THE
ELEMENTS
OF
BOTANY:

CONTAINING

The HISTORY of the SCIENCE:

WITH

Accurate Definitions of all the Terms of Art, exemplified in Eleven COPPER-PLATES;

The THEORY of VEGETABLES;

The ſcientific Arrangement of Plants, and NAMES uſed in Botany;

Rules concerning the general Hiſtory, Virtues, and Uſes of Plants.

Being a Tranſlation of the *Philoſophia Botanica*, and other Treatiſes of the celebrated LINNÆUS.

TO WHICH IS ADDED,

AN APPENDIX,

Wherein are deſcribed ſome Plants lately found in Norfolk and Suffolk, illuſtrated with three additional COPPER-PLATES, all taken from the Life.

By HUGH ROSE, APOTHECARY.

LONDON:
Printed for T. CADELL, oppoſite Catharine-Street in the Strand; and M. HINGESTON, near Temple-Bar. MDCCLXXV.

LINNÆUS'S PREFACE

TO THE

BOTANIC READER.

SEVERAL years ago I comprized in a few aphoriſms or ſhort ſentences the theory and inſtitutions of botany under the name of *Fundamenta Botanica*, or the Fundamentals of Botany; the explanation of which aphoriſms, by examples, obſervations, and demonſtrations, diſtinct and accurate definitions of the parts of plants and terms of art, I have intituled Botanic Philoſophy *(Philoſophia Botanica)*, becauſe in them were contained the principles and precepts of the ſcience.

Of this Botanic Philoſophy I have ſome time ſince publiſhed different parts; upon the firſt part or chapter of the *Fundamenta Botanica*, a book called *Bibliotheca Botanica*, the 3d edition, was publiſhed in 1751, containing 220 pages; on the ſecond another called *Claſſes Plantarum*, the 2d edition, in 1747, contains 656 pages; on the fifth a treatiſe called *Sponſalia Plantarum*, or the Nuptials of Plants; on the ſeventh, eighth, ninth, and tenth, a book called *Critica Botanica*, or Botanic Criticiſms, publiſhed in 1737, 270 pages, in 8vo; on the twelfth, a tract under the name of *Vires Plantarum*, or the Virtues of Plants. The remaining chapters, viz. the third, fourth, ſixth, and eleventh, I had long reſolved to publiſh, together with thoſe mentioned above, in one work, enlarged with new examples, obſervations, and demonſtrations, under the title of *Botanic Philoſophy*, and for this purpoſe I had made large collections. In the mean time, being frightened with the proſpect of what ſtill remained to be ſaid on this ſubject, I began to be weary of ſuch a laborious undertaking, and had put it off to a more ſeaſonable opportunity; while my time, daily engroſſed with cares both public and private, or taken up in the buſineſs of my profeſſion, and travels undertaken on account of natural hiſtory, ſlipped ſo faſt away, that I began to deſpair of the ſucceſs of ſuch a work.

In the mean time my Bookſeller urging the neceſſity of a new edition of the *Fundamenta Botanica*, all the copies of the former being ſold off, my Pupils at the ſame time earneſtly intreating me to add the parts of plants and terms of art properly defined, in the ſame way I uſed to deliver them in my lectures; to this their requeſt were added, the exhortations of ſome of my friends, eminent

eminent in botany, that I would explain the terms of art, and give definitions of the parts of plants: in order to ſatisfy both, I began to reduce my collections into an abridgement for publication. But no ſooner had I ſet about this work, than a ſevere fit of the gout ſo broke my ſtrength of body and mind, that it was ſtopped as ſoon as begun.

Having now in ſome meaſure recovered my ſtrength, I here preſent the reader with an abridgement of the *Botanic Philoſophy*. The book, though ſmall at preſent, as containing only the outlines or rudiments of botany, publiſhed for the ſake of my pupils, I intend, if health and leiſure ſhould permit, ſhall make its appearance, one time or other, with large additions.

Being now buſied in collecting the ſpecies of plants, I earneſtly beg and intreat all the moſt eminent botaniſts in Europe to ſend me compleat ſpecimens of ſuch ſcarce plants as they have duplicates of, or of thoſe I have not hitherto mentioned, that I may refer them to their proper *genera*, with their adequate ſpecific differences; and it ſhall be my care, in return, under every ſuch ſpecies in this work, publicly to teſtify my gratitude to thoſe who have favoured me with ſuch ſpecimens.

Upſal, Sept. 16, 1750. CHA. LINNE'E.

THE TRANSLATOR's PREFACE.

OUR author's deſign, in this compendious treatiſe, is to give us the outlines of botany. The firſt two chapters contain a brief account of the riſe and progreſs, the fate, changes, and diſcoveries in botany; the times when, and the places where, cultivated; its improvements, and all the methods uſed by the moderns in the diſpoſition and diſtribution of plants. As the whole of practical botany conſiſts in definition, diſpoſition, and denomination, Linnæus proceeds in the third and fourth chapters to lay down accurate deſcriptions and definitions of all the parts of plants. In the fifth chapter, where he treats of the ſexes and generation of plants, we have almoſt every thing relating to the theory of vegetables. In the ſixth, ſeventh, and eighth chapters, he treats of the other two parts of practical botany, to wit, diſpoſition and denomination, or the diſpoſing and naming, *i. e.* the arrangement of plants and names uſed in botany, both claſſic, generic, and ſpecific. In the four laſt chapters he treats of the varieties, ſynonyms, general hiſtory, medicinal virtues, and other uſes of plants, whether eſculent or œconomical.

The compleat hiſtory of any plant ſhould contain the following particulars:

1. The claſs and order of each ſyſtematic writer to which it does belong; and alſo the natural order, tribe, or family. This part of the ſubject is diſcuſſed in Chap. II.

2. The generic name of the plant. This is handled in Chap. VII; and,

3. The etymology or derivation of this name, in Chap. VII.

4. The generic characters, in Chap. VI.

5. The ſpecific difference of this from others of the ſame *genus*, in Chap. VIII.

6. The ſynonymous names (in Chap. X.) of all the different writers who have treated on the plant, Chap. I.

7. The ſeveral varieties of the plant, in Chap. IX.

8. The deſcription of all its external parts, in Chap. III, IV, V, and XI.

9. An accurate figure of the plant, in Chap. XI.

10. The place of growth, ſoil, and culture. See Chap. XI.

11. The times of leafing, flowering, fruiting. See alſo Chap. XI.

12. The medicinal virtues and œconomical uſes. See Chap. XII.

In treating of the medicinal virtues, we ought to deſcribe the manner of gathering and curing, or preparing the plant;—the origin of its uſe;—the inventor or diſcoverer if known, with the time when, and the place where, firſt diſcovered;—ſelect paſſages of the poets or others may and ought to be illuſtrated;—hiſtorical traditions, pleaſant and entertaining, mentioned;—the parts in uſe;—the marks by which to know its goodneſs;—the qualities, as far as they are deducible from the fructification, natural order, ſmell, taſte, colour, and place of growth;—experiments on the ſubject;—its chemical analyſis;—its real medicinal virtues, its good and bad effects, in what diſeaſes uſeful, in what hurtful;—its preparations, what compounds it enters; its doſes, and manner of giving; and laſtly, its *ſuccedanea*.

In treating of the œconomical uſes of any plant, we ſhould alſo deſcribe the manner and time of gathering or felling, curing or preparing, method of uſing, origin, inventor, hiſtorical traditions, ſelect paſſages, &c. And thus we ſee, that every chapter of this treatiſe is extremely uſeful, and that all of them together conſtitute the fundamental parts of botany.

And as the whole of this uſeful Treatiſe has not hitherto appeared in an Engliſh dreſs, drefs, the Tranflator humbly hopes that the prefent publication, in which he has endeavoured throughout, without taking too great liberties, to give the true fenfe and meaning of his author, may be of general ufe to thofe that are fond of this ftudy or fafhionable amufement, and meet with a favourable reception from the public. He alfo flatters himfelf that the errors and miftakes, which may be found in the following fheets, are not very great, and therefore begs the candid reader would look upon them with an indulgent eye.

ERRATA.

Page 3. line 6. for *Differentia* read *Differentiæ*. P. 7. l. 24. for *Antonius* read *Antoninus*. P. 22. l. 7. for *as the moffes* read *as in the moffes*, ibid. l. 29. for *fructif.* read *fructification*. P. 24. l. 1. read *imperfect herbs*. P. 25. l. 6. 9. 11. 13. p. 27. l. 19. 21, 22. 24. for *comp. fl.* read *compound flower*. P. 30. l. 29. 32. p. 31. l. 1. for *comp. fl.* read *compound flowers*. Ibid. l. 16. 18. 21. for *comp.* read *compound*. P. 41. l. 30. for *cor.* read *corolla*. P. 50. l. 13. for *Indian fl.* read *Indian flowering-reed*. P. 86. l. 22. for *hippophite* read *hippophäe*. P. 115. l. 6. for *piftilla* read *piftillum*. P. 126. l. 14. for *helictores* read *helicteres*. P. 150. l. 18. for *pulling* read *falling*. P. 279. l. 19. for *calamaræ* read *calamariæ*. P. 293. l. 2. for *tagates* read *tagetes*. P. 295. l. 11. for *filia* read *tilia*. P. 313. l. 10. for *agriiolium* read *agrifolium*. P. 348. l. 11. for *eryphille* read *erifyphe*. P. 359. l. 21. fhould begin with a rule thus —— P. 368. l. 4. for *perfect* read *imperfect*. P. 453. l. 22. for *about a foot* read *about half a foot*. P. 455. l. 10. for *thick* read *flender*.

A TABLE OF CONTENTS.

CHAP.

CHAP IV.

CHAP. V.

CHAP. VI.

CHAP.

CHAP. VII.

CHAP. VIII.

CHAP. IX.

CHAP. X.

CHAP. XI.

CHAP. XII.

THE ELEMENTS

OF

BOTANY.

PART I.

INTRODUCTION.

SECT. I.

ALL things that fall under our notice in this our earth, are the four ſimple elements, earth, water, air, fire; and natural bodies, which are compounded of the four elements.

SECT. II.

The natural bodies are commonly divided into the three great kingdoms of nature, the foſſil, vegetable, and animal. To deſcribe and demonſtrate the properties of the four elements, is the buſineſs of natural philoſophy; and to deſcribe the ſubjects of the three great kingdoms of nature, is properly the buſineſs of natural hiſtory.

SECT. III.

The ſubjects of the foſſil kingdom (though they are the moſt ſimple and inorganical bodies) have notwithſtanding a certain ſort of growth. The vegetables have not only an increaſe of growth, but, being beſides organized bodies, and having a regular propulſion of fluids through their proper veſſels, are alſo endued with life. Animals, the moſt perfect in the ſcale of natural bodies, beſides growth and life, are endued with ſenſes.

SECT. IV.

That branch of natural hiſtory which teaches the right knowledge of vegetables, and their application to the moſt beneficial uſes, is called botany; of the fundamental principles of which we intend to treat in the ſame order with Linnæus, who divides his *Philoſophia Botanica*, or Rudiments of Botany into the twelve following chapters, viz.

1. *Bibliotheca.* Of the various authors and books written on botany.
2. *Syſtemata.* The different botanic ſyſtems.
3. *Plantæ.* The different parts of plants, and their terms explained.
4. *Fructificatio.* The different parts of fructification.

5. *Sexus.*

5. *Sexus.* The ſexes and generation of plants.
6. *Charaćteres.* The charaćters of the *genera*, claſſes and orders.
7. *Nomina.* The generic names.
8. *Differentia.* The ſpecific names or differences.
9. *Varietates.* The varieties.
10. *Synonyma.* The ſynonymous names.
11. *Adumbrationes.* The hiſtory or compleat deſcription of plants.
12. *Vires.* The virtues and uſes of plants.

CHAP. I. The Botanic Library.

SECT. V.

This firſt chapter contains an account of the various authors, and their books which have been written on the ſubjećt of botany.

SECT. VI.

The authors (*phytologi*) who have written on plants, may be called either true botaniſts (*botanici*), or only lovers of botany (*botanophili*). The chief botaniſts ſince the revival of learning (for we ſhall have occaſion under ſećtion ninth to ſpeak of the antients) are the following. In the 15th century *Gaza* and *Barbarus.* In the 16th century Brunfelſius, Tragus, Cordus, Ruellius, *Geſner*, Fuſchius, Matthiolus, Dodonæus, Lobel, Clusius, *Cæsalpinus*, Dalechampius, Camerarius, Tabernomontanus, Alpinus, J. Bauhin, Columna, *C. Bauhin*, Gerard. In the 17th century, Robinus, Swertius, Jungermannus, Parkinson, Ferrarius, Cornutus, Stapelius, Hernandez, Marcgravius, Piso, Turner, Læselius, Jungius, Rudbeck, Ray, Hoffman, Chabræus, Merret, Bocco, Aldrovandus, *Morison*, Muntingius, Zannoni, Amman, Dodart, Breynius, Rheede, Commelin, Magnolius, Herman, Rivinus, Plukenet, Petiver, Plumier, *Tournefort*, Sloane, Bobart, Volkamerus.

In the 18th century, Sherard, Rudbeck, Jussieu, Boerhaave, Kempfer, Feuillee, Knautius, Bradley, Isnard, *Vaillant*, Blair, Pontedera, Ruppius, Dillenius, Montius, Buxbaumius, Tillius, Martyn, Michelius, Catesby, Geofroy, Celsius, *Linnæus*, Haller, Miller, Burman, Ludwig, Amman, Gronovius, Royen, Gesner, Gmelin, Wackendorf, Lechius, Kalmius, and Hasselquist, with many others; besides the several societies which have been establish-ed in different parts of Europe, as in Germany, England, France; at Upsal, Petersburg, Norimberg, Stockholm, &c. by whom many of the chief discoveries and improvements have been made.

SECT.

SECT. VII.

The true botanifts are of two forts, collectors or methodical writers.

SECT. VIII.

The collectors, whofe chief care has been about the number of fpecies, are the following, viz.

SECT. IX.

1. The moft antient and original writers (*patres*) among the Greeks, Romans, and Arabians, from Hippocrates and Theophraftus, down to the revival of learning in the 15th century, who may be faid to have laid the foundation, and to have taught the firft rudiments, of botany; the knowledge of which the Greeks received from the Egyptians, and they from the Chaldeans; the Romans not till after the defeat of Pompey; the Goths in the fourth, and the Lombards in the fifth century; the Arabians in the fixth and feventh centuries, and among them it was cultivated till the middle of the twelfth century. From thence to the middle of the 15th century, when learning began to be reftored in Europe, there are a few obfcure writers. All thofe writers are very deficient in the defcription of plants, for they feldom give any defcription, and what few they have left us are very incompleat and imperfect.

The Greek writers are, Hippocrates, who flourished in the 5th century before the Chriſtian æra; Ariſtotle in the 4th; Theophraſtus in the 3d, Baſſus, Nicander, Xenophon in the 2d century, Apuleius, Dioſcorides, Rufus, Galen, Oribaſius, Æthius, Alexander Trallian, Paulus Ægineta, Myrepſus, and Actuarius. Hippocrates has mentioned in his works only the names and medicinal virtues of about 234 plants. Ariſtotle, who flouriſhed in the 4th century before the Chriſtian æra, has mentioned a few plants. Theophraſtus, the father of botany, who flouriſhed in the 3d century before Chriſt, has given us the names of about 500 plants, chiefly without deſcriptions; and thoſe he has left are very ſhort and imperfect. Dioſcorides, who lived in the time of Nero, mentions about 600 plants in all, 410 of which are briefly deſcribed by him; of all the others he has given nothing but their names and virtues. Galen, who flouriſhed at Rome about the year of Chriſt 133, has treated on the virtues of about 450 plants, in his 6th, 7th, and 8th books of ſimple medicines, beſides many other plants which are mentioned in different parts of his works. Oribaſius, Ætius, Alexander Trallian, and Paulus Ægineta, who flouriſhed in the 4th, 5th, 6th, and 7th centuries, added little or nothing

thing to what had been advanced by their predeceſſors, but borrowed all from Galen, either in the very words of that writer, or even more briefly expreſſed.

The Roman or Latin writers are Cato, who lived about 149 years before Chriſt; Varro, in the reign of Auguſtus Cæſar. In both theſe writers on agriculture we find ſomewhat concerning plants. Virgil, and Antonius Muſa, both in the reign of Auguſtus. The firſt wrote four books on huſbandry, in which he mentions a great many plants. Muſa, a phyſician, wrote a book, which goes under his name, on betony, and the virtues of that plant. Columella, in the time of Claudius, wrote on agriculture; he wrote alſo a poem in the moſt pure and elegant Latin, called *Hortulus*, or his little garden. Pliny lived from the reign of Tiberius to that of Titus: he treats of plants from the 12th to the 27th book of his natural hiſtory, and has mentioned above 1000 plants. Palladius, in the time of Antonius Pius, wrote on huſbandry.

