587
- DALLA TORRE, C. G. DE et HARMS, H.—*Genera siphonogamarum* Leipzig. 1900-1907
- DAVY DE VIRVILLE, A. D.—*Histoire de la botanique en France* Paris. 1954
- DESCARTES, R.—*Discours de la méthode pour bien conduire sa raison, et chercher la vérité dans les sciences* Leiden. 1637 (n.v.); (ed. holl. Amsterdam 1937).
- DIDEROT, D.—see ALEMBERT
- DILLEN, J. J. (DILLENIUS, J. J.)—*Hortus Elthamensis* London. 1732
- . *Historia muscorum* Oxford. 1741

- DIOSCORIDES, P.—*Libri diascorides dicti [de materia medica libri V]* Medemblik. 1478 (Pritzel 2299, n.v.) (Adanson probably used the 1614 Frankfurt edition)
(See also sub Gunther)
- DODOENS, R.—*Histoire des plantes* Antwerpen. 1557
- . *Stirpium historiae pemptades sex, sive libri XXX* Antwerpen. 1583
- DUCHESNE, A.-N.—*Essai sur l'histoire naturelle des fraisiers*. Extrait de l'Encyclopédie méthodique, par M. le Chevalier de la Marck. Paris. 1766
- DUGHY, R.—Tournefort dans l'histoire de la botanique, in Becker et al. 1957, pp. 131-185
- DUHAMEL DU MONCEAU, H.-L.—*Traité des arbres et arbustes qui se cultivent en France* 2 vols. Paris. 1755
- DUPRAT, G.—Les manuscrits de Tournefort, conservés au Muséum national d'histoire naturelle. In G. Becker et al., *Tournefort* pp. 207-238. Paris. 1957
- EDLIN, H. L.—A critical revision of certain taxonomic groups of the Malvales. *New Phytologist* 34: 1-20, 122-143. (Feb-May) 1935
- EHRET, G. D.—*Plantae et papilionae rariores* London. 1748-1759
- FEE, A.-L.-A.—*Vie de Linné* Paris. 1832
- FRANÇOIS, YVES—Buffon au Jardin du Roi (1739-1788). In L. Bertin et al., *Buffon*. Paris. 1952
- FRIES, TH. M.—*Bref och Skrifvelser af och till Carl von Linné* afd. 1. del III. Stockholm. 1909
- . *idem* del V. Stockholm. 1911
- . *idem* del VI. Stockholm. 1912
- FRIES, TH. M. och HULTH, J. M.—*Bref och Skrifvelser af och till Carl von Linné* afd. 1. del VII. Upsala/Berlin. 1917
- GAZA, TH.—*Theophrasti de historia et de causis plantarum libros ut latinos legeremus* Treviso 1483; Amsterdam edition 1644 (Pritzel 9197)
- GERARD, J.—*The herball or generall historie of plantes* London. 1597
- GESNER, C.—*Opera botanica* vol. 3. Nürnberg. 1753 (n.v.)

- . *Bibliotheca Instituta et collecta primum a Conrado Gesnero, deinde in epitomen redacta et novorum librorum accessione locupletata, iam vero postremo recognita, et in duplum post priores editiones aucta, per Josiam Simler um Tugurinum*. Zurich. 1574 [Note: It is unknown to me which edition of this book was quoted by Adanson]
- GILMOUR, J. S. L.—Taxonomy and philosophy. In Julian Huxley (ed.), *The new systematics* Oxford. 1940
- . Taxonomy. In MacLeod, Anna M. and Copley, L. S. *Contemporary botanical thought* Edinburgh and London. 1961, pp. 27-45
- GISEKE, P. D.—*Caroli a Linné praelectiones in ordines naturales plantarum* Hamburg. 1792
- GRAS, A.—Note sur l'histoire du genre *Bassia*. *Bull. Soc. Bot. Fr.* 11: 71-83. 1864
- GREENE, E. L.—*Landmarks of botanical history* Washington. 1909
- GUNTHER, R. T.—*The Greek herbal of Dioscorides* Oxford. 1934
- GUYÉNOT, É.—*Les sciences de la vie aux XVIIe et XVIIIe siècles* Paris. 1941
- HALLER, A. VON—*Enumeratio methodica stirpium helvetiae indigenarum* 2 vols. Goettingen. 1742
- . *Enumeratio plantarum horti regii et agri gottingensis aucta et emendata* Goettingen. 1753
- HAMY, E.-T.—*Les débuts de Lamarck* Paris. 1909
- HEILBRUN, G.—Essai de bibliographie. In L. Bertin et al., *Bvffon* Paris. 1952
- HEISTER, L.—*Systema plantarum generale ex fructificatione, cui annectuntur regulae ejusdem de nominibus plantarum a cel. Linnaei longe diversae* Helmstedt. 1748 (n.v.)
- HÉRISSANT, L.-A.-P.—*Bibliothèque physique de la France* Paris. 1771
- HERMANN, P.—*Florae lugduno-batavae flores sive enumeratio stirpium horti lugduno-batavi methodo naturae vestigiis insistente dispositarum* Leiden. 1690
- . *Musaeum zeylanicum* Leiden. 1717; ed. 2. 1726
- HORT, A.—*Theophrastus' Enquiry into plants, with an English translation* 2 vols. London/New York. 1916
- . *The "Critica botanica" of Linnaeus* London. 1938
- HULTH, J. M.—*Bref och skifvelser af och till Carol von Linné* afd. 2. del 1. Uppsala/Berlin. 1917

- HULTH, J. M. och UGGLA, A. Hj.—*idem*, afd. 2. del 2. Uppsala. 1943
- H. . . . , F.—Adanson. In Hoefler, *Nouv. Biogr. Gén.* 1: 249. 1855
- ISNARD, DANTY D'—Etablissement d'un nouveau genre de plante que je nomme *Monospermalthaea*. *Mém. Acad. Sci. Paris* 1721: 277-284. 1723
- JACQUIN, N. J. VON—*Enumeratio stirpium plerarumque quae sponte crescunt in agro Vindobonensi, montibusque confinibus* Wien. 1762
- . *Selectarum stirpium americanarum historia* Wien. 1763
- JANSEN, A.—*Jean-Jacques Rousseau als Botaniker* Berlin. 1885
- JESSEN, K. F. W.—*Botanik der Gegenwart und Vorzeit* Leipzig. 1864
- JUNG, J.—*Isagoge phytoscopica, ut ab ihso privatis in collegiis auditoribus solita fuit tradi* Hamburg. 1678 (n.v.)
- JUSSIEU, ADR. DE—Taxonomie. In D'Orbigny, *Dictionnaire universel d'histoire naturelle* 12: 368-431. 1848
- JUSSIEU, A.-L. DE—*Genera plantarum* Paris. 1789
- . Notice historique sur le Muséum d'Histoire Naturelle. *Ann. Mus. Nat. Hist. Nat.* 1: 1-14. 1802
- JUSSIEU, B. DE—Ordines naturales in Ludovici XV horto Trianonensi dispositi, anno 1759. In A.-L. de Jussieu, *Genera plantarum*, pp. lxxij-lxx Paris. 1789
- KAEMPFER, E.—*Amoenitatum exoticarum politico-physico-mediciarum fasciculi V Lemgoviae [Lemgo]*. 1712
- KNAUT, CHR.—*Methodus plantarum genuina, qua notae characteristicae seu differentiae genericae tam summae quam subalternae ordine digeruntur et per tabulas quas vocant synopticas per spicue delineantur* Leipzig/Halle. 1716
- KOELREUTER, J. G.—*Fortsetzung der vorläufigen Nachricht von einigen des Geschlecht der Pflanzen betreffenden Versuchen und Beobachtungen* Leipzig. 1763
- KUNTZE, C. E. O.—*Revisio generum plantarum* 2 vols. Leipzig. 1891, 1893/98
- LACROIX, A.—*Figures des Savants* tome IV. Paris. 1938
- LAMBERT, ? —*Bibliothèque de physique et d'histoire naturelle* vol. 1. Paris. 1758 (n.v.)

- LANJOUW, J. et UITTEN, H.—Un nouvel herbier de Fusée Aublet découvert en France. *Rec. Trav. Bot. Néerl.* 37: 133-170. 1940 (also *Meded. Bot. Mus. Utrecht* no. 75)
- LAWRENCE, G. H. M.—*Taxonomy of vascular plants* New York. 1951
- LE BRAS, M.—Descartes. In *Grand Larousse Encyclopédique* 4: 954. 1960
- LE JOYAND—Notices sur Michel Adanson. *Mag. Enc.* 1806(5): 392-414
- LERICHE, A.—Autour du mot Baobab. *Notes Africaines* 63: 89. 1954
- LEROY, J. F.—Baobab. In *Grand Larousse Encyclopédique* 1: 894. 1960
- . Tournefort et la classification végétale. In G. Becker *et al.*, *Tournefort*, pp. 187-206. Paris. 1957
- LINNAEUS, C.—*Hortus cliffortianus* Amsterdam. 1737
- . *Classes plantarum* Leiden. 1738
- . *Genera plantarum* ed. 3, Paris. 1743; ed. 5, Stockholm. 1754; ed. 6, Stockholm. 1764 (also Vienna 1767)
- . *Philosophia botanica* Stockholm. 1751 (ed. 2, cur. J. G. Gleditsch, Berlin. 1780; for a French translation see Quesné).
- . *Species plantarum* 2 vols. Stockholm. 1753; ed. 2, 2 vols. Stockholm. 1762/63.
- . *Systema naturae* ed. 10, vol. 2. Stockholm. 1759
- LITTRÉ, M. É.—*Histoire naturelle de Pline* 2 vols. Paris. 1877
- L'OBEL, M. DE—*Plantarum seu stirpium historia* Antwerpen. 1576
- . *Plantarum seu stirpium icones* Antwerpen. 1581
- . *Kruidtboek* Antwerpen. 1581
- LONITZER, A.—*Naturalis historiae* 2 vols. Frankfurt. 1551, 1555; reissued 1565 as *Botanicon*; consulted by Adanson in a Frankfurt edition of 1713 (n.v.) (=Kreuterbuch, ed. Ulm 1713?)
- LOVEJOY, A. O.—*Essays in the history of ideas* Baltimore. 1948
- LUDWIG, CHR. G.—*Definitiones generum plantarum in usum auditorum* Leipzig. 1737; auctae et emendatae, Leipzig. 1747