The Arabian writers are Serapio, Rhazes, Avicenna, Avenzoar, Abenguefit, Abenbitar, Averrhoes; all between the 9th and 12th centuries. They added many things to what the Greeks had formerly advanced on this ſubject, and indeed a great many of the medicines now uſed in the ſhops were introduced by the Arabians, and wholly unknown to the Greeks.

And laſtly, the following obſcure and barbarous writers, viz. Nicolaus Myrepſus, Hildegardis, Platearius, Matthæus Sylvaticus, Arnoldus de Villa Nova, Jacobus de Dondis, Petrus Creſcentienſis, Joannes Cuba, Quiritius, Joannes de Boſco, Paulus Suardus, all lived between the beginning of the 12th, and middle of the 15th century; during which time ignorance in the arts and ſciences prevailed almoſt over the whole world, till, at laſt, about the cloſe of the 15th century, the works of Theophraſtus, Dioſcorides, and others, were tranſlated by Theodorus Gaza, and Hermolaus Barbarus, out of the original Greek, into the Latin; and learning began to revive in Europe.

SECT. X.

2. The ſecond order of the collectors are the commentators (*commentatores*), who, either by tranſlating, commenting upon, or reſtoring the true reading of the antients, have thereby elucidated or cleared up their writings; as Bodæus à Stapel on Theophraſtus, Dalechampius and Gronovius on Pliny, Matthiolus and Geſner on Dioſcorides.

SECT.

SECT XI.

3. Thoſe who have given cuts or figures of the plants (*ichniographi*) on wood, copper, or other plates, as Gerard, Parkinſon, Moriſon, Plukenet, Petiver, Dillenius, &c.; though an *hortus ſiccus*, properly made and methodically diſpoſed, is far preferable to any cuts, and abſolutely neceſſary to every botaniſt.

SECT. XII.

4. The next ſort of collectors are thoſe who have given us deſcriptions or hiſtories of the vegetable kingdom (*deſcriptores*), either in whole or in part, as Dodonæus, Gerard, Parkinſon, Bauhin, Ray, Moriſon, Dillenius, Scheuchzer, &c.

SECT. XIII.

5. Next follow thoſe who have written whole treatiſes on one ſingle plant (*monographi*), or one *genus*, as Kempfer on tea, Boerhaave on the *protea*, Dillenius on the *meſembryanthemum*, Haller on *allium*, Breynius on *ginſeng*, Bradley on ſucculent plants, Linnæus on the *betula nana*, *ficus*, *paſſiflora*, *ſenega*, and ſeveral others in his *Amœnitates Acad.*

SECT. XIV.

6. Again ſome have treated on the moſt ſcarce and rare plants (*curioſi*); as Gmelin on

on the plants of Siberia, Linnæus on the Lapland plants, Læſelius on the Pruſſian, Ray on the Engliſh, Amman on the Ruſſian, Haller on the Swiſs plants, Dillenius, in his *Hortus Elthamenſis*, on the Indian plants; as alſo Plukenet in his *Phytographia*; with a great many others too tedious to mention.

SECT. XV.

7. In the next place we may reckon thoſe who have given catalogues of all the plants (*adonides*) that were cultivated in particular gardens, public or private; as Magnolius's garden of Montpelier, Herman's Leyden garden, Volkamerus's Norimberg garden, Haller's Gottingen garden, Linnæus's Upſal garden; with many others.

SECT. XVI.

8. Others have collected all the indigenous or ſpontaneous plants (*floriſtæ*) or natives, as we may properly call them, of ſome particular country, kingdom, province, or diſtrict; as Gmelin in his *Flora Sibirica*, Amman in his *Flora Ruthenica*, Haller in his *Flora Helvetica*, Ray in his *Flora Anglica*, Ruppius in his *Flora Jenenſis*, Linnæus in his *Flora Suecica*, &c.

SECT.

SECT. XVII.

9. Laſtly, others have traveled into far diſtant countries on purpoſe to collect the foreign plants; as Scheuchzer's travels through the Alps, Pona's plants of Mount Baldus, Ray's travels and voyages, Tournefort's voyage to the Levant, Shaw's travels into Africa, &c. Alpinus to Egypt, Kempfer to Japan, Margravius and Piſo to Brazil, Feuillee to Peru, Hernandez to Mexico, Cornutus to Canada, Rheede to Malabar, Rumphius to Amboyna, Sloane to Jamaica, Plumier to North America, &c.

SECT. XVIII.

The methodical writers (*methodici*), ſee N° 7, whoſe buſineſs was chiefly the regular diſpoſition and denomination, or ordering and naming the plants, are of ſeveral ſorts or orders; and

SECT. XIX.

1. Philoſophers (*philoſophi*) or theoretical botaniſts; and of them,

SECT. XX.

1. Some have written orations or declamations (*oratores*) in praiſe of botany, or a few general obſervations concerning the utility of the ſcience, &c. ſee the *Amœn. Acad.*

SECT.

SECT. XXI.

2. Some in the controverſial way (*eriſtici*) have written in defence of certain ſyſtems; as Tournefort's Elements, Colet's Critical Letters, Ray's Sylloge and Rivinus' Letters to Ray, Linnæus' *Methodus Plantarum*, and Sigeſbeck's Criticiſm on the ſame, &c.

SECT. XXII.

3. Some have laid down the laws and principles of vegetation, (*phyſiologi*) and the doctrine of the ſexes of plants; as Millington in 1676, Camerarius's Epiſtle, Vaillant's Diſcourſe, Wahlbom in his *Sponſalia Plantarum*, or Nuptials of Plants.

SECT. XXIII.

4. Others have laid down certain rules and aphoriſms on the fundamentals of botany; as Linnæus in his *Fundamenta Botanica*, Ludwigius in his Botanical Aphoriſms, &c.

SECT. XXIV.

2. The ſecond order of methodical writers (ſee N° 18.) are the ſyſtematics (*ſyſtematici*), who have diſpoſed the plants into certain claſſes, and are either the orthodox or heterodox, that is to ſay, the true ſyſtematics, or the falſe.

SECT. XXV.

The falſe ſyſtems, not being founded on the fructification, have ranged the plants, ſome in an alphabetical manner (*alphabetarii*), others according to the ſtructure of their roots (*rhizotomi*), others according to the different ſpecies of their leaves (*phyllophili*), or the habit or external appearance of plants (*phyſiognomi*), or their time of flowering (*chronici*), their places of growth (*topophili*), their medicinal uſes (*empirici*), or laſtly, according to the order laid down in the ſeveral diſpenſatories (*ſeplaſiarii*).

SECT. XXVI.

The true ſyſtematics (*orthodoxi*), who have always built their ſeveral methods on the fructification, are either univerſal, taking in the whole compaſs of vegetables; or partial, comprehending only a ſmall part.

SECT. XXVII.

The univerſal ſyſtems have been formed either on the ſeveral parts of

SECT. XXVIII.

The fruit, (*fructiſtæ*) viz. the *pericarpium*, ſeed or receptacle; as Cæſalpinus, Moriſon, Ray, Knautius, Herman, and Boerhaave; or on the

SECT. XXIX.

Corollæ or petals of the flower (*corolliſtæ*), as Rivinus, and Tournefort, &c. or on the

SECT. XXX.

Calyx or flower-cup (*calyciſtæ*), as Magnolius and Linnæus, in the year 1737; as we ſhall afterwards ſee in chap. II.; or, laſtly, on the

SECT. XXXI.

Sexes of plants (*ſexualiſtæ*), as that of Linnæus, firſt publiſhed in 1735, and now univerſally allowed to be the beſt.

SECT. XXXII.

Of the partial ſyſtems (*partiales*), which have been generally of one claſs only; the chief are the following, together with the authors who have treated on them.

SECT. XXXIII.

The compound flowers by Vaillant in 1718, and Pontedera in 1720.

SECT. XXXIV.

The umbelliferous plants by Moriſon in 1672, and Artedi in 1735.

SECT. XXXV.

The graſſes by Ray in 1703, by Monti in 1719, Scheuchzer in 1719, by Michelius in in 1729, and Linnæus in 1737, in his *Genera Plantarum.*

SECT. XXXVI.

The mosses by Dillenius, professor of botany at Oxford, in 1741.

SECT. XXXVII.

The funguses by Dillenius, then physician at Gissein in Germany, in 1719, and Michelius in 1729.

SECT. XXXVIII.

The third sort of methodical writers (see N° 18.) are called nomenclators, and are those who have written any thing concerning the names of plants; of whom

SECT. XXXIX.

1. Some have collected all the synonymous names (*synonomistæ*) given by different authors to plants, as Caspar Bauhin in his *Pinax.*

SECT. XL.

Some have written critical dissertations (*critici*) on the generic and specific names of plants, as Linnæus in his *Critica Botanica.*

SECT. XLI.

Others have endeavoured to find out the etymology (*etymologici*), or original derivation

vation of ſuch names, as Falugius in his *Proſopopœia.*

SECT. XLII.

Others have made collections (*lexicographi*) of the different names of plants uſed in different languages, as Menzelius in his *Lexicon Polyglotton.*

SECT. XLIII.

The lovers of botany (*botanophili*, N° 4.) are thoſe who have written various obſervations on plants in general, though not properly belonging to botany as a ſcience; as, for inſtance,

SECT. XLIV.

1. On the internal ſtructure of plants, (*anatomici*) as Malpighi, Grew, Hales.

SECT. XLV.

2. On the culture of plants (*hortulani*), as Miller, Bradley, and others on huſbandry and gardening.

SECT. XLVI.

3. On the medicinal virtues and uſes of plants, which ſome have endeavoured to deduce from

SECT.

SECT. XLVII.

Aſtrology *(aſtrologi)*, that is to ſay, from the influence of the ſtars, as Bodeſtein; others from the ſimilitude *(ſignatores)* between the part of the plant and the part injured or diſeaſed, as Pappen; others from

SECT. XLVIII.

Chemiſtry *(chemici)*, that is to ſay, from a chemical analyſis of the plants, as Geofroy, Tournefort, &c.

SECT. XLIX.

Others from obſervation and experience *(obſervatores)*, as Herman, Boerhaave, Linnæus in his *Materia Medica*, Haller; or from mechanical and phyſiological principles.

SECT. L.

Others have endeavoured to aſcertain the virtues of eſculent plants from ſmell and taſte *(diætetici)*, as Quercetan, Nonnius, Behren, Liſter.

SECT. LI.

And laſtly, others have diſtinguiſhed the virtues of medicinal plants according to the natural claſſes *(botano-ſyſtematici)* to which they belonged, as Camerarius in his *Con-*

venientia Plantarum, and Haſſelquiſt in his Tract called *Vires Plantarum*, in the *Amœn. Acad.*

SECT. LII.

Of the fourth and laſt ſpecies of the lovers of botany (ſee N° 43.) we ſhall reckon thoſe who have written various obſervations on the manifold uſes of plants in common life, as Linnæus in his *Flora Oeconomica*, his *Pan Suecicus*, his *Iter Olandicum*, *Gothicum*, *Weſtrogothicum*, *Scanicum*; or thoſe who have written the lives of famous botaniſts; or thoſe who have explained the ſcripture plants, as Celſius in his *Hierobotanicon*; or laſtly, the botanic works of ſeveral excellent poets, as Macer, Strabus, Rapin, Nevianus, Pectorius, Santolinus, Falugius, and Cowley.

CHAP. II. Systems of Botany.

SECT. LIII.

TO the true ſyſtematics, and to them only, all the clearneſs and perſpicuity, as well as certainty of botany as a ſcience, is owing: they are the following, together with their ſyſtems.

SECT. LIV.

Cæſalpinus founds his ſyſtem on the fruit. He is the firſt true ſyſtematic writer;

ter; diſtributing his claſſes according to the ſituation of the *corculum* or germ of the ſeed and receptacle.

1. *Arbores Corculo ex Apice Seminis.* Trees with the germ on the point of the ſeed.
2. —— *Corculo ex Baſi Seminis.* Trees with the germ on the baſe of the ſeed.
3. *Herbæ Monoſpermæ.* Herbs having one ſeed only.
4. —— *Diſpermæ.* Herbs having two ſeeds.
5. —— *Tetraſpermæ.* Herbs having four ſeeds.
6. —— *Polyſpermæ.* Herbs having many ſeeds.
7. —— *Monococcæ.* Herbs having one grain or kernel.
8. —— *Monocapſulæ.* Herbs having one capſule.
9. —— *Bicapſulæ.* Herbs having two capſules.
10. —— *Fibroſæ.* Herbs having fibrous roots.
11. —— *Bulboſæ.* Herbs having bulbous roots.
12. —— *Cichoraceæ.* Herbs having ſuccory or endive-like flowers.
13. —— *Flore Communi.* Herbs having a common flower.
14. —— *Pluribus Folliculis.* Herbs having ſeveral follicles or ſeed-bags.

15. *Herbæ Ananthæ et Aspermæ.* Herbs having neither flower nor feed.

SECT. LV.

Morifon founds his fyftem on the fruit, the *corollæ*, and habit of the plants.

1. *Arbores.* Trees.
2. *Frutices.* Shrubs.
3. *Suffrutices.* Underfhrubs.
4. *Herbæ Scandentes.* Herbs climbing.
5. —— *Leguminofæ.* Herbs leguminous or papilionaceous.
6. —— *Siliquofæ.* Herbs podded.
7. —— *Tricapfulares.* Herbs tricapfular, or with three capfules.
8. —— *a numero Capfularum dictæ.* Herbs with 4, 5, &c. capfules.
9. —— *Corymbiferæ.* Herbs corymbiferous.
10. —— *Lactefcentes f. pappofæ.* Herbs having a milky juice, or downy tops.
11. —— *Culmiferæ.* Herbs culmiferous, as graffes.
12. —— *Umbelliferæ.* Herbs umbelliferous.
13. —— *Tricoccæ.* Herbs having three kernels.
14. —— *Galeatæ.* Herbs having helmet-fhaped flowers.
15. —— *Multicapfulares.* Herbs having many capfules.

16. *Herbæ*

16. *Herbæ Bacciferæ*. Herbs berry-bearing.
17. —— *Capillares*. Herbs called capillary plants, as the fern kind.
18. —— *Heteroclitæ*. Herbs anomalous or irregular.

SECT. LVI.

Herman builds his ſyſtem on the fruit, claſſing the plants according as they have naked ſeed or ſeed veſſels, in the following manner.

1. *Herbæ Gymnomonoſpermæ ſimplices*. One naked ſeed, and a ſimple flower.
2. ———————— *compoſitæ*. One naked ſeed, and a compound flower.
3. —— *Gymnodiſpermæ ſtellatæ*. Two naked ſeeds, and ſtellated or ſtar-ſhaped.
4. ———————— *umbellatæ*. Two naked ſeeds, and umbelliferous.
5. —— *Gymnotetraſpermæ aſperifol*. Four naked ſeeds, and rough leaves.
6. ———————— *verticillat*. Four naked ſeeds, and verticillated or whorl-ſhaped.
7. —— *Gymnopolyſpermæ*. Many naked ſeeds.
8. —— *Angioſpermæ, bulboſæ tricapſul*. Having ſeed veſſels, bulbous and tricapſular.

9. *Herbæ Angiospermæ Univasculares.* One seed vessel.

10. ———————— *Bivasculares.* Two seed vessels.

11. ———————— *Trivasculares.* Three seed vessels.

12. ———————— *Quadrivasculares.* Four seed vessels.

13. ———————— *Quinquevasculares.* Five seed vessels.

14. ———————— *Siliquosæ.* Podded, which are always tetrapetalous.

15. ———————— *Leguminosæ.* Leguminous and papilionaceous.

16. ———————— *Multicapsulares.* Many capsules.

17. ———————— *Carnosæ. Bacciferæ.* Fleshy fruit. Berry-bearing.

18. ———————— *Carnosæ. Pomiferæ.* Fleshy fruit. Apple bearing.

19. —— *Apetalæ Calyculatæ.* Without petals, but having a calyx.

20. ———— *Glumosæ s. stamineæ.* Without petals, chaffy or stamineous,

21. ———— *Nudæ s. muscosæ.* Without petals, calyx, chaff, or *stamina*, i. e. a naked *anthera*, as the mosses.

22. *Arbores. Incompletæ, Juliferæ.* Trees. Imperfect fructif. bearing catkins.

23. ——— *Carnosæ umbilicatæ.* Trees with a fleshy fruit, umbilicated or navel-shaped.

24. *Arbores*

24. *Arbores Carnoſæ non umbilicatæ.* Trees with a fleſhy fruit not umbilicated.
25. —— *Fructu Sicco.* Trees with a dry fruit.

SECT. LVII.

Chriſtopher Knautius takes Ray's method inverted, as follows.