- MAGNOL, P.—*Prodromus historiae generalis plantarum in quo familiae plantarum per tabulas disponuntur* Montpellier. 1689
- . *Novus character plantarum in duos tractatus divisus* Montpellier. 1720 (n.v.)
- MANSFELD, R.—Über "alte" und "neue" Systematik des Pflanzen. *Die Kulturpflanze Beiheft* 3: 26-46. 1962
- MARCHANT, J.—Observations sur la nature des plantes. *Mém. Acad. Sci. Paris* 1719: 59-66 pl. 6 et 7; etiam vide *Hist. Acad. Sc. Paris* 1719: 57-58
- MARTIN, K.—*French liberal thought in the eighteenth century* ed. 2, by J. P. Mayer. London. 1962
- MAUNY, R.—Baobabs—Cimetières a griots. *Notes Africaines* 67: 72-75. (July) 1955
- MERRILL, E. D.—A commentary on Loureiro's Flora cochinchinensis. *Trans. Am. Philos. Soc.* ser. 2. 24(2): 1-403. 1935
- MITCHELL, J.—Dissertatio brevis de principiis botanicorum. *Acta Acad. Nat. Cur. Ephemerides* 8: 187-224. 1748
- MORISON, R.—*Plantarum historiae universalis pars secunda, pars tertia*. Oxford. 1680, 1699
- MORNET, D.—*Le sentiment de la nature en France de J.-J. Rousseau à Bernardin de Saint-Pierre* Paris. 1907
- . *Les sciences de la nature en France, au XVIIIe siècle* Paris. 1911
- NICOLAS, J.-P.—Le cas Michel Adanson. *Journ. Agr. Trop. Bot. Appl.* 5(1-3). 1958
- NICOLAS, R.-P. et F.-J.—Recherches sur la valeur sémantique du mot Baobab. *Notes Africaines* 67: 77-78. 1955
- PENA, P. et L'OBEL, M. DE—*Nova stirpium adversaria* Antwerpen. 1576; (orig. edit.: *Stirpium adversaria nova* London. 1570. n.v.)
- PIZZETTA, J.—*Galerie des naturalistes* Paris. 1893
- PLINIUS SECUNDUS, CAJUS—*Historiae naturalis libri XXXVII, ab Alexandro Benedicto emend. redd.*, 2 vols. Lyon. 1510
- . *Historiae mundi libri XXXVII*. Genève. 1631; (edition used by Adanson, see Margadant, no. AD 103).
- . See Littré.

- PLUCHE, N.-A.—*Le Spectacle de la nature, ou entretiens sur les particularités de l'histoire naturelle*, etc. 9 vols. Paris. 1732-x
- PLUKENET, L.—*Phytographia* pars 1 et 2, London. 1691, pars 3, 1692, pars 4, 1696
- PLUMIER, C.—*Plantarum americanarum fasciculus primus (-decimus)* Fasc. 1-10, Leiden. 1755-1760
- PONTEDERA, G.—*Anthologia, sive de floris natura libri tres, plurimis inventis observationibusque ac aeneis tabulis ornati. Accedunt ejusdem Dissertationes XI* Padua. 1720 (n.v.)
- POS, H. J.—Inleiding, A. Descartes' leven en werken, B. Descartes' filosofie. In R. Descartes, *Vertoog over de methode* Amsterdam. 1937
- PRITZEL, G. A.—*Thesaurus literaturae botanicae* Ed. 2. Leipzig. 1872[-77]
- QUESNÉ, FR.-A.—*Philosophie botanique de Charles Linné* Paris. 1788
- QUINBY, J.—*Catalogue of botanical books in the collection of Rachel McMasters Miller Hunt* Vol. 1, printed books 1477-1700. Pittsburgh. 1958
- RAVEN, CH. E.—*English naturalists from Neckam to Ray, a study of the making of the modern world* Cambridge. 1947
- . *John Ray, naturalist* Cambridge. 1942
- RAY, J.—*Methodus plantarum nova* London. 1682 (fascimile reprint, Weinheim. 1962)
- . *Historia plantarum, species hactenus editas aliasque insuper multas noviter inventas & descriptas complectens* 3 vols. London. 1686-1704
- RHEEDE VAN DRAAKENSTEIN, H.—*Hortus Indicus Malabaricus* Vol. 1, Amsterdam. 1678; vol. 3, 1682; vol. 10, 1690
- RICHTER, H. F.—*Codex Linnaei Systema, genera, species plantarum uno volumine* Leipzig. 1835
- RICKETT, H. W.—Botany from 840 to 1700 A.D. In Quinby, Jane, *Catalogue of botanical books in the collection of Rachel McMasters Miller Hunt* Vol. 1, Pittsburgh. 1958, pp. xxiii-xxxi
- RICKETT, H. W. and STAFLEU, F. A.—Nomina generica conservanda et rejicienda spermatophytorum, VII, Bibliography. *Taxon* 10: 71. 1961
- RIVINUS, A. Q.—*Ordo plantarum quae sunt flore irregulari monopetalo* Leipzig. 1690
- . *Ordo . . . tetrapetalo* Leipzig. 1691

- . *Ordo . . . pentapetalo* Leipzig. 1699
- ROBYNS, A.—Contribution à l'étude monographique du genre *Bombax* s.l. *Taxon* 10: 156-160. 1960
- ROLLINS, R. C.—Some considerations of the comparative systematics of vascular plant species. *Uppsala Univ. Årsskrift* 1958(6): 113-119; (also in O. Hedberg, ed., *Systematics of to-day*, 1958)
- ROTHMALER, W.—Nomina generica neglecta, 1753-1763. *Repert. Sp. Nov.* 53(1): 1-37. 1944
- ROUSSEAU, J.-J.—*Émile ou de l'Éducation* Amsterdam/Den Haag. 1762; (orig. ed. n.v.)
- . *Essais élémentaires sur la botanique* Paris. 1771
- . *La botanique de J. J. Rousseau, contenant tout ce qu'il a écrit sur cette science* ed. Haüy. Paris. 1802
- ROUSSEAU, P.—*Histoire de la Science* Paris. [1945]
- ROYEN, A. VAN—*Florae leydensis prodromus* Leiden. 1740
- RUMPHIUS (RUMPF), G. E.—*Herbarium amboinense* 6 vols. Amsterdam. 1741-1755
- RUPPIUS, H. B.—*Flora jenensis* Frankfurt/Leipzig. 1718 (n.v.)
- SACHS, J.—*Geschichte der Botanik vom 16. Jahrhundert bis 1860* München. 1875
- SAUVAGES, F. BOISSIER DE LA CROIX DE—*Projet d'une méthode sur les feuilles des plantes* Montpellier. 1743
- . *Methodus foliorum* Den Haag. 1751
- SAUVAGES, P.-A. BOISSIER DE LA CROIX DE—*Culture des Mûriers* Nîmes. 1763 (n.v.)
- SCHEUCHZER, J.—*Agrostographia, sive graminum, juncorum, cyperorum, cyperoidum, iisque affinium historia* Zürich. 1719
- SCHIERBEEK, A.—*Bloemlezing uit het Cruydt-boeck van Rembert Dodoens* Den Haag. 1941
- SCHLECHTENDAL, D. F. L. VON—[Review of *Histoire de la Botanique*, Adanson et Payer]. *Bot. Zeit.* 24: 148-149. 11 Mai 1866
- SCHUMANN, K.—Malvaceae. In Engler & Prantl, *Natürl. Pflanzenfam.* 3(6): 30-53. 1895

- SIEGESBECK, J. G.—*Botanosophiae verioris brevis sciagraphia in usum discentium adornata* St. Petersburg. 1737 (n.v.)
- SMITH, J. E.—*A selection of the correspondence of Linnaeus* 2 vols. London. 1821
- SOUÉGES, R.—*L'Embryologie végétale, résumé historique, 1ère Epoque : des origines à Hanstein* 1870 Paris. 1934
- SOULSBY, B. H.—*A catalogue of the works of Linnaeus preserved in the libraries of the British Museum (Bloomsbury) and the British Museum (Natural History) (South Kensington)* ed. 2. London. 1933
- SINK, J. S.—*French free-thought from Gassendi to Voltaire* London. 1960
- SPRAGUE, T. A.—The herbal of Otto Brunfels. *Journ. Linn. Soc.* 48: 79-124. 1928
- . The evolution of botanical taxonomy from Theophrastus to Linnaeus. In *Linn. Soc. Lectures on the Development of Taxonomy* 1948-49 pp. 1-23, London. 1949
- . Linnaeus as a nomenclaturist. *Taxon* 2: 40-46. 1953
- SPRENGEL, K.—*Historia rei herbariae* 2 vols. Amsterdam. 1807-1808
- . *Geschichte der Botanik* 2 vols. Leipzig. 1817-1818
- STAFLEU, F. A.—Dates of botanical publications 1788-1792. *Taxon* 12: 43-87. 1963
- . L'Héritier de Brutelle, the man and his work. In C.-L. L'Héritier de Brutelle, *Sertum anglicum* Hunt facsimile edition. Pittsburgh. 1963
- STEARN, W. T.—An introduction to the *Species plantarum* and cognate botanical works of Carl Linnaeus. In Linnaeus, *Species plantarum* Ray Society facsimile edition, vol. 1. London. 1957.
- . Four supplementary Linnaean publications. In Linnaeus, *Species plantarum* Ray Society facsimile edition, pp. 73-102. London. 1959
- . Notes on Linnaeus's *Genera plantarum*. In Linnaeus, *Genera plantarum* ed. 5. 1754, facsimile edition. Weinheim. 1960
- . Botanical gardens and botanical literature in the eighteenth century. In *Catalogue of botanical books in the collection of Rachel McMasters Miller Hunt* vol. 2(1). Pittsburgh. 1962
- . The influence of Leyden on botany in the seventeenth and eighteenth centuries. *Brit. Journ. Hist. Sci.* 1(2²): 137-158. 1962