1. *Herbæ Bacciferæ.* Herbs berry-bearing.
2. —— *Monopetalæ.* Monopetalous, 1 petal.
3. —— *Tetrapetalæ regulares.* Tetrapetalous and regular, 4 petals.
4. ———————— *irregulares.* Tetrapetalous and irregular.
5. —— *Pentapetalæ.* Pentapetalous, or 5 petals.
6. —— *Hexapetalæ.* Hexapetalous, or 6 petals.
7. —— *Polypetalæ.* Polypetalous, or many petals.
8. —— *Multicapſulares.* Multicapſular, or many capſules.
9. —— *Gymnoſpermæ.* Naked ſeeds.
10. —— *Solidæ.* Solid, or not downy.
11. —— *Pappoſæ.* Downy ſeeds.
12. —— *Apetalæ.* Without petals.
13. —— *Stamineæ.* Stamineous, without petals or calyx.
14. —— *Inconſpicuæ.* Imperceptible.

15. *Herbæ Imperfectæ.* Imperfect.
16. *Arbores.* Trees.
17. *Frutices.* Shrubs.

SECT. LVIII.

Boerhaave blends Herman's ſyſtem with that of Ray and Tournefort, in the following manner.

1. *Herbæ Submarinæ.* Herbs ſubmarine, or ſea plants.
2. —— *Terreſtres.* Imperfect land plants.
3. —— *Capillares.* Capillary plants, or the fern kind.
4. —— *Gymnopolyſpermæ.* Many naked ſeeds.
5. —— *Gymnotetraſpermæ verticillatæ.* Four naked ſeeds, and verticillated.
6. ———————— *aſperifoliæ.* Four naked ſeeds, and rough leaves.
7. ———————— *tetrapetalæ.* Four naked ſeeds, and four petals.
8. —— *Monangiæ.* Having one ſeed veſſel.
9. —— *Diangiæ.* Two ſeed veſſels.
10. —— *Triangiæ.* Three ſeed veſſels.
11. —— *Tetrangiæ.* Four ſeed veſſels.
12. —— *Pentangiæ.* Five ſeed veſſels.
13. —— *Polyangiæ.* Many ſeed veſſels.
14. —— *Gymnodiſpermæ umbellatæ.* Two naked ſeeds, and umbelliferous.

15. *Herbæ*

15. *Herbæ Gymnodiſpermæ ſtellatæ.* Two naked ſeeds, and ſtar-ſhaped.
16. —— *Gymnomonoſpermæ ſimplices.* One naked ſeed, and a ſimple flower.
17. ———————— *planipetalæ.* One naked ſeed, and comp. fl. ſemi-floſculous.
18. ———————— *radiatæ.* One naked ſeed, and comp. fl. radiated.
19. ———————— *nudæ.* One naked ſeed, and comp. fl. corymbiferous.
20. ———————— *capitatæ.* One naked ſeed, and comp. fl. floſculous.
21. —— *Bacciferæ.* Berry-bearing herbs.
22. —— *Pomiferæ.* Apple-bearing herbs.
23. —— *Apetalæ.* Without petals.
24. —— *Monocotyledones Bracteatæ.* One cotyledon, and having petals.
25. ———————— *Apetalæ.* One cotyledon, and without petals.
26. *Arbores Monocotyledones.* Trees having one cotyledon.
27. —— *Multiſiliquæ.* Many podded.
28. —— *Siliquoſæ.* Podded.
29. —— *Tetrapetalæ cruciformes.* Tetrapetalous and cruciform.
30. —— *Leguminoſæ.* Leguminous.
31. —— *Apetalæ.* Having no petals.
32. —— *Amentaceæ.* Bearing catkins.
33. —— *Monopetalæ.* Monopetalous flowers.
34. —— *Roſaceæ.* Roſaceous flowers.

SECT.

SECT. LIX.

I. Ray's firſt method or ſyſtem is taken chiefly from the fruit, as in the following table.

1. *Arbores.* Trees.
2. *Frutices.* Shrubs.
3. *Herbæ imperfectæ.* Herbs imperfect.
4. —— *Flore carentes.* Having no flower.
5. —— *Capillares.* Capillary plants.
6. —— *Stamineæ.* Stamineous, having only the *ſtamina.*
7. —— *Gymnomonoſpermæ.* One naked ſeed.
8. —— *Umbellatæ.* Umbelliferous.
9. —— *Verticillatæ.* Verticillated, annular or ring-ſhaped.
10. —— *Aſperifoliæ.* Rough leafed.
11. —— *Stellatæ.* Stellated or ſtar-ſhaped.
12. —— *Pomiferæ.* Apple-bearing herbs.
13. —— *Bacciferæ.* Berry-bearing herbs.
14. —— *Multiſiliquæ.* Many podded.
15. —— *Monopetalæ uniformes.* Monopetalous uniform or regular.
16. ———————— *difformes.* Monopetalous irregular, or different forms.
17. —— *Tetrapetalæ ſiliquoſæ.* Tetrapetalous, large pods.
18. ———————— *ſiliculoſæ.* Tetrapetalous, ſmall pods.
19. —— *Papilionaceæ.* Papilionaceous.

20. *Herbæ*

20. *Herbæ Pentapetalæ.* Pentapetalous, or five petals.
21. —— *Frumenta.* Corns.
22. —— *Gramina.* Graſſes.
23. —— *Graminifolia.* Graſs - leafed plants.
24. —— *Bulboſæ.* Bulbous rooted plants.
25. —— *Bulboſis affines.* Plants near a-kin to the bulbous.

II. Ray's method amended is taken from the fruit and *corolla*, as may be ſeen in the following table.

1. *Herbæ Submarinæ.* Submarine plants or ſea plants.
2. —— *Fungi.* Funguſes.
3. —— *Muſci.* Moſſes.
4. —— *Capillares.* Capillary plants.
5. —— *Apetalæ.* Without petals.
6. —— *Planipetalæ.* Comp. fl. ſemi-floſculous, or half florets.
7. —— *Diſcoideæ.* Comp. fl. radiated.
8. —— *Corymbiferæ.* Comp. fl. corym-biferous.
9. —— *Capitatæ.* Comp. fl. floſculous, or whole florets.
10. *Monoſpermæ.* One ſeed.
11. —— *Umbellatæ.* Umbellated.
12. —— *Stellatæ.* Stellate, or ſtar-ſhaped.
13. —— *Aſperifoliæ.* Rough leafed.

14. *Herbæ Verticillatæ.* Verticillate, or whorled.
15. —— *Polyſpermæ.* Many ſeeds.
16. —— *Pomiferæ.* Apple-bearing herbs.
17. —— *Bacciferæ.* Berry-bearing herbs.
18. —— *Multiſiliquæ.* Many pods.
19. —— *Monopetalæ.* Monopetalous, or one petal.
20. —— *Di-tripetalæ.* Two and three petals.
21. —— *Siliquoſæ et ſiliculoſæ.* Great and ſmall, or long and ſhort pods.
22. —— *Leguminoſæ.* Leguminous plants.
23. —— *Pentapetalæ.* Pentapetalous, or five petals.
24. —— *Bulboſæ, et bulboſis affines.* Bulbs, and bulbous-like plants.
25. —— *Stamineæ.* Stamineous, i. e. having only the *ſtamina.*
26. —— *Anomalæ.* Herbs of an uncertain family.
27. *Arbores Arundinaceæ.* The palms.
28. ——— *Apetalæ.* Trees without petals.
29. ——— *Fructu umbilicato.* Trees with an umbilicated fruit.
30. ——— *Fructu non umbilicato.* Trees with fruit not umbilicated.
31. ——— *Fructu ſicco.* Trees with a dry fruit.
32. ——— *Fructu ſiliquoſo.* Trees with podded fruit.

Arbores

33. *Arbores Anomalæ.* Trees anomalous or irregular.

SECT. LX.

Camellus attempted to diſpoſe the plants according to the valves of the *pericarpium*, thus,

Pericarpia Aſora. *Pericarpium* without valves.

——— *Uniſora.* ——— with one valve.

——— *Biſora.* ——— with two valves.

——— *Triſora.* ——— with three valves.

——— *Tetraſora.* ——— with four valves.

——— *Pentaſora.* ——— with five valves.

——— *Hexaſora, &c.* ——— with ſix valves, &c.

SECT. LXI.

Rivinus forms his ſyſtem on the regularity and number of the petals, taking in alſo the fruit, which is of three ſorts, viz. either 1. naked, or having 2. a dry, or 3. a fleſhy *pericarpium*.

Ruppius afterwards improved Rivinus's ſyſtem in the compound flowers.

1. *Regulares*

1. *Regulares Monopetalæ.* Regular. Monopetalous, or 1 petal.
2. ——— *Dipetalæ.* ——— Dipetalous, or 2 petals.
3. ——— *Tripetalæ.* ——— Tripetalous, or 3 petals.
4. ——— *Tetrapetalæ.* ——— Tetrapetalous, or 4 petals.
5. ——— *Pentapetalæ.* ——— Pentapetalous, or 5 petals.
6. ——— *Hexapetalæ.* ——— Hexapetalous, or 6 petals.
7. ——— *Polypetalæ.* ——— Polypetalous, or many petals.
8. *Irregulares Monopetalæ.* Irregular. Monopetalous, or 1 petal.
9. ——— *Dipetalæ.* ——— Dipetalous, or 2 petals.
10. ——— *Tripetalæ.* ——— Tripetalous, or 3 petals.
11. ——— *Tetrapetalæ.* ——— Tetrapetalous, or 4 petals.
12. ——— *Pentapetalæ.* ——— Pentapetalous, or 5 petals.
13. ——— *Hexapetalæ.* ——— Hexapetalous, or 6 petals.
14. ——— *Polypetalæ.* ——— Polypetalous, or many petals.
15. *Compositæ ex flore regulari.* Comp. fl. of regular florets.
16. ——— *regulari et irregulari.* Comp. fl. of regular and irregular florets.

17. *Compositæ*

17. *Compoſitæ ex flore irregulari.* Comp. fl. of irregular florets only.
18. *Incompletæ Imperfectæ.* Incompleat or imperfect plants.

SECT. LXII.

Knautius (Chriſtian) inverted Rivinus's ſyſtem, preferring number to regularity. He maintained alſo that there were no flowers without petals, nor any naked ſeeds.

1. *Monopetali Uniformes.* Monopetalous, uniform or regular.
2. ——— *Difformes.* Monopetalous, difform or irregular.
3. ——— *aggregati uniformes.* Monopetalous. comp. uniform or regular.
4. ——————— *Difformes.* Monopetalous, comp. difform or irregular.
5. ——————— *Uniformi-difformes.* Monopetalous, comp. uniform and difform together.
6. *Dipetali Uniformes.* Dipetalous, uniform or regular.
7. ——— *Difformes.* Dipetalous, difform or irregular.
8. *Tripetali Uniformes.* Tripetalous, uniform or regular.
9. ——— *Difformes.* Tripetalous, difform or irregular.

10. *Tetrapetali*

10. *Tetrapetali Uniformes.* Tetrapetalous, uniform or regular.
11. ——— *Difformes.* Tetrapetalous, difform or irregular.
12. *Pentapetali Uniformes.* Pentapetalous, uniform or regular.
13. ——— *Difformes.* Pentapetalous, difform or irregular.
14. *Hexapetali Uniformes.* Hexapetalous, uniform or regular.
15. ——— *Difformes.* Hexapetalous, difform or irregular.
16. *Polypetali Uniformes.* Polypetalous, uniform or regular.
17. ——— *Difformes.* Polypetalous, difform or irregular.

SECT. LXIII.

Ludwigius united Rivinus's method with that of Linnæus, thus,

Monantheræ, monoſtyli. One *anthera* and one ſtyle.

Diantheræ, diſtyli. Two *antheræ*, two ſtyles.

Triantheræ, triſtyli. Three *antheræ*, three ſtyles.

Pentantheræ, tetraſtyli. Five *antheræ*, four ſtyles.

Decantheræ, &c. polyſtyli, &c. Ten *antheræ*, &c. many ſtyles, &c.

Thus taking his claſſes from the *antheræ*, and the orders of his claſſes from the ſtyles.

SECT. LXIV.

Tournefort's ſyſtem is formed on the regularity and figure of the petals, together with the two-fold ſituation of the receptacle of the flower. His orders on the *piſtillum* or *calyx*.

HERBÆ. HERBS.

1. *Simplices monopetalæ campaniformes.* Simple flowers monopetalous, bell-ſhaped.
2. *Simplices monopetalæ infundibuliformes & rotatæ.* Simple flowers monopetalous, tunnel and wheel-ſhaped.
3. *Simplices monopetalæ labiatæ.* Simple flowers monopetalous, labiate or lip'd.
4. *Simplices monopetalæ anomalæ.* Simple flowers monopetalous, anomalous or irregular.
5. *Simplices polypetalæ cruciformes.* Simple flowers polypetalous, cruciform or croſs-ſhaped.
6. *Simplices polypetalæ roſaceæ.* Simple flowers polypetalous, roſaceous, like a roſe.
7. *Simplices polypetalæ umbellatæ.* Simple flowers polypetalous, umbellated.
8. *Simplices polypetalæ caryophyllaceæ.* Simple flowers polypetalous, caryophyllaceous, clove-form.
9. *Simplices polypetalæ liliaceæ.* Simple flowers polypetalous, liliaceous, or lily-form.

10. *Simplices polypetalæ papilionaceæ*. Simple flowers polypetalous, papilionaceous, butterfly-form.
11. *Simplices polypetalæ anomalæ*. Simple flowers polypetalous, anomalous or irregular.
12. *Compoſitæ floſculoſæ*. Compound flowers floſculous, tubular or whole florets.
13. ——— *Semifloſculoſæ*. Compound flowers ſemifloſculous, flat or half florets.
14. ——— *Radiatæ*. Compound flowers radiated, like the ſpokes of a wheel.
15. *Apetalæ*. Apetalous, having no petals.
16. *Ananthæ ſpermatophoræ*. No flower, but bearing ſeed.
17. *Ananthæ & aſpermæ vulgo*. No flower nor ſeed in the vulgar eſtimation.

ARBORES. TREES.

18. *Arbores, Apetalæ ſtamineæ*. No petals, but bare *ſtamina*.
19. ——— *Apetalæ amentaceæ*. No petals, bearing catkins.
20. ——— *Monopetalæ*. Monopetalous.
21. ——— *Roſaceæ*. Roſaceous.
22. ——— *Papilionaceæ*. Papilionaceous.

SECT. LXV.

Pontedera's ſyſtem is a compound of Tournefort and Rivinus's ſyſtems.

1. *Incertæ*. Uncertain to which claſs they belong.
2. *Floribus deſtitutæ*. Having no flowers.

3. *Gemmis carentes imperfectæ.* Without buds, imperfect plants.

4. ———— *Anomalæ.* Anomalous or irregular.

5. ———— *Labiatæ.* Labiated.

6. ———— *Campaniformes.* Bell-ſhaped.

7. ———— *Hypercrateriformes.* Saucer-ſhaped.

8. ———— *Rotatæ.* Wheel-ſhaped.

9. ———— *Infundibuliformes.* Tunnel-ſhaped.

10. ———— *Floſculoſæ.* Floſculous.

11. ———— *Lingulatæ.* Semifloſculous.

12. ———— *Radiatæ capitulis.* Radiated.

13. ———— *Anomalæ.* Irregular.

14. ———— *Papilionaceæ.* Papilionaceous.

15. ———— *Liliaceæ.* Liliaceous.

16. ———— *Caryophyllaceæ.* Caryophillaceous.

17. ———— *Cruciformes.* Cruciform, or croſs-ſhaped.

18. ———— *Umbellatæ.* Umbellated.

19. ———— *Filamentoſæ.* Stamineous, or naked *ſtamina.*

20. *Gemmiferæ Filamentoſæ.* Bearing buds, ſtamineous, or naked *ſtamina.*

21. ———— *Apetalæ.* Bearing buds, apetalous, without petals.

22. *Gemmiferæ Anomalæ.* Bearing buds, irregular.

23. ——— *Campaniformes.* Bearing buds, bell-ſhaped.

24. ——— *Rotatæ.* Bearing buds, wheel-ſhaped.

25. ——— *Infundibuliformes.* Bearing buds, tunnel-ſhaped.

26. ——— *Papilionaceæ.* Bearing buds, papilionaceous.

27. ——— *Roſaceæ.* Bearing buds, roſaceous.

SECT. LXVI.

Magnolius's ſyſtem is formed on the calyx and fruit.

HERBÆ. HERBS.

1. *Calyce externo includente florem ignotum.* Calyx external, including a flower unknown.

5. *Calyce externo includente florem ſtamineum.* Calyx external, including a flower ſtamineous.

4. *Calyce externo includente florem monopetalum.* Calyx external, including a flower monopetalous.

3. *Calyce externo includente florem polypetalum.* Calyx external, including a flower polypetalous.

2. *Calyce externo includente florem compoſitum.* Calyx external, including a flower compound.