- STEVENSON, A.—*Catalogue of botanical books in the collection of Rachel McMaster Miller Hunt* vol. 2(2), printed books 1701-1800. Pittsburgh. 1961
- SVENSON, H. K.—Linnaeus and the species problem. *Taxon* 2: 55-58. 1953
- THEOPHRASTUS—*Historia plantarum libri decem* Ed. J. B. Stapel. Amsterdam. 1644
- . *Enquiry into plants* Engl. transl. by Sir Arthur Hort, 2 vols. London. 1916
- THÉVET, A.—*Les singularitez de la France antarctique* Paris. 1558
- TOURNEFORT, J. PITTON DE—*Éléments de botanique, ou méthode pour connoître les plantes* 3 vols. Paris. 1694
- . *Institutiones rei herbariae editio altera, gallica longe auctior*, 3 vols. Paris. 1700
- . Suite de l'établissement de quelques nouveaux genres de plantes. *Mém. Acad. Sci. Paris* 1706: 83-87. tt. 1-3. 1707
- VOLTAIRE, F.-M. AROUET, dit—*Essai sur les mœurs et l'esprit des nations* orig. edit. 1756 (n.v.)
- WACHENDORFF, E. J. VAN—*Horti ultrajectini index* Utrecht. 1747
- WERNISCHEK, J.—*Genera plantarum cum characteribus suis essentialibus et naturalibus, quae ad facilius assequendam earum notitiam secundum corollae limbum ordinavit et edidit . . .*, Wien. 1763
- WIARDA, R.—Jean-Jacques Rousseau. In Winkler Prins, *Encycl.* ed. 5. 16: 194. 1953
- WILLEY, B.—*The seventeenth-century background* London. 1934
- . *The eighteenth-century background* London. 1940
- WINCKLER, E.—*Geschichte der Botanik* Frankfurt. 1854

APPENDIX

Selected list of botanical books and pamphlets published in 1763

- ADANSON, MICHEL (1727-1806)—*Familles des plantes* 2 Vols., 8°, Paris. 1763
Publication: vol. 1: early March 1764, vol. 2 late July or August 1763
Reviews & Lit.: cf. pp. 238-239 of this volume.
- ARDÈNE, JEAN-PAUL DE ROME D' (1689-1769)—*Traité des Renonculées* Ed. 3, Avignon. 1763
Publication: ed. 1, Paris. 1746 (Hunt 526), ed. 3. 1763
Lit.: Stevenson 1961, p. 208.