6. *Herbæ*

6. *Herbæ Calyce externo ſuſtinente florem monopetal.* Calyx external, ſupporting a flower monopetalous.
7. ——— *Calyce externo ſuſtinente florem polypetal.* Calyx external, ſupporting a flower polypetalous.
8. ——— *Calyce interno tantum.* Calyx internal only, which is the *corolla.*
9. ——— *Calyce externo internoque flore monopetalo.* Calyx external and internal, flower monopetalous.
10. ——— *Calyce externo internoque flore di-tripetalo.* Calyx external and internal, flower with two and three petals.
11. ——— *Calyce externo internoque flore tetrapetalo.* Calyx external and internal, tetrapetalous.
12. ——— *Calyce externo internoque flore polypetalo.* Calyx external and internal, polypetalous.

ARBORES. TREES.

13. *Calyce externo tantum.* Calyx external only.
14. —— *interno tantum.* Calyx internal only.
15. —— *externo internoque ſimul.* Calyx external and internal both.

SECT. LXVII.

Linnæus formed in 1737 a ſyſtem from the calyx, as follows.

1. *Spathacei.* Spathaceous, like a ſheath or hoſe.
2. *Glumoſi.* Glumoſe, or chaffy.
3. *Amentacei.* Amentaceous, or catkins.

4. *Umbellati.* Umbellated.
5. *Communes.* Common calyx, or flower cup.
6. *Duplicati.* Double calyx.
7. *Floribundi.* Flowering; the petals and *ſtamina* are inſerted into the flower-cup.
8. *Coronati.* Crowned, or crown-ſhaped with a *radius.*
9. *Anomali.* Irregular.
10. *Difformes.* Difform, or different ſhapes.
11. *Caduci.* Caducous, which fall off, or ſhed their leaves.
12. *Perſiſtentes uniformes monopetali.* Not caducous, uniform and monopetalous.
13. ——— *uniformes polypetali.* Not caducous, uniform and polypetalous.
14. ——— *difformes monopetali.* Not caducous, difform and monopetalous.
15. ——— *difformes polypetali.* Not caducous, difform and polypetalous.
16. *Incompleti.* Incompleat calyx.
17. *Apetali.* Apetalous, or a bare calyx without petals.
18. *Nudi.* Naked, or no petals nor calyx.

SECT. LXVIII.

Linnæus's ſexual ſyſtem is formed on the *number*, *proportion*, *figure*, and *ſituation* of the *ſtamina* and *piſtilla*, which he calls the male and female parts of vegetables. It conſiſts

consists of 25 classes, which are taken from the *stamina*, or rather the *antheræ*; and the orders of the first 13 classes from the *pistilla*, as *monogynia*, *digynia*, *trigynia*, *tetragynia*, *&c.* that is, 1, 2, 3, 4 *pistilla*, &c. The orders of the last 12 classes are characterized from other parts of the fructification, &c. six or seven of his classes are natural, and have been most of them assumed by all the systematic authors. These are the 14th, which contains the labiated and personated flowers of Tournefort; the 15th, the tetrapetalous and cruciform of Tournefort; the 16th, the mucilaginous monopetalous of Tournefort; the 17th, the papilionaceous or leguminous plants of Tournefort; the 19th, the compound flowers which make three of Tournefort's classes, viz. the flosculous, semiflosculous, and radiated; the 24th, the ananthous and aspermous of Tournefort; the 25th, is the first of Royen.

Classes.		Characters of the Classes.
1. *Monandria.*	Number.	One fertile stamen, *i. e.* having the *anthera.*
2. *Diandria.*		Two fertile, or fruitful *stamina.*
3. *Triandria.*		Three ditto.
4. *Tetrandria.*		Four ditto, all of an equal length, by which this is distinguished from the 14th class.

Claſſes.		Characters of the Claſſes.
5. *Pentandria.*		Five ditto.
6. *Hexandria.*		Six ditto, all of an equal length, by which this is diſtinguiſhed from the 15th claſs.
7. *Heptandria.*		Seven ditto.
8. *Octandria.*		Eight ditto.
9. *Enneandria.*		Nine ditto.
10. *Decandria.*		Ten ditto.
11. *Dodecandria.*		From 11 to 19 *ſtamina* incluſive.
12. *Icoſandria.*	Number.	Twenty *ſtamina* and upwards, ſometimes fewer, which are fixed to the inner ſide of the *corolla* or calyx, and not to the receptacle; and the *corolla* is faſtened to the inner ſide of the calyx, which is concave and monophylous, or conſiſts of one leaf.
13. *Polyandria.*		From 15 to 1000 *ſtamina*, which are faſtened to the receptacle. It differs from the *Icoſandria* in the calyx, and the inſertion of the *ſtamina* and *corolla*.

14. *Didynamia.*

Claſſes.		Characters of the Claſſes.
14. *Didynamia.*	Proportion.	Four *ſtamina.* The two next to one another ſhorter than the other two, one ſtyle and an uneven *corolla.*
15. *Tetradynamia.*		Six *ſtamina* tapering and erect; the two oppoſite *ſtamina* are as long as the calyx, *the other four a little longer*, but ſhorter than the *corolla*, four even petals.
16. *Monadelphia.*	Figure.	A *Perianthium*, not caducous, often double, five petals. The filaments are all joined below into one parcel, but not above, the external are ſhorteſt.
17. *Diadelphia.*		The filaments are joined below into two parcels; the lower has nine. A *perianthium* monophyllous, campanulated, caducous; the *cor.* always papilionaceous and uneven.

Classes.		Characters of the Classes.
18. *Polyadelphia.*	Figure.	The filaments of the *stamina* are united below into three or more distinct parcels.
19. *Syngenesia.*		The *stamina* are joined by their *antheræ* (rarely by their filaments) in the form of a cylinder.
20. *Gynandria.*		The *stamina* grow upon the style, or on the receptacle elongate, in the form of a style; which in that case supports both the *stamina* and *pistilla.*
21. *Monæcia.*	Situation.	Male and female flowers in distinct cups on the same plant. All these are called androgynous plants.
22. *Diæcia.*		Male and female flowers on different plants of the same species.
23. *Polygamia.*		Male, female, and hermaphrodite flowers distinct in the same species,

Classes.	Characters of the Classes.
	ſpecies, and ſometimes on the ſame plant. All the plants of this claſs are called polygamous.
24. *Cryptogamia.*	The fructification either wholly eſcapes our notice, or the flowers are hid within the fruit.
25. *Palmæ.* This laſt claſs is by way of an appendix to the ſexual ſyſtem; becauſe their fructification is hitherto but imperfectly made out. They are all of the 21ſt, 22d, and 23d claſſes.	Palms, which have always a ſimple ſtem, not branched, the top frondoſe, the fructification on a ſpadix, which is originally contained within a *ſpatha* or ſheath. The flowers of all the palm kind are always tripetalous.

Monoclinia, i. e. the firſt 20 claſſes have the male and female parts both in the ſame calyx; or in other words they are all hermaphrodite flowers. The 21ſt, 22d, 23d claſſes are *diclinia*, *i. e.* they have the male and female organs in diſtinct flowers.

Obſ. The *Dodecandria* and *Polyandria*, in my opinion, are not ſufficiently diſtinguiſhed.

Obſ. on claſs 22, *Diæcia*. There are many flowers which have the male and female

male organs on different plants of the ſame ſpecies, which are put under other claſſes, and could not be reckoned under the *Diœcia*, becauſe all the ſpecies of thoſe *genera* are not diſtinct ſexes, as for example, the *carex dioica*, *valeriana dioica*, *morus nigra*, *phylica dioica*, *rhamnus alaternus*, *ſalix pentandra*, *rumex acetoſa*, *laurus nobilis*, *acer rubrum*, *lychnis dioica*, *cucabalus otites*, *phytolacca dioica*, *rubus chamæmorus*, *clematis dioica*, *thalictrum dioicum*, *napæa dioica*, *gnaphalium dioicum*, *&c.* Vide Syſt. Nat. 642, &c.

See Tab. I. where the claſſes and their characters are repreſented on a beautiful copper-plate.

SECT. LXIX.

Haller in 1740, Royen in 1742, and Wackendorf in 1747, have each of them endeavoured to find out a natural method, or nature's ſyſtem, in the cotyledons, the calyx, the ſex, and other parts and circumſtances of plants.

Royen's natural method is as follows.

1. *Palmæ.* Palms.
2. *Lilia.* Lilies.
3. *Gramina.* Graſſes and corn.
4. *Amentaceæ.* Catkins.
5. *Umbellatæ.* Umbels.
6. *Compoſitæ.* Compound flowers.
7. *Aggregatæ.* Aggregate flowers.

8. *Tricoccæ.*

8. *Tricoccæ.* Three kernels or grains.
9. *Incompletæ.* Incomplete or imperfect.
10. *Fructifloræ.* That bear the flower upon the fruit, or above the germ.
11. *Calycifloræ.* That bear the flower within the calyx, or below the germ.
12. *Ringentes.* Gaping flowers.
13. *Siliquosæ.* Siliquose, or podded.
14. *Columniferæ.* Plants with a pillar-like appearance in the middle of the flower.
15. *Leguminosæ.* Leguminous plants or pulse.
16. *Oligantheræ.* *Stamina*, fewer than the divisions of the *corolla*.
17. *Diplosantheræ.* *Stamina*, double the number of the divisions of the *corolla*.
18. *Polyantheræ.* Many more *antheræ* than the divisions of the *corolla*.
19. *Cryptantheræ.* Hidden *antheræ*.
20. *Lithophyta.* Hard or stony plants.

Haller's natural method.

1. *Fungi.* Funguses.
2. *Musci.* Mosses.
3. *Epiphyllospermæ.* Bearing seed on the leaves.
4. *Apetalæ.* Without petals.
5. *Gramina.* Grasses.
6. *Graminibus affines.* Grass-leafed plants.
7. *Monocotyledones Petaloideæ.* One cotyledon or lobe, with petals.

8. *Polystemones.*

8. *Polyſtemones.* Many more *ſtamina* than petals.
9. *Diploſtemones.* Double the number of *ſtamina* to the petals.
10. *Iſoſtemones.* Equal number of *ſtamina* and petals.
11. *Mejeſtomones.* Leſſer number of *ſtamina* than petals.
12. *Staminibus ſeſquialteris.* Half as many more *ſtamina* than petals.
13. *Staminibus ſeſquitertiis.* A third part more *ſtamina* than petals.
14. *Staminibus* 4 *ringentes.* Four *ſtamina*, and a gaping *corolla.*
15. *Congregatæ.* Aggregate and compound flowers.

Wackendorf's natural method.

1. *Gymnoſpermæ.* Naked ſeeds.
2. *Homoiodiperianthæ.* Plants with ſeed veſſels. The *ſtamina* and petals equal to the diviſions of the calyx.
3. *Anomoiodiperianthæ.* Plants with ſeed veſſels. The *ſtamina* and petals not equal to the diviſions of the calyx.
4. *Pollaploſtemonopetalæ.* The *ſtamina* much more numerous than the petals.
5. *Aniſoſtemonopetalæ.* The *ſtamina* and petals unequal in length.
6. *Cylindrobaſioſtemones.* Filaments united in a cylinder below the *antheræ*, diſtinct at top, as in the *monadelphia.*

7. *Dima-*

7. *Dimacroſtemones.* Four *ſtamina*, two long, and two ſhort.
8. *Tetramacroſtemones.* Six *ſtamina*, four long, and two ſhort.
9. *Diſtemonopleantheræ.* Filaments united in two parcels below, as in *Diadelphia.*
10. *Eleutherantheræ.* Aggregate flowers properly ſo called, as *Dipſacus.*
11. *Cylindrantheræ.* Compound flowers properly ſo called, as in *Syngeneſia.*
12. *Monoperianthæ.* Flowers having no *corollæ.*
13. *Monophythanthæ.* Monæcious flowers.
14. *Diphythanthæ.* Diæcious flowers.
15. *Acalyces.* Flowers having no calyx.
16. *Calycinæ.* Viſible flowers which have a calyx, and a ſingle cotyledon, as *Juncus.*
17. *Spathaceæ.* Spathaceous plants.
18. *Glumoſæ.* Chaffy plants.
19. *Cryptanthæ.* Fructification ſcarce viſible.

Thus have we mentioned all the univerſal methods of claſſing plants, made uſe of by the true or orthodox ſyſtematics before the middle of this century.

We ſhall next ſpeak of the partial ſyſtems, which have been generally of one claſs only.

SECT. LXX.

Vailliant has diſtributed the compound flowers according to the calyx, receptacle,

 and

and *coronula*, or little crown of the ſeed, thus,

Claſſes. *Cynarocephali.* *Capitatæ* of Ray, round or globular heads.

—— *Corymbiferi.* Compound flowers corymbiferous.

—— *Cichoreacei.* Compound flowers ſemifloſculous or half florets.

—— *Dipſacei.* Compound flowers where each floret has a proper calyx.

Orders. *Calyx ſimplex.* Calyx ſimple.

—— —— *imbricatus.* Calyx imbricated.

—— —— *calyculatus.* Calyx included within another calyx.

—— *Receptaculum nudum.* Receptacle naked or bare.

—— *Receptaculum paleaceum.* Receptacle chaffy.

—— *Receptaculum piloſum.* Receptacle hairy.

—— *Coronula nulla.* Crown of the ſeed none.

—— *Coronula piloſa.* Crown of the ſeed hairy.

—— *Coronula plumoſa.* Crown of the ſeed feathered.

SECT. LXXI.

The umbelliferous plants were claſſed by Moriſon according to the figure of the ſeeds, but by Artedius according to the *involucra* into three claſſes, thus,

Involucrum

Involucrum univerſale et partiale. Univerſal and partial *involucrum.*

——— *partiale tantum.* Partial *involucrum* only.

——— *nullum.* No *involucrum.*

SECT. LXXII.

Ray, Montius, and Scheuchzer have diſpoſed the graſſes according to their affinity with the different ſorts of corn, &c. Michelius according to the glume or chaff, ſimple or compound; and Linnæus according to the ſexes.

Ray, Montius, and Scheuchzer's *genera* of graſſes are:

Spicata Triticea. Spiked like wheat.

——— *Hordeacea.* Spiked like barley.

——— *Secalina.* Spiked like rye.

——— *Loliacea.* Spiked like darnel.

——— *Panicea.* Spiked like panic.

——— *Phalaroidea.* Spiked like canary-graſs.

——— *Alopecuroidea.* Spiked like fox-tail.

——— *Typhoidea.* Spiked like cats-tail.

——— *Myoſuroidea.* Spiked like mouſe-tail.

——— *Echinata.* Spiked rough or briſtly.

——— *Criſtata.* Spiked and creſted.

——— *Aromata.* Spiked aromatic graſſes.

——— *Dactyloidea.* Spiked fingered.

Paniculata Simplicia mutica. Panicle ſimple and beardleſs.

——— *Simp. ariſtata.* Panicle ſimple and bearded.

——— *Compoſita.* Panicle compound.

Affines Linagroſtis. Graſs-like plants, *Linagroſtis*, cotton-graſs.

—— *Juncoides.*
—— *Juncus.* Graſs-like plants, *Juncoides*, *Juncus*, ruſhes.

—— *Canna.* Graſs-like plants. *Canna*, Indian-fl. reed.

—— *Scirpus.*
—— *Cyperus.* Graſs-like plants, *Scirpus*, *Cyperus*, ruſhes.

—— *Cyperoides.* *Cyperoides*, or carexes.

SECT. LXXIII.

Dillenius has with the moſt amazing diligence diſcovered, and compleatly deſcribed and figured, the moſſes; his principal diſtinction of which is with or without a *calyptra*.

SECT. LXXIV.

Dillenius has ranked the *algæ* according to their texture, and Michelius according to their flowers.

SECT.

SECT. LXXV.

As to the *fungufes*, Dillenius has diftinguifhed them according to their tops or caps, which are underneath *folded*, *porous*, or *echinated*; and Michelius according to their fructification.

SECT. LXXVI.

As to the *lithophyta*, or ftony plants, as they have been called, fuch as corallines, &c. which were of old reckoned of the foffil or mineral kingdom, Marfilius put them under the vegetables, but Peyfonellus reftored them to their right place, to which they certainly belong, the animal kingdom.

SECT. LXXVII.

Befides all the above-mentioned fyftems or methods of diftributing the plants deduced from the fructification, and which may therefore be called artificial, there is a natural method, or nature's fyftem, which we ought diligently to endeavour to find out. Some detached fragments of this we fhall here fubjoin. And that this fyftem of nature is no *chimæra*, as fome may imagine, will appear, as from other confiderations, fo in particular from hence, that all plants, of what order foever, fhew an affinity to fome others to which they are nearly allied. In the mean time, till the whole of nature's method is compleatly diſcovered (which is much to be wiſhed), we muſt be content to make uſe of the beſt artificial ſyſtems now in uſe.