- BASSI, FERDINANDO (1714-1774)—*Ambrosina, novum plantae genus* 4°, Bologna. 1763
Publication: 1763, preprint from Comm. Acad. Bonon., Opusc. 5(1): 82-86. 1767
Review: Gött. gelehrte Anz. 1764 (1): 424. 30 Apr 1764
Lit.: Gras 1864, p. 74; Hulth 1916, p. 229 (letter Bassi to Linnaeus dated 15 Mar. 1763)
- BERMANN, J. . . . G. . . . (1741-?)—*De olerum vernalium praestantia* Leipzig. 1763
Publication: 18 Feb 1763 preface (?) (date given by Rothmaler 1944, p. 35).
- BIANCHI, CASIMIR (?-?)—*Vademecum botanico, contenente li caratteri generici delle piante, secondo la decima edizione del Ch. sign. Carlo Linneo; . . .* Florence. 1763
Lit.: Soulsby 1933, no. 74.
- BROOKES, RICHARD (fl. 1720-1763)—*The (natural) history of vegetables* Vol. 6 of *A new system of natural history*, 12°, London. 1763
- BUC'HOZ, PIERRE-JOSEPH (1731-1807)—*Traité historique des plantes qui croissent dans la Lorraine et les trois Evêchés; contenant leur description, leur figure, l'endroit où elles croissent, leur culture, leur analyse, & leurs propriétés, tant pour la Médecine que pour les Arts & Métiers* Vol. 2, 8°, Nancy. 1763
Publication: Jan-Aug 1763 (Feb, fide Rothmaler 1944, p. 35).
Reviews: *Journ. Enc.* 1763 (6²): 145. 1 Sep 1763 (cens. 17 Sep); Gött. gelehrte Anz. 1763 (2): 792. 15 Aug 1763 (announcement); 1764 (2): 820. 25 Aug 1764.
Lit.: Buc'hoz 1787, p. 3.
- CATESBY, MARK (1682-1749)—*Hortus britanno-americanus: or, a curious collection of trees and shrubs, the produce of the British colonies of North America; adapted to the soil and climate of England* 4°, London. 1763
Publication: 1763, reissued with a substitute title 1767
Lit.: Stevenson 1961, p. 288.
- CRANTZ, HEINRICH JOHANN NEFOMUK VON (1722-1799)—*Stirpes austriacae* Fasc. 3, 8°, Vienna and Leipzig. 1763
Publication: fasc. 1, 1762; fasc. 2, 1763; fasc. 3, 1767
Review: Goett. gelehrte Anz. 1763 (2): 703. 21 Jul 1763 (fasc. 1 only).
- FABRICIUS, PHILIPP KONRAD (1714-1774)—*Enumeratio methodica plantarum horti medici Helmstedensis, subijuncta stirpium rariorum vel nondum satis extricarum descriptione* Ed 2, 8°, Helmstedt. 1763
Publication: 1763, probably late in the year (later than Adanson).
Review: Goett. gelehrte Anz. 1764 (2): 1204. 13 Dec 1764
Lit.: Kuntze 1891, p. cxxviii; Rothmaler 1944, p. 32, 36; Rickett et Stafleu 1961, p. 82.
Note: In this bibliography Fabricius cited Nonne, *Flora in territorio erfordensi indigena* but none of the other 1763 publications listed here.
- GEHLER, JOHANN KARL (1732-1796)—*De usu macerationis seminum in plantarum vegetatione. Programma* 4°, Leipzig. 1763
Publication: 1763 sem. 2; 3 Aug 1763 date preface?, (date given by Rothmaler 1944, p. 36).

GLEICHEN, FRIEDRICH WILHELM, Freiherr von, nommé RUSWORM (1717-1783)—*Das neueste aus dem Reiche der Pflanzen oder mikroskopische Untersuchungen und Beobachtungen der geheimen Zeugungstheile der Pflanzen* Fasc. 1, F°, Nürnberg. 1763

Publication: published in three fascicles in 1763 and 1764; fasc. 1 Jan-Mar 1763

Review: Journ. Enc. 1763 (3²): 137. 15 Apr 1763 (cens. 2 Jun).

HECKER[T], [JOHANN JULIUS (1707-1768)?]—*Die Naturgeschichte einiger Provinzen des Unterharzes* Zuerlin. 1763

Publication: 1763 (Mar: fide Rothmaler 1944, p. 35).

HILL, JOHN (1716-1775)—*The vegetable system. Or, the internal structure, and the life of plants, etc* Vol. 5, F°, London. 1763

Note: see fig. 2.

JACQUIN, NICOLAUS JOSEPH VON (1727-1817)—*Selectarum stirpium americanarum historia, in qua ad Linnaeanum systema determinatae descriptaeque sistuntur plantae illae, quas in insulis Martinica, Jamaica, Domingo, aliisque, et in vicinae continentis parte, observavit rariores; adjunctis iconibus in solo natali delineatis* F°, Vienna. 1763

Publication: before 1 Aug 1763, probably Jun-Jul.

Reviews: Journ. Enc. 1763 (5³): 144. 1 Aug 1763 (cens. 25 Aug); Gött. gelehrte Anz. 1764: 743. 2 Aug 1764

Lit.: Stevenson 1961, p. 292; Rickett & Stafleu 1961, p. 90.

KAHNLEIN, ULRICH (? - ?)—*Verzeichniss einiger um Wittenberg befindlichen Kräuter* 8°, Wittenberg. 1763

KAPP, CHRISTIAN EHRHARDT (1739-1824)—*Motum humorum in plantis cum motu humorum in animalibus comparat* 4°, Leipzig. 1763

KESSLER, FRANZ ANTON (fl. 1763)—*De Viola* 8°, Vienna. 1763

Publication: 7 Jul preface?, (date cited by Rothmaler 1944, p. 35).

KNOOP, JOHANN HERMANN (1700-1769)—*Fructologia, of beschrijving der vrugtbomen en vrugten die men in de hoven plant en onderhoud; etc* F°, Leeuwarden. 1763

Publication: After 1 Feb 1763, date of preface.

KNOOP, J. H.—*Dendrologia, of beschrijving der plantagie-gewassen, die men in de tuinen cultiveert, etc.* F°, Leeuwarden. 1763

Publication: After 1 Mar 1763, date of preface.

KOELREUTER, JOSEPH GOTTLIEB (1733-1806)—*Fortsetzung der vorläufigen Nachricht von einigen das Geschlecht der Pflanzen betreffenden Versuchen und Beobachtungen* 8°, Leipzig. 1763

Publication: 1763 (probably early in the year: preface dated 10 Dec 1762)

Review: Gött. gelehrte Anz. 1764 (1): 281. 24 Mar 1764.

- LINNAEUS, CARL (1707-1778)—*De Raphania dissertatio medica*, . . . offert Georgius Rothman, etc. 4°, Uppsala. 1763
Publication: 27 Mai 1763, date on title-page, old style (new style: 7 Jun 1763)
Reviews: Lärda Tidningen 1763: 258-260 (*vide* Soulsby); Gött. gelehrte Anz. 1764 (1): 464. 12 Mai 1764
Lit.: Soulsby 1933, nos. 2228-2231.
- LINNAEUS, C.—*Dissertatio botanico-medica, sistens Lignum Quassiae*, . . . submittit Carolus M. Blom . . . etc. 4°, Uppsala. 1763
Publication: 28 Mai 1763, date on title-page, old style (new style: 8 Jun 1763)
Reviews: Lärda Tidningen 1763: 323-324 (*vide* Soulsby); Gött. gelehrte Anz. 1764 (2): 664. 9 Jul. 1764
Lit.: Soulsby 1933, nos. 2239-2244.
- LINNAEUS, C.—*Fructus esculenti, quos dissertatione diaetetica*, . . . subjicit Johannes Salberg . . . etc. 4°, Uppsala. 1763
Publication: 11 Jun 1763, date on title-page, old style (new style: 22 Jun 1763)
Review: Lärda Tidningen 1763: 277 (*vide* Soulsby)
Lit.: Soulsby 1933, nos. 2233-2238.
- LINNAEUS, C.—*Disquisitio de prolepsi plantarum*, . . . submittit Johannes Jacobus Ferber . . . etc. 4°, Uppsala. 1763
Publication: 22 Jun 1763, date on title-page, old style (new style 3 Jul 1763)
Reviews: Lärda Tidningen 1763: 263-264 (*vide* Soulsby); Gött. gelehrte Anz. 1764 (2): 747. 4 Aug 1764
Lit.: Soulsby 1933, nos. 2245-2250.
- LINNAEUS, C.—*Species plantarum* . . . editio secunda aucta . . . etc. Vol. 2, pp. 785-1684, 8°, Stockholm. 1763
Publication: Jul 1763 (Richter, Bryk), although possibly Aug 1763. The review written by Linnaeus himself and published on 1 Aug 1763 is not absolute proof that the book was available at that date.
Reviews: Lärda Tidningen 1763: 233-235. 1 Aug 1763 (*vide* Bryk, Soulsby); Gött. gelehrte Anz. 1764 (2): 689. 19 Jul 1764
Lit.: Richter 1835, p. . . . ; Soulsby 1933, nos. 505-501; Bryk 1933, p. 80.
- LINNAEUS, C.—*Amoenitates academicae* . . . volumen sextum . . . etc. 8°, Stockholm. 1763
Publication: Oct 1763 (Richter); preface dated 16 Sep 1763 (new style 27 Sep)
Review: Gött. gelehrte Anz. 1764 (2): 1181. 6 Dec 1764
Lit.: Richter 1835, p. xxxi; Soulsby 1933, nos. 1304-1307.
- LINNAEUS, CARL (*filius*) (1741-1783)—*Decas secunda plantarum rariorum horti upsaliensis*, . . . etc. F°, Stockholm. 1763
Publication: 1763
Reviews: Gött. gelehrte Anz. 1764 (2): 664. 9 Jul 1764; Berl. Magaz. 1: 251. 1765 (*vide* Soulsby)
Lit.: Soulsby 1933, no 3821.

LYONS, ISRAEL (1739-1775)—*Fasciculus plantarum circa Cantabrigiam nascentium quae post Rajum observatae fuere* 8°, London. 1763
Publication: 1763

MARTYN, THOMAS (1735-1825)—*Plantae cantabrigienses: or, a catalogue of the plants which grow wild in the county of Cambridge, disposed according to the system of Linnaeus* 8°, London. 1763
Publication: Apr-Jun 1763 (preface dated 10 Apr 1763)
Reviews: *Bibl. Sci. Beaux Arts* 19: 461. Apr-Jun 1763; *Gött. gelehrte Anz.* 1764 (2): 896. 13 Sep 1764

MAUPIN (fl. 1763)—*Nouvelle méthode de cultiver la vigne* Paris. 1763
Publication: Jan-Mai 1763
Review: *Journ. Enc.* 1763 (4²): 144. 1 Jun 1763 (cens. 16 Jul)

MEESE, DAVID (1723-1770)—*Plantarum rudimenta, sive illarum methodus. Ducta ex differentia earum seminum, cotyledonum, aliarumque partium, quae brevi tempore post earum propullulationem, ac ulterius incrementum, in iis conspiciuntur; etc.* 4°, Leeuwarden. 1763
Publication: 1763 (preface dated 1 Mar 1762)

NONNE, JOHANN PHILIPP (1729-1772)—*Flora in territorio erfordensi indigena*. 8°, Erfurt. 1763
Publication: 1763, ante Fabricius, *Enum.* ed. 2