Natural Orders*.

1. *Palmæ.* Palms, and ſome *genera* that agree with them in habit; *cocos*, *phœnix*, *ſtratiotes*, &c.

2. *Piperitæ.* Pepper, and ſome other that reſemble it in habit, ſtructure, and ſenſible qualities; *piper*, *arum*, &c.

3. *Calamariæ.* Reed-like plants. In theſe the leaf is entire at the baſe, they have no joints nor petals; *ſcirpus*, *ſchænus*.

4. *Gramina.* Graſſes; *triticum*, *ſecale*.

5. *Tripetaloideæ.* Plants with three petals; *calamus*, *juncus*.

6. *Enſatæ.* Plants with ſword-ſhaped leaves; *iris*, *gladiolus*.

7. *Orchideæ.* Orchiſes, and thoſe that reſemble them in habits, powers, and ſenſible qualities; *orchis*, *ſatyrium*.

8. *Scitamineæ.* Aromatic plants, and ſome others which afford agreeable fruit, and agree in habit; *muſa*, *coſtus*, *amomum*.

* See Mr. Milne's Botan. Dict. To the ſenſible and ingenious writings of that gentleman, I acknowledge myſelf indebted for many things, particularly for his accurate definitions.

9. *Spathaceæ.*

9. *Spathaceæ*. Spathaceous plants, whoſe flowers are contained within a *ſpatha* or ſheath; *narciſſus, galanthus, amaryllis.*

10. *Coronariæ.* Plants of the garland or lily tribe; *lilium, tulipa, hemerocallis, fritillaria, hyacinthus, ornithogalum.*

11. *Sarmentoſæ.* Plants with climbing ſtems and branches; *tamus, ſmilax, ariſtolochia.*

12. *Holoraceæ.* Pot herbs, plants for the table, and other domeſtic uſes; *blitum, ſpinachia, atriplex, beta.*

13. *Succulentæ.* Succulent and fleſhy plants; *cactus, meſembryanthemum, aizoon, ſempervivum, ſedum, cotyledon.*

14. *Gruinales.* Plants like the geranium in habit; *linum, droſera, oxalis, geranium.*

15. *Inundatæ.* Plants which grow in the water; *potamogeton, ruppia, myriophyllum, ceratophyllum, hippuris.*

16. *Calycifloræ.* Plants with the *ſtamina* inſerted into the calyx, have no *corolla*, and their fruit is a pulpy *drupa* or *bacca*; *oſyris, trophis, hippophae, elæagnus.*

17. *Calycanthemæ.* Plants with the *corolla* and *ſtamina* inſerted into the calyx; *epilobium, oenothera, glaux.*

18. *Bicornes.* Plants with horned *antheræ*; *kalmia, ledum, azalea, rhododendrum, erica, vaccinium, arbutus, andromeda, pyrola, epigea.*

19. *Heſperideæ.* Plants in habit like the myrtle; *eugenia, pſidium, myrtus, caryophyllus, philadelphus.*

20. *Rotaceæ.* Plants with one flat wheel-ſhaped petal, and no tube; *trientalis, centunculus, anagallis, lyſimachia, phlox, gentiana, ſwertia.*

21. *Preciæ.* Early flowering plants, as *primula*, and ſome others that agree in habit; *androſace, diapenſia, dodecatheon, cortuſa, cyclamen, menyanthes, hottonia, ſamolus.*

22. *Caryophylleæ.* Plants of the pink or carnation tribe, and others nearly allied to them; *dianthus, ſaponaria, ſilene, cucubalus, lychnis, ceraſtium, holoſteum.*

23. *Tribilatæ.* Plants with three ſeeds, each marked with a ſcar; *melia, acer, æſculus, ſtaphylea, ſapindus.*

24. *Corydales.* Plants with hooded or helmet-ſhaped flowers; *melianthus, epimedium, fumaria, utricularia, pinguicula.*

25. *Putamineæ.* Plants whoſe fruit is covered with a hard woody ſhell; *cleome, capparis, moriſona.*

26. *Multiſiliquæ.* Plants which have many ſeed veſſels; *Pæonia, aquilegia, aconitum, delphinium, dictamnus, ruta, nigella, trollius, helleborus, caltha, ranunculus, adonis, anemone, thalictrum.*

27. *Rhoeadeæ.* Plants of the poppy tribe, or reſembling them in habit; *arge-*

mone,

mone, chelidonium, papaver, ſanguinaria, podophyllum.

28. *Luridæ.* Plants of an ominous appearance, hurtful or noxious; *verbaſcum, digitalis, nicotiana, atropa, hyoſcyamus, datura, capſicum, ſolanum.*

29. *Campanaceæ.* Plants having bell-ſhaped flowers; *convolvulus, polemonium, campanula, trachelium.*

30. *Contortæ.* Plants with a monopetalous *corolla*, twiſted or bent towards one ſide; *genipa, vinca, nerium, periploca, apocynum, cynancum, aſclepias, ſtapelia.*

31. *Vepreculæ.* Plants that reſemble the *daphne, dirca, gnidia, paſſerina, theſium.*

32. *Papilionaceæ.* Plants that have papilionaceous flowers, *i. e.* ſomewhat reſembling a butterfly in ſhape, of which number are all the leguminous plants; *piſum, vicia, ervum, cicer, orobus, lupinus, arrachis, medicago, trifolium, lotus.*

33. *Lomentaceæ.* Plants which afford a fine dye, with others like them in habit; *cæſalpinia, hæmatoxylon, caſſia, mimoſa, hymenæa, polygala.*

34. *Cucurbitaceæ.* Plants reſembling the gourd in figure, habit, virtues, and ſenſible qualities; *anguria, elaterium, cucurbita, cucumis, momordica, paſſiflora.*

35. *Senticoſæ.* Briars, brambles, and others which reſemble them in external

 appear-

appearance; *alchimilla*, *agrimonia*, *dryas*, *geum*, *tormentilla*, *fragaria*, *rubus*, *rosa*.

36. *Pomaceæ*. Plants with a pulpy esculent fruit of the apple, berry, and cherry kind; *ribes*, *sorbus*, *cratægus*, *mespilus*, *pyrus*, *punica*, *prunus*, *amygdalus*.

37. *Columniferæ*. Plants whose *stamina* and *pistilla* have the appearance of a column or pillar in the middle of the flower; *malva*, *alcea*, *althæa*, *lavatera*, *hybiscus*.

38. *Tricoccæ*. Plants with a single three-cornered capsule, having three cells, each containing one seed; *euphorbia*, *croton*, *jatropha*, *ricinus*, *mercurialis*, *buxus*.

39. *Siliquosæ*. Podded plants; the *tetrapetalæ cruciformes* of Tournefort, and *tetradynamia* of Linnæus, *draba*, *lepidium*, *alyssum*, *iberis*, *cochlearia*, *lunaria*, *myagrum*, *sinapis*, *brassica*, *crambe*, *turritis*, *cheiranthus*.

40. *Personatæ*. Plants with a masked flower; the *ringentes* of Rivinus, *chelone*, *antirrhinum*, *rhinanthus*, *pedicularis*, *euphrasia*, *melampyrum*, *orobanche*, *acanthus*.

41. *Asperifoliæ*. Rough-leafed plants; the *didynamia angiospermia* of Linnæus, *symphytum*, *borrago*, *echium*, *asperugo*, *lithospermum*.

42. *Verticillatæ*. Verticillate plants, they have four naked seeds, and flowers growing in whorls; the *labiatæ* of Tournefort, and *didynamia gymnospermia* of Linnæus, *thymus*,

mus, ſatureia, meliſſa, origanum, hyſſopus, lavendula ſalvia, mentha, nepeta, teucrium.

43. *Dumoſæ.* Plants which are thick-ſet with irregular branches, and buſhy; *rhamnus, ceanothus, ilex, viburnum, celaſtrus, caſſine, euonymus.*

44. *Sepiariæ.* Woody plants proper for hedges; *jaſminum, liguſtrum, phillyræa, olea, fraxinus, ſyringa.*

45. *Umbellatæ.* Umbelliferous plants; *eryngium, ſanicula, daucus, angelica, paſtinaca, ſium, ſiſon, coriandrum, cicuta, anethum, cuminum.*

46. *Hederaceæ.* Plants reſembling the ivy; *panax, hedera, vitis, ciſſus.*

47. *Stellatæ.* Starry plants, with two naked ſeeds, and leaves round the ſtem in form of a ſtar; *ſherardia, aſperula, gallium, valantia, rubia, cornus.*

48. *Aggregatæ.* Aggregate flowers, conſiſting of a number of florets, which have each a proper and a common calyx; *ſtatice, globularia, dipſacus, ſcabioſa, knautia, circæa, lonicera, linnæa, viſcum.*

49. *Compoſitæ.* Compound flowers; *arctium, carduus, cnicus, cichorium, lapſana, leontodon, lactuca, gnaphalium, tanacetum, matricaria, inula, tuſſilago, aſter, helenium, othonna, bidens, helianthus, melampodium, tagetes, zinnia, amellus, artemiſia, ſeriphium, filago, xanthium.*

50. *Amentaceæ.*

50. *Amentaceæ.* Plants bearing catkins; *ſalix, populus, platanus, fagus, juglans, corylus, betula, myrica.*

51. *Coniferæ.* Cone-bearing plants; *pinus, cupreſſus, thuja, juniperus, taxus.*

52. *Coadunatæ.* Plants with numerous ſeed veſſels, joined together to form a ſingle round or conical fruit; *annona, uvaria, magnolia, liriodendron.*

53. *Scabridæ.* Plants with rugged or briſtly leaves; *ficus, parietaria, urtica, morus, ulmus, cannabis, humulus.*

54. *Miſcellaneæ.* Miſcellaneous plants; *reſeda, poterium, lemna, coriaria, empetrum, amaranthus, nymphæa, ſwietenia, telephium.*

55. *Filices.* Ferns; *ophioglоſſum, oſmunda, adiantum, aſplenium, polypodium, pilularia, iſoetes.*

56. *Muſci.* Moſſes; *lycopodium, fontinalis, ſphagnum, phaſcum, mnium, ſplachnum, polytrichum, bryum, hypnum.*

57. *Algæ.* Flags; *marchantia, jungermannia, anthoceros, targionia, lichen, blaſia, riccia, tremella, ulva, fucus, chara, conferva.*

58. *Fungi.* Funguſes; *agaricus, boletus, hydnum, phallus, clathrus, elvela, clavaria, peziza, lycoperdon, byſſus, mucor.*

59. *Dubii ordinis.* Doubtful *genera*; *amyris, berberis, cuſcuta, dioſma, empetrum, fuſchia, galax, hydrophyllum, illicium, limonia, mangifera, nepenthes, ophioxylon, plantago, randia, ſantalum, trapa, ximenia, &c.*

As

As to all the other *genera* under this laſt number, which are near one hundred and twenty, it is uncertain of what order they are.

In the above table I have added only a few examples to each number, referring the reader to the *Genera Plantarum*, Edit. VI. for the other *genera* contained under each number.

CHAP. III. Of the PARTS of PLANTS.

AFTER this long but neceſſary digreſſion concerning the authors on botany, and the ſeveral botanic ſyſtems, we ſhall now reſume our ſubject.

SECT. LXXVIII.

A vegetable (ſee N° 4.) is an organical body, which draws the matter of its nouriſhment and growth by pores or veſſels placed on its external ſurface; and conſequently it may be aptly enough called an inverted animal. As to the component parts of vegetables they conſiſt of three ſorts of veſſels (with their contained fluids, ſap and air), to wit, 1. The ſap veſſels, in which the circulation, or rather propulſion, is carried on. 2. Small reſervoirs, wherein the ſap is lodged; and laſtly, very ſmall veſicles, air veſſels, or *tracheæ*, by which they draw and retain the air.

Vegetables may be divided into the three following tribes, viz. 1. *Monocotyledones*; 2. *Dicotyledones*; and 3. *Acotyledones*. The firſt have only one ſeminal leaf, valve, or lobe; and therefore the leaves they put forth, at their firſt ſpringing out of the ground, are entirely ſimilar to the ſucceeding ones. This tribe comprehends the three families of 1. palms, 2. graſſes, and 3. bulbous plants of the lily kind, &c. The ſecond tribe have two ſeminal leaves, and comprehend the two numerous families of, 4. herbs, and, 5. trees. The third tribe have no ſeminal leaves or lobes; they comprehend the four families of, 6. ferns, 7. moſſes, 8. *algæ* or flags, and, 9. funguſes.

1. The palms have a ſimple ſtem, not branched; the top is frondoſe, *i. e.* ſhaped like the fern kind, the fructification is on a ſpadix, which is originally contained within a *ſpatha* or ſheath. The flowers are always tripetalous.

2. Graſſes have the moſt ſimple leaves, an articulated or jointed ſtalk and tubular, their calyx is glumoſe or chaffy, each calyx containing one ſeed only.

3. Bulbous plants of the liliaceous kind; as *allium*, *narciſſus*, *ornithogalum*, *hyacinthus*, *crocus*, *iris*, *&c.*

4. Herbs, and

5. Trees: theſe need no definition.

6. Ferns

6. Ferns have, properly ſpeaking, no ſtem, but conſiſt of what botaniſts call *frons*, which is a compoſition of leaf and ſtem. Ferns alſo for the moſt part have their ſeeds on the backſide of the leaf.

7. Moſſes have an *anthera* without any filament ſupporting it, remote from the female flower; have no *piſtillum*; their ſeeds have no cotyledons or lobes, nor any coat or tunic.

8. *Algæ* have their root, leaf, and ſtem, all in one.

9. Funguſes are plants ſeemingly imperfect, low, having neither flower, leaf, colour, nor texture, analogous to others; of a quick growth, and ſhort duration.

The component parts of trees, the moſt perfect vegetables, are, 1. The outer bark, *cortex*; 2. the inner bark, *liber*; 3. the blea or white ſap, *alburnum*; 4. the fibres, filaments, or woody parts, *lignum*; and 5. the pith, *medulla*. By the inner bark of trees is cauſed their increaſing growth or thickneſs, by the addition of a new covering or ring of wood, every year. Hence the principal part of trees is that portion of the bark which is joined to the wood, or the inner bark, by whoſe aſſiſtance trees perpetuate life, their trunks become thicker, and their germination or budding, as well as fruitfulneſs, ſucceed. Of trees, ſome are gemmi-

gemmiparous, and others not. Thoſe growing in warm climates are moſtly deſtitute of buds, and thoſe in cold climates are for the moſt part furniſhed with buds. Hence it is, that trees which are natives of the warmer climates cannot be naturalized to our cold northern climes, becauſe of their want of buds. " All trees, ſays Alſton, " whether they do or do not bear gems or " buds, are furniſhed with a true bark, " with a *liber* or inner bark, and with an " *alburnum*, which is that ſappy part of " trees betwixt the inner bark and wood, " or the external ſoft part commonly call-" ed the white ſap; and theſe are the prin-" cipal parts of them. Conſequently we " may infer, that ſuch plants, whoſe ſtems " are not annual, but endure for ſome " years, and are not covered with a true " bark, but only with a cuticle or film, " may be ſtyled ſhrubs or underſhrubs, or " numbered with herbs." Though Linnæus ſays, that nature has put no limits or diſtinction betwixt trees and ſhrubs; for, ſays he, it cannot conſiſt, as has been commonly thought, in having or not having buds, ſince many trees in hot countries, as we ſaid before, are entirely deſtitute of buds. Buds are the rudiments of leaves and flowers, or both, and alſo of young ſhoots. Perennial herbs have gems or eyes,

as

as they are commonly called, on their roots, and ſome roots there are which conſiſt of a great many little bulbs; all theſe are analogous to the buds on trees. So then perennial plants have a double ſet of flowers at one and the ſame time, as one may ſay, the bulbs, or eyes and buds containing the rudiments of the next ſucceeding flowers in embryo. Another diſtinction of trees is into the evergreens and deciduous, that is, thoſe which ſhed their leaves every autumn. Herbs are annual, biennial, or perennial; the perennial are of two ſorts; evergreens, as the lavender, roſemary, &c. or caducous, which die down to the root every year. Another general diviſion of vegetables may be into exotic and indigenous plants. Exotics or foreign plants are of four ſorts; 1. the Tropical, which are never expoſed to the air of our climate, but kept within ſtoves all the year round; 2. the African or ſucculent plants, which in the ſummer will bear being expoſed abroad in the day-time; 3. the Tame *(manſuetæ)*, which in the ſummer will bear being ſet abroad day and night; 4. the Naturalized, which will bear our winters, as rue, lavender, &c. Indigenous plants or natives, which grow ſpontaneouſly with us, are diſtinguiſhed according to their place of growth into marſh, wood, mountain, ſea, river, plants, &c.

SECT. LXXIX.