NONNE, J. P.—*De botanices usu, et ratione, qua studium hoc rite ingrediendum* 4°, Erfurt 1763
Publication: 1763

OEDER, GEORG CHRISTIAN (1728-1791)—*Icones plantarum sponte nascentium in regnis Daniae et Norvegiae, . . . Florae danicae nomine inscriptum* Vol. 1 (fasc. 1-3), F°, Copenhagen. 1766
Publication: Plates 61-120 (fasc. 2) Easter 1763 (*fide* announcement)
Review: *Gött. gelehrte Anz.* 1763 (1): 39. 10 Jan 1763 (announcement); 1764 (1): 288. 24 Mar 1764 (fasc. 2; on p. 880 fasc. 3, 1764 is reviewed). Fasc. 1 and 2 available at 1763 Michaelmas fairs (*Allg. Verz. Bücher Michaelismesse* 1763, p. 388).

ORTEGA, CASIMIRO GOMEZ (1740-1818)—*De Cicuta commentarius* 4°, Madrid. 1763

PLAZ, ANTON WILHELM (1706-1784)—*De plantarum virtutibus ex ipsarum caractere haud quaquam addiscendis, Prolusio* 2 (23²). 4°, Leipzig. 1763
Publication: Prolusio 1, 1762, 2 (23) 1763 (Rothmalier 1944, p. 36 cites the date 23 Sep: date preface?).

PLAZ, A. W.—*De saccharo. Programma* 4°, Leipzig. 1763
Publication: 1763

POMIER (fl. 1763)—*Traité sur la culture des mûriers blancs* Orléans, Paris. 1763
Publication: Jan-Jun 1763
Review: *Journ. Enc.* 1763 (5¹): 141. 1 Jul 1763 (cens. 9 Aug)

- PRÉFONTAINE, ? (? - ?)—*Plantes et arbres qui naissent à Cayenne* (Maison rustique pp. 135-211), Paris. 1763
- QUER Y MARTÍNEZ, JOSÉ (1695-1764)—*Flora española, o historia de las plantas, que se crían en España* Vol. 4, 4°, Madrid. 1763 vel 1764
- SAUVAGES, PIERRE-AUGUSTIN BOISSIER DE LA CROIX DE (1710-1795)—*Culture des mûriers* 8°, Nîmes. 1763
 Publication: 1763
 Review: Gött. gelehrte Anz. 1764 (2): 758. 6 Aug 1764
- SAUVAGES, P.-A. BOISSIER DE LA CROIX DE—*Observations sur l'origine du miel* 8°, Nîmes. 1763
 Publication: 1763, read before the Société Royale de Montpellier on 16 Dec 1762
 Review: Gött. gelehrte Anz. 1764 (2): 757. 6 Aug 1764
- SCHAEFFER, JAKOB CHRISTIAN (1718-1790)—*Fungorum qui in Bavaria et Palatinatu circa Ratisbonam nascuntur icones nativis coloribus expressae. Tomus secundus, tab. 101-200.* 4°, Regensburg. 1763
 Publication: four volumes: 1762, 1763, 1770, 1774; vol. 2 post Mar 1763 (prefaces dated 16 and 19 Mar 1763)
 Reviews: Gazette littéraire de l'Europe 1: 20. 14 Mar 1764; Gött. gelehrte Anz. 1764 (1): 352. 9 Apr 1764.
- THIBAUT DE CHANVALON, JEAN-BAPTISTE (ca. 1725-1785)—*Voyage à la Martinique, contenant diverses observations sur la physique, l'histoire naturelle, l'agriculture, les mœurs, & les usages de cette île, faites en 1751 & dans les années suivantes* 4°, Paris. 1763
 Review: Gött. gelehrte Anz. 1764 (2): 884. 10 Sep 1764
- TREW, CHRISTOPH JAKOB (1695-1769)—*Plantae rariores, quas maximam partem ipse in horto domestico coluit secundum notas suas examinavit et breviter explicavit, nec non depingendas aërie incidendas curavit Christophorus Jacobus Trew, edente Johann Christoph Keller, pictore Norimbergensi* F°, Nürnberg. 1763
 Publication: Decas 1, 1763; decas 2, 1779
- WERNISCHEK, JAKOB (? -1804)—*Genera plantarum cum characteribus suis essentialibus et naturalibus, quae ad facilius assequendam earum notitiam secundum corollae limbum ordinavit et edidit Jacobus Wernischek, Medic.* 8°, Vienna. 1763
 Publication: Before Oct 1763; reissued in 1764 with a new title-page but otherwise a page for page reprint; ed. 3. 1766 with a different pagination.
 Review: Journ. Enc. 1763 (7²): 138. 15 Oct 1763 (cens. 27 Oct)
- WHEELER, JAMES (fl. 1763)—*The botanist's and gardener's new dictionary; containing the names, classes, orders, generic characters, and specific distinctions of the several plants cultivated in England, according to the system of Linnaeus; etc.* 8°, London. 1763
 Lit.: Soulsby 1933, no. 647.