The three principal parts of vegetables are; 1. the root; 2. the herb, or main body of the plant; and 3. the fructification. Of the two firſt only we ſhall treat in this Chapter, and of the fructification in the following.

SECT. LXXX.

The root which draws nouriſhment for the ſupply and production of the whole plant and its fructification, conſiſts of the ſtock *(caudex)* and radicle.

A. The radicle is that fibrous part of the root in which the deſcending ſtock terminates, and by which the root draws nouriſhment for the ſupport of the whole plant.

B. The deſcending ſtock gradually ſtrikes downward into the ground, and puts forth radicles. From its various ſtructure it has been diſtinguiſhed by botaniſts into,

1. The perpendicular root, when it runs in a ſtrait line downwards.

2. The horizontal root, which runs tranſverſly under the earth. *Iris.*

3. The ſimple root (ſee f. 129.) which is not ſubdivided.

4. The branched root (ſee f. 130.) which is divided into lateral branches.

5. The tapering root (ſee f. 129.) which is oblong, thick at the upper end, and gradually

dually ſmaller to the other extremity; as in *Daucus*, *paſtinaca*.

6. The *tuberous* root (ſee f. 128.), which conſiſts of a bundle of roundiſh knobs. As in *pæonia*, *hemerocallis*, *helianthus*, *ſolanum*, *filipendula*.

7. The *creeping* root (ſee f. 131.), which runs out to a great length, putting forth ſmall roots here and there as it creeps along.

8. The *fibrous* root, which conſiſts only of ſmall fibres.

9. The *ſtumped* root, whoſe lower extremity is not tapering to a point, but ſtumped, or as it were bitten off. As in *ſcabioſa*, *plantago*, *valeriana*.

C.

The aſcending ſtock gradually raiſes itſelf above ground, often ſupplying the place of a trunk, and produces the main body of the plant. It is for this reaſon that all trees and ſhrubs may be conſidered as roots above ground; and therefore a tree turned upſide down, will produce leaves from the deſcending ſtock, and roots from the aſcending.

SECT. LXXXI.

The ſecond part of the vegetable is the HERB or main body of the plant, which riſes from the root, and is terminated by the fructification. It conſiſts of the *trunk*,

 the

the *leaves*, the *fulcra*, props or ſupports, and the *hybernacula* or winter quarters: the *trunk*, whoſe uſe is to multiply the herb, leads immediately from the root to the fructification; the *leaves* tranſpire and draw the air, as the lungs in animals, and alſo afford ſhade; the *fulcra* or props ſerve as ſupports to the plant, which however ſeldom periſhes, though deprived of thoſe *fulcra*; the *hybernacula* or winter quarters, to wit, the bulbs and buds, contain the herb or plant, as it were, in miniature.

SECT. LXXXII.

The TRUNK, which produces the leaves and fructification, is of ſeven ſorts, viz. the *caulis*, *culmus*, *ſcapus*, *pedunculus*, *petiolus*, *frons*, and *ſtipes*.

A.

The *caulis* or ſtem is the proper trunk of the herb, and produces leaves and fructification.

a. Simple ſtems are extended in a continued direction to the top, without deviation, and are the following:

1. The *entire* ſtem is moſt ſimple, having ſcarce any branches.

2. The *naked* ſtem is without leaves, as in the *euphorbia*, *cactus*, *ſtapelia*, *ephedra*, *cuſcuta*.

3. The *leafy* ſtem, which is furniſhed with leaves.

4. The

4. The *bending* ſtem is turned according to the joints in different directions, as in *ptelea*; to the left, or according to the motion of the ſun, as it is commonly called, as in *humulus*, *helxine*, *lonicera*, *tamus*; to the right, or contrary to the ſun's motion, as in *convolvulus*, *baſella*, *phaſeolus*, *cynanche*, *euphorbia*, *eupatorium*.

5. The *twining* ſtem (fig. 115.), mounts in a ſpiral line upon the branch or ſtem of another plant.

6. The *reclining* ſtem, which bends like a bow towards the earth, as in the *ficus*.

7. The *procumbent* ſtem, which lies flat on the ground.

8. The *creeping* ſtem (fig. 112.), which lying on the ground puts forth ſmall roots here and there, as in the *hedera*, *bignonia*.

9. The long and ſlender or *twig-like* ſtem (*ſarmentoſus*, ſee f. 131.), is alſo creeping, and almoſt naked or without leaves.

10. The *paraſitic* ſtem is that which grows on ſome other plant, and not out of the ground; as the *epidendrum*, *viſcum*, *tillandſia*.

11. The *round* ſtem is cylindrical.

12. The *two-edged* ſtem has two angles oppoſite to one another, as in the *ſiſyrinchium*.

13. The two, three, four, five, and many *edged* ſtems are all ſpecies of the foregoing.

14. The *three-cornered* ſtem has three plain ſides, and three angles.

15. The *triangular*, *quadrangular*, *quincangular*, and *multangular* ſtems, which have two, three, four, five, or many angles.

16. The *furrowed* ſtem is marked with broad and deep channels through its whole length.

17. The *ſtriated* or ſtreaked ſtem is fluted or marked with very ſmall parallel channels through the whole length.

18. The *ſmooth* ſtem, which has a ſmooth or even ſurface.

19. The *hairy* ſtem, which is covered with ſoft hairs; as in *rhus*, *tomex*.

20. The *rough* ſtem is covered with rough projecting points.

21. The *briſtly* ſtem is ſpread over with ſtiff briſtles; as in *braſſica erucaſtrum*.

Simple branching Stems.

22. The *aſcending* ſtem, where the branches come out horizontally, and then gradually turn upwards.

23. The *ſpreading* ſtem, where the branches are ſpread out wide, as in the common water *germander*.

24. The *diſtich* ſtem, where the branches are put forth in two rows, or from two ſides of the ſtem only.

25. The

25. The *brachiate* ſtem ſends out its branches in oppoſite pairs, each pair croſſing the other. (See f. 117.)

26. The *moſt branched* ſtem abounds with branches diſpoſed without any regular order.

27. The *propped* ſtem is ſupported by the branches which deſcend to the earth; as in *ficus*, *rhizophora*, *mangroove*.

28. The *proliferous* ſtem, which throws out its branches from the center of the apex; as in the *pinus*.

Compound Stems.

b. 29. The *forked* ſtem is when the diviſion is always made in two parts; as in the *ceraſtium dichotomum*. (See f. 116.).

30. The *ſubdivided* ſtem is divided into branches without any order.

31. The *jointed* ſtem has joints or knots at certain diſtances; as in *ſalicornia*.

B.

The *culmus*, ſtraw or haulm, is that ſort of ſtem which is proper to graſſes and corn, bearing the leaves and fructification thereof. Beſides many of the diſtinctions given for the *caulis*, it admits alſo of ſome peculiar to itſelf, as,

32. The ſtraw without *knots* or joints.

33. The *jointed* ſtraw or haulm. (See f. 114.).

34. The *ſquamoſe* or ſcaly ſtraw. (See f. 111.).

C.

The *ſcapus* or ſtalk is an univerſal trunk, bearing the fructification only, and not the leaves; as in *narciſſus*, *pyrola*, *convallaria*, *hyacynthus*. (See f. 113.).

D.

The *peduncle* or footſtalk of the flower is a partial trunk, bearing the fructification only, but not the leaves.

When branched or divided, each of the diviſions is called *pedicellus*, or a little flower-ſtalk. Flower-ſtalks are diſtinguiſhed from the place of the plant where they grow, into,

1. The *radical* flower-ſtalk, when they proceed immediately from the root.

2. The *cauline* flower-ſtalk, which proceeds from the ſtem.

3. The *branch* peduncle, which proceeds from the branches.

4. The *axillary* or boſom flower-ſtalk, which comes out between the leaf and ſtem, or between the branch and ſtem.

5. The *terminal* flower-ſtalk, which comes from the extremity of the branch or ſtem.

6. The *ſolitary* peduncle, when there is only one in the ſame place.

7. The *ſcattered* peduncles, when a great many grow together without any order.

Again, flower-ſtalks are diſtinguiſhed from the different modes in which flowers are borne and connected on them, into,

8. The

8. The *uniflorous*, *biflorous*, *triflorous*, or *multiflorous* peduncle, that is, which bear one, two, three, or many flowers.

9. The *fasciculus*, a bunch or bundle, where the peduncles are erect, parallel, placed close to one another, and all of the same height, as in sweet william, *dianthus barbatus*, Pl. 10. f. 164.

10. The *capitulum*, a little head, where many flowers are collected into a head at the extremity of a peduncle, as in *globe amaranthus*, *gomphrena*, f. 171.

11. The *spike* where the sessile flowers are placed alternately upon both sides of a simple common flower-stalk (f. 165.). A spike is said to be single rowed (*spica secunda)*, when the flowers are all turned one way, as in *dactylis cynosuroides*; or double rowed (*spica disticha)*, when the flowers look to both sides, or stand two ways.

12. The *Corymbus*, where the lesser flower-stalks of unequal lengths are produced along the common peduncle on both sides, and rise to the same height, so as to form a flat or even surface at top, as in *spiræa opulifolia*, gold of pleasure, &c. (see f. 163. Pl. 10.)

13. The *panicle* where the fructifications are dispersed upon foot-stalks variously subdivided (f. 170.), as in oats, &c. A panicle is said to be *diffuse*, when the partial foot-stalks diverge, and the fructifications

 hang

hang looſe; as in the *poa aquatica*, or *ſtraight* and narrow; when the foot-ſtalks approach near to one another, as in *feſtuca ovina*, *aira cœrulea*.

14. The *thyrſus* is a panicle contracted into an oval or egg-ſhaped form, reſembling the cone of a pine; as in *lilac*, *butterburr*, f. 168.

15. The *racemus* or cluſter, conſiſts of a common peduncle, having ſhort lateral branches, all of equal lengths, proceeding from it; as in the *vitis*, *ribes*, f. 166.

16. The *verticillus* or whorl, where the flowers are produced in rings at each joint of the ſtem, with very ſhort foot-ſtalks, as in mint, horehound, &c. See f. 169.

E.

The *petiolus* or foot-ſtalk of the leaf is a ſpecies of trunk which bears the leaf, but not the fructification. It happens ſometimes, though very rarely, that the fructification and leaf are both produced on the ſame foot-ſtalk; as in *turnera*, Syrian mallow.

F.

The *frons* is a ſpecies of trunk conſiſting of a branch and leaf, and frequently the flower and fruit all blended together. It belongs properly to the ferns and palms, f. 108.

G.

The *ſtipes* is the baſe or lower part of a *frons* and *fungus*, and is only proper to the palms, ferns, and *fungi*.

SECT.

SECT. LXXXIII.

LEAVES are either *ſimple*, *compound*, or *determinate*, which laſt term reſpects their diſpoſition upon the plant.

A.

Simple leaves are thoſe which have only a ſingle leaf on a foot-ſtalk. Simple leaves differ in reſpect to circumference, angles, ſinuſes, extremity, margin, ſurface, and ſubſtance.

a. As to their circumference ſimple leaves are either,

1. Round *(orbiculatum)*, as in *rumex digynus*, fig. 1.

2. Roundiſh *(ſubrotundum)*, ſee f. 2.

3. Egg-ſhaped *(ovatum)*, as in *vaccinium myrtyllus*, f. 3.

4. Oval *(ovale)* as in the roſe, f. 4.

5. Parabolic or half oval *(parabolicum)*, f. 110.

6. Shaped like a *ſpatula (ſpatulatum)*, f. 109.

7. Wedge-ſhaped *(cuneiforme)*, as in *apium graveolens*, f. 45.

8. Oblong *(oblongum)*, as in ſorrel, &c. f. 5.

b. In reſpect to their angles ſimple leaves are,

9. Lancet-ſhaped *(lanceolatum)*, as in *plantago lanceolata*, f. 6.

10. *Linear* or equally broad every where *(lineare)*; as in roſemary, pine, graſſes, f. 7.

11. Chaffy

11. Chaffy and evergreen *(acerosum)*, as in *pinus*, *abies*, *juniperus*, *taxus*, f. 102.

12. Awl-shaped, or tapering to a point *(subulatum)*, as in *arenaria saxatilis sedum rupestre*, &c. See f. 8.

13. Triangular *(triangulare)*, f. 12.

14. Quadrangular, quincangular, *i. e.* with four, five angles, &c. f. 20.

15. Deltoid, shaped like a *delta (deltoides)*, as in *populus nigra*, f. 58.

16. Round *(rotundum)*, which has no angles.

c. Sinuses are deep cuts or openings in the disk of the leaf.

17. Kidney-shaped *(reniforme)*, as in *asarabacca*, *saxifraga granulata*, f. 9.

18. Heart-shaped *(cordatum)*, as in lime-tree, f. 10.

19. Moon-shaped *(lunulatum)*, f. 11, as in moonwort.

20. Arrow-shaped *(sagittatum)*, f. 13, as in field-bindweed.

21. Spear-shaped *(hastatum)*, f. 15, as in *dulcamara*, *scutellaria hastifolia*.

22. Fiddle-shaped *(panduræforme)*, f. 15, nearly resembles it.

23. Parted or cut half way down *(fissum)*, f. 16.

24. Lobed or divided almost to the mid-rib *(lobatum)*. From the number of divisions in this and the foregoing, the leaves are

are termed, *bifida*, *trifida*, *quadrifida*, *quinquifida*, *multifida*, or *biloba*, *triloba*, *quadriloba*, *quinqueloba*, i. e. divided into two, three, four, five, or many ſegments or lobes.

25. Hand-ſhaped *(palmatum)*, f. 22. as in *palma Chriſti*, *rheum palmatum*.

26. Pinnatifid, cut like wings *(pinnatifidum)*, f. 23.

27. Shaped like a lyre *(lyratum)*, f. 76.

28. Jagged *(laciniatum)*, f. 24.

29. Sinuated, having ſinuſes *(ſinuatum)*, f. 25.

30. Divided to the baſe *(partitum)*, f. 28. From the number of diviſions they are termed *bipartitum*, *tripartitum*, *quadripartitum*, *quinquepartitum*, *multipartitum*, *i. e.* having two, three, four, five, or many diviſions.

31. Entire *(integrum)*, having no diviſion or ſinus.

d. The extremity or tip of ſimple leaves is either,

32. Stumped *(truncatum)*, as in the tulip tree.

33. Bitten *(præmorſum)*, f. 18.

34. Blunted *(retuſum)*, f. 46.

35. Notched *(emarginatum)*, at the tip, f. 45.

36. Obtuſe or blunt *(obtuſum)*, f. 40.

37. Acute or ſharp-pointed *(acutum)*, f. 41.

38. Tapering

38. Tapering to a point *(acuminatum)*, f. 42.

Obtufe with a point *(obtufum cum acumine)*, f. 43.

39. Terminated with tendrils *(cirrhofum)*, f. as in fuperb lily, &c.

e. The margin or brim of a fimple leaf is either,

40. Prickly *(fpinofum)*, as in holly.

Unarmed *(inerme)*, without prickles, oppofed to the former.

41. Toothed or indented *(dentatum)*, f. 30. as in dandelion.

42. Sawed or ferrate *(ferratum)*, f. 31, as in *vaccinium myrtillus.*

43. Notched *(crenatum)*, f. 38, as in *primula farinofa.*

Notches blunt, f. 36. notches fharp, f. 35, notches double, f. 33.

44. Serpentine edged, f. 29, *repandum.*

45. Griftly or cartilaginous *(cartilagineum)*, f. 34.

46. Fringed or ciliate *(ciliatum)*, f. 50, as in *erica ciliaris.*

47. Torn or ragged *(lacerum)*, the various fegments of the margin of different forms.

48. Gnawed *(erofum)*, f. 21, is a finuated leaf, f. 25, with other very fmall obtufe finufes on its margin.

49. Very entire *(integerrimum)*, f. 42.

f. The

f. The ſurface, upper or under of a ſimple leaf is either,

50. Clammy *(viſcidum)*, as in *ſenecio viſcoſus.*

51. Cottony *(tomentoſum)*, as in *ceraſtium tomentoſum*, f. 48. *verbaſcum thapſus.*

52. Wooly *(lanatum)*, as in *ſalvia, ſideritis, ledum villoſum*, and ſome geraniums.

53. Hairy *(piloſum)*, f. 47. as in *cortuſa*, and *juncus piloſus.*

54. Briſtly *(hiſpidum)*, f. 49. as in *turritis hirſuta.*

55. Rough with knots *(ſcabrum)*, as in ſome of the fig marygolds.

56. Prickly *(aculeatum)*, as in ſome of the thiſtles.

57. Streaked with parallel lines *(ſtriatum)*.

58. Bliſtered *(papilloſum)*, ſee f. 54. as in ſome of the fig marygolds.

59. Dotted, or covered with tranſparent points *(punctatum)*, as in St. John's-wort.

60. Glittering or ſhining *(nitidum)*, as in *ferula Canadenſis*, *angelica Canadenſis.*

61. Plaited *(plicatum)*, as in ladies-mantle, f. 37.

62. Waved *(undulatum)*, as in *rheum undulatum.*

63. Curled *(criſpum)*, f. 39. as in *braſſica criſpa*; all curled leaves are monſters.

64. Wrinkled *(rugoſum)*, as in ſage, f. 51.

65. Hollow

65. Hollow or concave *(concavum)*.

66. Veined *(venoſum)*, when the veins are branched, as in *laurus nobilis, &c.* f. 52.

67. Ribbed *(nervoſum)*, when the veſſels are not branched, as in plantain, f. 53.

68. Beautifully coloured *(coloratum)*, as in *amaranthus tricolor*.

69. Smooth *(glabrum)*.

g. Simple leaves with reſpect to their ſubſtance are either,

70. Cylindrical *(teres)*, f. 62. as in *allium vineale*, and *allium oleraceum*.

Semicylindrical *(ſemicylindraceum)*, half a cylinder, as in *chenopodium maritimum*.

71. Tubular, or hollow like a pipe, *(tubuloſum)*, as in the onion.

72. Fleſhy *(carnoſum)*, as in all the ſucculent plants.

73. Compreſſed *(compreſſum)*, when the leaf is thicker than the breadth of the diſk.

74. Plane, even or level *(planum)*, of an equal thickneſs throughout.

75. Humped or bunched *(gibbum)*, convex on both ſides, f. 76.

76. Depreſſed *(depreſſum)*, when the diſk is lower than the ſides.

77. Convex (*convexum*), when the diſk is higher than the ſides.

78. Channelled (*canaliculatum*), f. 61, ſunk almoſt to a ſemicylinder.

79. Sword-ſhaped (*enſiforme*), as in *iris, gladiolus*.

80. Shaped like a Perſian ſcymitar (*acinaciforme*), f. 56, as in ſome of the fig marygolds.

81. Tongue-ſhaped (*linguiforme*), f. 55, as in ſome of the fig marygolds.

82. Hatchet-ſhaped (*dolabriforme*), f. 57, as in ſome of the fig marygolds.

83. Two edged (*anceps*), as in the *ſiſyrinchium*.

84. Three cornered (*triquetrum*), f. 59, with three angles and three flat ſides.

85. Furrowed (*ſulcatum*), f. 60, with longitudinal ridges and channels.

86. Keel-ſhaped (*carinatum*) on the under ſurface, as in *crinum Aſiaticum*.

87. Membranaceous (*membranaceum*), thin like films.

B.

Leaves are called *compound* when there are two or more upon one foot-ſtalk. Such leaves are either once or twice, or more than twice compounded.

b. 88. A *compound* leaf, properly ſo called, is, when a ſingle foot-ſtalk ſupports more than one leaf.

89. It is called *jointed* when one leaf grows out of the extremity of the other, ſee f. 107. as in the prickly pear.

90. *Fingered*, when a ſingle foot-ſtalk has ſeveral ſmall leaves connected to its extremity, f. 66. as in horſe-cheſnut, lupin, ſetterwort; and theſe fingered leaves are ſaid to be,

91. *Binatum*, compounded of two, fee f. 63. or

92. *Ternatum*, compounded of three, fee f. 64, 65. or

93. *Quinatum*, compounded of five, or

94. *Pinnatum*, when a fingle foot-ftalk has a great many fmall leaves attached along its fides; and thefe pinnated leaves either end with

An odd one, as in f. 68, or with

A tendril, as in f. 72, or with neither, and then they end

Abruptly, as in f. 69, or the *pinnæ* or fmall leaves are

Oppofite to one another on the mid-rib, or they are

Alternately placed, as in f. 70, or they are

Interrupted, *i. e.* with every other leaf fmaller, as in f. 71. or

Jointed, when the common foot-ftalk is fo, as in f. 75, or

Decurrent, when the lobes run down along the mid-rib, as in f. 74.

95. *Conjugate* is a pinnate leaf, confifting only of two lobes, f. 73.

i. In a leaf *twice compounded*, the common foot-ftalk bears other leffer or partial foot-ftalks.

96. A *decompounded* leaf, when a foot-ftalk once divided connects feveral leffer leaves.

97. Bigemi-

97. Bigeminate leaf, when a forked foot-ſtalk connects four ſmall leaves on its extremities.

98. Double-three-leaved (*biternatum* or *duplicato-ternatum*), when each of the lateral foot-ſtalks ſupports three leaves, f. 77. as in barrenwort.

99. Bipinnate or doubly pinnate, f. 78. a double winged leaf.

100. Foot-ſhaped *(pedatum)*, when the foot-ſtalk divides at top into two parts, on the inſide of which the lobes are ſupported, as in paſſion-flower, *arum*, &c. ſee f. 67.

k. More than twice compounded leaves.

101. A more than twice compounded leaf, when the lateral foot-ſtalks are ſubdivided into other partial foot-ſtalks, which laſt bear the lobes or leſſer leaves.

102. Triple-three-leafed (*triternatum* or *triplicato-ternatum*), as in f. 79. where double-three-leafed are inſerted into a common foot-ſtalk.

103. Triple-winged (*tripinnatum* or *triplicato-pinatum*) as in f. 80. where double-winged leaves are inſerted into a common foot-ſtalk.

C.

As to the determination or diſpoſition of leaves, we are to conſider their place, ſituation, inſertion, and direction.

l. Place.

104. A ſeed leaf (*folium ſeminale*) is a

G production

production of the cotyledons or lobes of the ſeed, ſee f. 91.

105. A radical or root leaf (*folium radicale*), or bottom leaf, comes immediately from the root.

106. A ſtem leaf (*folium caulinum*) proceeds from the ſtem or ſtalk of the plant, ſee f. 90.

107. A branch leaf (*folium rameum*) is ſeated upon the branch, ſee f. 89.

108. An axillary leaf (*folium axillare*) proceeds from the boſom or armpit of a branch.

109. A flower leaf (*folium florale*) is placed at the coming out of the flower, ſee f. 88.

m. Situation.

110. Leaves are called ſtarry or whorled (*ſtellata* or *verticillata*), when more than two leaves ſurround the ſtem in rings or whorls, ſee f. 106.

111. Theſe are called *terna*, *quaterna*, *quina*, *ſena*, *&c.* i. e. three, four, five, ſix, according to the number of leaves which compoſe the ſtar or whorl; as in *nerium*, *brabeium*, *hippuris*, *ſedum verticillatum*, *gallium ſpurium*.

112. Oppoſite leaves, *i. e.* facing one another, where each pair is croſſed by that immediately above or below it; as in myrtle, jeſſamy, and rocket, &c. ſee f. 82-87.

113. Alternate,

113. Alternate, when they come out ſingly, and are ranged gradually upon both ſides of the ſtem; as in *antirrhinum, cymbalaria*, ſee f. 103.

114. Scattered (*ſparſa*), when diſpoſed plentifully round the ſtem without any regular order; as in ſeveral ſpecies of the lily.

115. Crowded (*conferta*), when they come out in ſuch quantities as to cover the branches, leaving ſcarcely any ſpace between them; as in toadflax, *antirrhinum, monſpeſſulanum*, ſee f. 102.

116. Laid over each other like tiles or fiſh-ſcales (*imbricata*), as in ſome ſpecies of ſaxifrage, ſee f. 101.

117. Placed in bundles (*faſciculata*), when many leaves proceed from the ſame point; as in the larch, and ſome pines, ſee f. 100.

118. Ranged along two ſides of the branches only (*diſticha*), as in the fir-tree.

n. Inſertion.

119. A target-ſhaped leaf (*peltatum*) has the foot-ſtalk inſerted into the center of the lower diſk or ſurface; as in water-lily, *palma Chriſti*, Indian creſs, and *geranium peltatum*, ſee f. 99.

120. A leaf furniſhed with a foot-ſtalk is called *folium petiolatum*, ſee f. 98.

121. A leaf furniſhed with no foot-ſtalk is called *folium ſeſſile*, ſee f. 97.

 122. A

122. A running leaf (*fol. decurrens*) runs downwards along the ſtem beyond its baſe; as in thiſtle, *verbaſcum,* and globe flower, ſee f. 96.

123. A leaf is ſaid to embrace the ſtem (*fol. amplexicaule*), when by its baſe it entirely ſurrounds it tranſverſely; as in moth mullein, and black henbane, ſee f. 95. When ſuch a leaf half ſurrounds the ſtem, it is called (*ſemiamplexicaule*).

124. A perforated leaf (*perfoliatum*) is, when the ſtem penetrates the leaf above its baſe; as in the round-leafed *bupleurum*, ſee f. 94.

125. Two oppoſite leaves grown together into one at their baſe are called *folia connata*, as in *lonicera, eupatorium*, ſee f. 93.

126. A glove-like leaf (*fol. vaginans*) has the baſe formed into a tube, which embraces the ſtalk like a ſheath; as in corn, graſs, and ſome of the lilies, ſee f. 92.

o. Direction.

127. *Adverſum*, a leaf whoſe upper diſk is turned to the meridian, and its margin or edge to the ſky; as in *amomum.*

128. An oblique leaf (*obliquum*), when the baſe looks to the ſky, and the tip to the horizon; as in *ruſcus, fritillaria,* and *protæa.*

129. Bent inwards (*inflexum*), when they are turned upwards towards the plant, ſee f. 87.

130. Laid

130. Laid cloſe to the ſtem (*adpreſſum*).

131. Upright (*erectum*), is nearly perpendicular, ſee f. 86.

132. Spreading (*patens*), when they recede from the ſtem, ſee f. 85.

133. Horizontal (*horizontale* or *patentiſſimum*), when they form right angles with the ſtem, ſee. f. 84.

134. Reclined (*reclinatum* or *reflexum*), when they are bent downwards, ſo that the tip is lower than the baſe, ſee f. 83.

135. Rolled back (*revolutum*), when the tip is rolled downwards, f. 82.

136. Hanging down (*dependens*), when they point with the tips to the earth.

137. A rooting leaf (*radicans*) is one, which being planted ſtrikes root, as in aloe.

138. A floating leaf (*natans*), lies on the ſurface of the water, as in water-lily and pondweed.

139. A ſunk leaf (*demerſum*) is one which lies below the ſurface of the water.

N. B. There are above forty more ſpecies of leaves in Elmgren's *Termini Botanici* in the *Amœnitates Academiæ*, Vol. VI.

SECT. LXXXIV.

Fulcra (ſee N° 81.), the props or ſupports of the plant, are the ſeven following, viz. *ſtipula*, *bractea*, *ſpina*, *aculeus*, *cirrhus*, *glandula*, *pilus*.

1. *Stipula* is a ſcale or ſmall leaf on each ſide the baſe of the foot-ſtalks of the flowers and leaves, though in the *Amœn. Ac.* it is confined to the foot-ſtalks of the leaves only. Theſe *ſtipulæ* may be ſeen in the tamarind tree, caſſia, roſe, honey flower, tulip tree, apricot, peach, bird cherry, and the leguminous plants (ſee f. 118. *b.*)

2. *Bractea* is the floral leaf, or leaf next the flower, but differing both in ſhape and colour from the other leaves of the flower. Examples of this may be ſeen in the lime tree, bulbous fumitory, cow wheat, ſage, lavender, monarda, hellebore, fennel flower, paſſion flower, bird's-foot, French honey-ſuckle, African broom, milkwort, reſt-harrow, lady's-finger, kidney-bean, *cytiſus*, *lotus*, indigo, and many others (ſee f. 120.).

3. *Spina*, a thorn, proceeds from the woody part of the plant, and is exemplified in *prunus*, *rhamnus*, *hippophite*, *celaſtrus*, *lycium*, &c. (ſee f. 121.). Spines often diſappear by culture; as may be ſeen in *pyrus malus*.

4. *Aculeus*, a prickle, proceeds only from the bark of the plant. Examples of this may be ſeen in the roſe, bramble, currant, barberry, &c. (ſee f. 122, 123.).

5. *Cirrhus*, a claſper or tendril, is a ſmall ſpiral ſtring, by which a plant fixes itſelf to any thing in its neighbourhood for

ſupport.

ſupport. Examples of this are the vine, the vetch, peaſe, cucumbers, *bignonia*, &c. (ſee f. 118.)

6. *Glandula*, a gland, is a ſmall prominent body, ſerving as an organ of ſecretion. They are chiefly to be found on the footſtalks and other parts of the leaves, and on the tender *ſtipulæ*. Examples may be ſeen in *palma Chriſti*, *caſſava*, paſſion flower, wild *ſena* and *acacia*; in willow, in almond tree, gourd, gelder roſe, bird cherry, tamariſk, butterwort, ſun-dew, apricot tree, &c. (ſee f. 119.)

7. *Pilus*, hair, is defined by Linnæus to be a ſmall excretory duct of ſome ſecretion in the plant.

SECT. LXXXV.

Hybernaculum (ſee N° 81.), the winter quarters, is that part which is deſtined by nature to incloſe and defend the tender plant in its embryo ſtate from external injuries, during the winter, is of two ſorts, the *bulbus* and *gemma*.

1. The bulb is generally ſituated on the root, or deſcending ſtock, and is either

Scaly, as in the lily, f. 125.
Solid, as in the tulip, f. 126.
Coated, as in the onion, f. 127, or
Jointed, as in *lathræa*, *martynia*, *adoxa*.

They are only large buds under ground.

Bulbs are ſometimes placed on the ſtem, and other parts of herbaceous plants, as may be ſeen in ſome ſpecies of the lily and garlick.

2. *Gemma*, the bud, is ſeated on the aſcending ſtock or trunk, and conſiſts of *ſtipulæ*, ſcales, foot-ſtalks, and rudiments of the leaves, or ſcales of the bark. They are only ſmall bulbs above ground.

Moſt part of the plants in cold countries have buds, but in warm countries ſcarce any of the plants have them.

Many trees have no buds; as *philadelphus*, *frangula*, *T. alaternus*, *T. paliurus*, *T. jatropha*, *hibiſcus*, *bahobab*, *juſticia*, *caſſia*, *mimoſa*, *gleditſchia*, *erithryna*, *anagyris*, *medicago*, *nerium*, *viburnum*, *rhus*, *tamarix*, *hedera*, *erica*, *malpighia*, *lavatera*, *ſolanum*, *aſclepias*, *ruta*, *geranium*, *petiveria*, *pereſkia* of Plumier, *cupreſſus*, *thuia*, *ſabina*.

Buds and bulbs are of various ſorts, viz.

Deciduous, as in *dentaria*, *ornithogalum*, *lilium*, *ſaxifraga*.

Containing the leaves but not the flowers; as in *alnus*.

Containing the leaves and flowers in diſtinct buds; as in *populus*, *ſalix*, *fraxinus*.

Containing the leaves and female flowers only; as in *corylus*, *carpinus*.

Containing the leaves and male flowers only; as in *pinus*, *abies*.

Containing

Containing the leaves and hermaphrodite flowers; as in *daphne, ulmus, cornus, amygdalus.*

Containing both the leaves and flowers as in moſt trees. See Læfling's *Diſſ. de Gemmis Arborum* in the *Amœn. Academ.*

In this laſt the leaves come out upon a ſmall branch, which afterwards produces flowers.

CHAP. IV. Of the FRUCTIFICATION.

IN the foregoing Chapter we have ſpoken of all the parts of plants except thoſe of the fructification. In this fourth chapter we ſhall treat of the ſeveral parts of fructification; of the threefold ſtructure of the fructification; of ſimple and aggregate flowers; and laſtly, of luxuriant flowers.

SECT. LXXXVI.

Fructification is a temporary part of vegetables, appointed for the purpoſe of generation, terminating the old vegetable, and beginning the new. The parts of fructification are the ſeven following, viz.

1. The calyx, flower-cup or empalement.
2. The *corolla*, petals or painted leaves of the flower.
3. The *ſtamina*, threads or chives.
4. The *piſtillum*, or pointal.

5. The *pericarpium*, or ſeed veſſel.

6. The ſeeds.

7. The receptacle or baſe on which all the other parts of the fructification are connected.

I. The calyx (which is the termination of the outer bark of the plant, preſenting itſelf in the fructification, in this form) comprehends the ſeven following ſpecies, viz. the *perianthium*, the *involucrum*, the *amentum*, the *ſpadix*, the *gluma*, the *calyptra*, and *volva*, of each of which in their order.

1. The *perianthium*, or flower-cup properly ſo called, is the moſt common ſpecies of calyx, and ſituated cloſe to the fructification. If it incloſes the *ſtamina* and *germen*, it is called the *perianthium* of the fructification. If it incloſes the *ſtamina* and not the *germen*, it is the *perianthium* of the flower. If it includes the *germen*, and not the *ſtamina*, it is the *perianthium* of the fruit.

2. The *involucrum* or cover (f. 134.) is ſituated at the bottom of an umbel at ſome diſtance from the flower. It is called univerſal *involucrum* or cover, if it is ſituated at the bottom of an univerſal umbel; and a partial *involucrum* or cover, if at the foot of a partial umbel.

3. The *amentum* or catkin (fig. 139) is that

that ſort of calyx which conſiſts of a great number of chaffy ſcales proceeding from a common receptacle or ſlender thread, as in the willows and poplars, &c.

4. The *ſpatha* or ſheath (fig. 132. 136.) is a ſort of calyx which burſts lengthways, and puts forth a ſtalk ſupporting the flowers; as in *narciſſus*, ſnow-drop, *arum*, and the palms.

5. The *gluma* or chaffy huſk (f. 133.) is that ſort of calyx peculiar to graſſes, compoſed of thin ſcales or valves, which are often terminated by an *ariſta*, a beard or awn.

6. The *calyptra*, a veil or hood, (f. 135.) is a ſort of calyx peculiar to moſſes, placed over their *antheræ*, and reſembling a Monk's cowl, or rather an extinguiſher.

7. The *volva* (ſee f. 141.) is a ſort of calyx peculiar to the *fungi* or muſhroom tribe, involving or incloſing their fructification. It is membranaceous and torn quite round.

II. The *corolla*, literally a wreath or garland, ſerving together with the calyx as covers to the parts they incloſe, is the termination of the inner bark of the plant preſenting itſelf in this form, and conſiſts of the *petalum* and *nectarium*.

8. The *petalum* is the corollaceous covering of the flower. If the flower is monopetalous,

monopetalous, *i. e.* confifts of one petal, the lower hollow part of fuch a *corolla* is called

The tube, fee f. 142. letter *a.*

And the upper part which fpreads wider is called

The limb, fee f. 142. letter *b.*

Again, this upper part or limb in monopetalous flowers, from its different figure, has got different names, for it is either

Bell-fhaped (*campanulatus*), without any tube below; or

Tunnel-fhaped or conical (*infundibuliformis*), with a tube; or

Saucer or falver-fhaped (*hypocrateriformis*), f. 142. with a tube.

Wheel-fhaped (*rotatus*), without any tube below; or

Gaping (*ringens*), lipped or mafked.

If the *corolla* be polypetalous, *i. e.* confifts of many petals, the lower part of each petal is called

The *unguis*, or claw, fee f. 144. letter *a*.

And the upper part which is wider, is called

The *lamina*, or thin plate, fee f. 144. letter *b.*

Again, this upper part, or *lamina*, is either

Crofs-fhaped (*cruciformis*), of four equal fpreading petals, f. 144.

Butterfly-

Butterfly-ſhaped *(papilionaceus)*, irregular, of four petals; the under one keel-ſhaped, the upper one aſcending, and the two ſide ones ſtanding ſingle.

9. The *nectarium* is that part of the *corolla* which contains the honey, having a wonderful variety both as to ſhape and ſituation, and is ſometimes united with the petals, and ſometimes ſeparate from them, ſee f. 138. 145. 147. 148.

III. The *ſtamina* are thoſe parts of a flower appropriated to the preparation of the *pollen* or fecundating duſt, and conſiſt of the *filamentum*, the *anthera*, and the *pollen*.

10. The *filamentum*, or thread, ſerves to elevate the *anthera*, and connect it to the flower, ſee f. 143.

11. The *anthera*, or ſummit of the *ſtamen*, is that part which contains the *pollen* or fecundating duſt, and diſcharges it when ripe.

12. The *pollen*, or impregnating duſt, is that fine powder contained within the *antheræ*, or tops of the *ſtamina*, and diſperſed, when ripe, upon the female organ, for impregnating the ſame.

IV. The *piſtillum*, or pointal, or female organ, adheres to the fruit, and is that part appropriated for the reception of the *pollen*, ſpoken of abo e It conſiſts of the *germen*, the *ſtylus*, and the *ſtigma*.

13. The

13. The *germen*, or ſeed-bud, is the baſe or lower part of the *piſtillum*, containing the rudiments of the unripe fruit, or ſeed, in the flowering ſtate of the plant.

14. The *ſtylus*, or ſtyle, is that part of the *piſtillum* which ſtands upon the *germen*, and elevates the *ſtigma* or ſummit.

15. The *ſtigma*, the ſummit, or top of the ſtyle, is that part which receives the fertilizing duſt of the *antheræ*, and tranſmits its *effluvia*, through the ſtyle, into the middle of the *germen* or ſeed bud.

V. The *pericarpium*, or ſeed veſſel, is that part which contains the ſeeds, and diſcharges them when ripe. It comprehends the eight following ſpecies, viz. the *capſula*, the *ſiliqua*, the *legumen*, the *conceptaculum* or *folliculus*, the *drupa*, the *pomum*, the *bacca*, and the *ſtrobilus*; of each of which in their order.

16. The *capſula*, a capſule or little caſket, is a dry, hollow ſeed veſſel, that ſplits or opens in ſome determinate manner, ſee f. 161, 162, 163.

Capſules, when opened or ſplit, are divided outwardly into one or more pieces, called

Valvulæ, or valves, ſee f. 162. letter *a*.

The parts which divide the capſule internally into cells, are called

Diſſepimenta, or partitions, ſee f. 162. letter *b*.

 And

And the ſubſtances which connect the partitions to the ſeeds, are called

Columellæ, or little pillars, ſee f. 162. letter *c*.

And the empty ſpaces for containing the ſeeds, are called

Loculamenta, or cells, ſee f. 162. letter *d*.

17. The *ſiliqua*, or pod (f. 157.), is a ſeed veſſel with two valves, having the ſeeds fixed along the joining or edge of both valves.

18. The *legumen*, or cod (f. 155.), is a ſeed veſſel with two valves, having the ſeeds fixed along the edge of one of the valves only.

19. The *conceptaculum*, a receiver, or *folliculus*, a little bag, is a ſeed veſſel with one valve (f. 156.), ſplitting lengthways from top to bottom, and has no ſeam for faſtening the ſeeds within it.

20. The *drupa* (f. 159.), or ſtone fruit, is a pulpy ſeed veſſel, which has no valve or opening, and contains within it a ſtone or nut.

21. The *pomum*, or apple (f. 158.), is a pulpy ſeed veſſel, which has no valve or external opening, and contains within it a capſule.

22. The *bacca*, or berry, is a pulpy ſeed veſſel (f. 160.), which has no valve, and contains ſeeds which are naked, or have no other covering than the pulp.

23. The

23. The *ſtrobilus*, or cone (f. 140.), is a ſeed veſſel compoſed of woody ſcales, laid over one another like tiles; it opens only at top, the ſcales being fixed below to the center of the cone.

VI. *Semen*, the ſeed, is a deciduous part of the plant, containing the rudiments of a new vegetable, and fertilized by the ſprinkling of the male duſt. Under this head are comprehended the ſeed properly ſo called, the nut and *propago*.

24. The ſeed properly ſo called is made up of the following parts, viz.

1. *Corculum*, the little heart, the point or ſpeck of life. It conſiſts of the

Plumula, or ſcaly part of the *corculum*, which aſcends and becomes the ſtem, and the

Roſtellum, that ſimple part of the *corculum*, which ſtrikes downwards and becomes the root.

2. *Cotyledons*, the porous and periſhable ſide lobes of the ſeed.

3. *Hilum*, an external mark or ſcar in the ſeed, where it had been attached to the ſeed veſſel.

4. *Arillus*, the proper exterior coat of the ſeed, which falls off ſpontaneouſly, ſee Pl. VIII. *A*.

5. *Coronula*, the crown of the ſeed, which is termed *pappus* or down, and is either feathered

feathered or hairy. The thread which ſupports the *pappus* is called *ſtipes*, ſee f. 164.

6. *Ala*, the wing of the ſeed, or the thin membrane by which it is diſperſed, f. 152.

25. The nut is a ſeed covered with a hard bony ſkin.

26. *Propago*, the ſeed of the moſſes, which has no tunic or covering.

VII. The *receptaculum*, or receptacle, the ſeventh and laſt part of the fructification on which the other ſix are connected, comprehends the *receptaculum proprium*, the *receptaculum commune*, the *umbella*, the *cyma*, and the *ſpadix*: and firſt of

27. The *receptaculum proprium*, or proper receptacle, which belongs to the parts of a ſingle fructification only. It is called the receptacle

Of the fructification, when it is common to both flower and fruit. It is called the receptacle

Of the flower, when the parts of the flower only are faſtened to it without the *germen*; and the receptacle

Of the fruit, when it is a baſe for the fruit, and at a diſtance from the receptacle of the flower; and the receptacle

Of the ſeeds, when it is a baſe to which the ſeeds are fixed within the *pericarpium* or ſeed veſſel, f. 163.

28. The *receptaculum commune*, or common receptacle, is that which connects ſeveral florets together; ſo that if part of them were taken away, an irregularity would enſue, ſee f. 137. That thin ſubſtance, which grows on the common receptacle, and ſeparates the florets, is called *palea* or chaff, f. 146.

29. The *umbella* or umbel is a receptacle, where a number of ſmall flower-ſtalks riſe from the ſame center to an equal height, and form an even ſurface at top. It is called a *ſimple umbel* when it has no ſubdiviſions; as in *panax*. It is called a *compound umbel*, and ſometimes an *univerſal umbel*, when all the flower-ſtalks are ſubdivided into other ſmaller umbels, commonly called *partial umbels*, f. 134.

30. The *cyma* is a receptacle, where a number of ſlender flower-ſtalks riſe from the ſame center to an equal height, as in the former; but the partial foot-ſtalks are irregularly diſperſed, without order; as in elder, gelder roſe, &c. f. 172.

31. The *ſpadix* (f. 136.), is the receptacle of the palms, and is always branched. It is alſo uſed to ſignify the flower-ſtalk of every plant, which was originally contained within a *ſpatha* or ſheath; but in this laſt caſe it is often ſimple.

SECT. LXXXVII.

The parts of a flower are the *calyx*, *corolla*, *ſtamina*, and *piſtillum*.

The parts of the fruit are the *pericarpium*, the ſeed, and the receptacle.

The parts therefore of the fructification, which comprehends both, are the flower and fruit.

Obſ. That the *calyx* is a part of the flower, though it is often preſent with the fruit, clearly appears from hence, that it never comes out after the flower is blown. It is true the *calyx* of the *patagonula* grows to a much larger ſize in the fruit than it had been of when in the flower; and there are many plants furniſhed with deciduous flower cups, which fall off as ſoon as the flowers are opened; as in the barrenwort and poppies.

SECT. LXXXVIII.

The eſſence of a flower conſiſts in the *antheræ* and *ſtigma*.

The eſſence of the fruit conſiſts in the ſeed.

The eſſence of fructification in the flower and fruit.

The eſſence of vegetables in the fructification: for,

1. The pollen is that fine duſt of vegetables, which, being diſcharged, emits a ſubtle and elaſtic vapour imperceptible to the naked eye.

2. The ſeed is a deciduous part of a plant, containing the rudiments of a new plant, and quickened or enlivened by the pollen.

3. The *anthera* is the organ which produces and diſcharges the pollen.

4. The *pericarpium* is the organ which produces and diſcharges the ſeeds.

5. The filament ſupports the *anthera*, and connects it to the plant.

6. The *germen* is the unripe rudiment of the *pericarpium* or ſeed veſſel, exiſting for the moſt part at the ſame time that the *antheræ* diſcharge their duſt.

7. The *ſtigma* is the moiſt ſummit or top of the *germen*.

8. The *ſtyle* ſupports the *ſtigma*, and connects it to the *germen*.

9. The *corolla* and *calyx* ſerve as covers to the *ſtamina* and *piſtilla*; the *calyx* being a prolongation of the outer, and the *corolla* of the inner bark.

10. The receptacle is that which connects all the foregoing parts.

From theſe definitions it plainly appears

11. That a flower is conſtituted of the *antheræ* and *ſtygma*, whether the covers (viz. the *calyx* and *corolla)* be wanting or not. And

12. That the fruit is conſtituted of the ſeed, whether there be a ſeed veſſel or not. And

13. That

13. That every fructification has the *anthera*, *ſtigma*, and ſeed. And laſtly,

14. That every vegetable, without exception, is furniſhed with flower and fruit.

The eſſence of a ſeed conſiſts in the *corculum*, which is connected with and wrapped within the lobe or lobes, and is beſides cloſely covered with its proper coat.

The eſſence of the *corculum* conſiſts in the *plumula*, which is the vital ſpeck of the plant under the ſmalleſt dimenſion, and like the *gemma* or bud increaſes infinitely. The baſe of the *plumula* is the *roſtellum*, which deſcends and ſtrikes root, being originally contiguous to the mother plant.

The *propagines* or ſeeds of moſſes have neither coat nor lobes, but are naked *plumulæ*, where the *roſtellum* is fixed into the *calyx* of the plant.

SECT. LXXXIX.

The *perianthium* or *calyx* may always, with certainty, be diſtinguiſhed from the *bractea* or floral leaf; in that the former withers when the fruit is ripe, if not before; but the *bracteæ* continue longer.

Examples of the *bractea* or floral leaf may be ſeen in the cow-wheat, *monarda*, ſage, lavender, *bartſia*, *hebenſtretia*, *muſſenda*, lime-tree, fumitory.

That the *bractea* is often taken for the *perianthium* or *calyx*, appears from the *hellebore*, *nigella*, paſſion-flower, *hepatica* and *peganum*, where the *calyx* is wanting.

SECT. XC.

The *corolla* may be diſtinguiſhed from the *calyx* by this rule; the former in point of ſituation is ranged alternately with the *ſtamina*, whereas the ſegments of the *calyx* ſtand oppoſite to the *ſtamina*.

That the *ſtamina* are ranged alternately with the petals, as the petals are with the *calyx*, and conſequently that the *ſtamina* are oppoſed to the ſegments of the *calyx*, will plainly appear from the compleat flowers of the *tetrandria* and *pentandria*, I mean thoſe which have both *calyx* and *corolla*.

Examples to prove the truth of this rule may be taken from the *chenopodium*, *urtica*, and *parietaria*, where it will appear that the *corolla* is wanting.

Some would infer, when one of the two covers is preſent, that this muſt be the *corolla*, as being the more excellent of the two; but the contrary will appear from the *ammania*, *iſnarda*, *peplis*, *ruellia* and *campanula*, which often want or exclude the *corolla*, but not the *calyx*.

That the *calyx*, as proceeding from the outer bark of the plant, is coarſer and thicker

thicker than the *corolla*, is abundantly evident; but their limits are ſcarce ever determinable, except from the colour, which is by no means ſufficient; as appears from the *bartſia*, whoſe *calyx* is of a deep red.

Several flowers have coloured and naked petals, which, inſtead of falling off at the time of flowering, grow green, harden, and remain on the plants; as may be ſeen in the *hellebore* and ſtar of Bethlehem.

That nature has put no abſolute limits between the *calyx* and *corolla*, will appear from the *daphne*, where both are grown together, and quite united in the margin, like a leaf of box.

Some make the *euphorbia* to be monopetalous, but they have taken the *calyx* for the *corolla*; for that the *peltæ* or ſhields in this flower are the real petals, appears from ſome annual Indian ſpecies of this plant, which have moſt diſtinct white petals.

SECT. XCI.

The number of the petals in a flower is to be reckoned from the baſe of the *corolla*; and the number of the ſegments in a petal is to be reckoned from the middle of the limb or *lamina*.

If the petals are quite diſtinct at the bottom, then the flower is ſaid to be polypetalous, or to conſiſt of more petals than one; but

but if the petals are united at the bottom, though ever fo flightly, then the flower is monopetalous, or confifts of one petal only. Thus the cranberry is monopetalous, and not tetrapetalous, becaufe, though the petals fall off in four diftinct parts, they were originally united at the bafe into one.

SECT. XCII.

We come now to the threefold ftructure of the fructification, viz. the moft natural, the differing ftructure, and the fingular ftructures, which are obfervable in all the parts of fructification, and ought to be defcribed according to the number of thefe parts; and their figure, their proportion one to another; their fituation, infertion, and connection: for other differences, fuch as magnitude or fize, colour, fmell, tafte, are often fallacious, and not to be depended upon.

SECT. XCIII.

The moft natural ftructure of the fructification is that which moft frequently and commonly occurs, and that in the greateft part of plants.

SECT. XCIV.

The moft natural number is where the *calyx* is divided into as many fegments as the

the *corolla*; and the filaments alſo are of the ſame number, each filament being furniſhed with a ſingle *anthera*: but the diviſion of the *piſtillum* uſually agrees in number with the cells of the ſeed veſſel, or the receptacles of the ſeeds.

The number five is moſt frequent in the parts of fructification, as appears from the plants of the *pentandria*, *ſyngeneſia*, and others. The *calyx* and *corolla* are cut into five ſegments in a great many plants. The moſt natural number is exemplified in *lyſimachia* and *linum*.

SECT. XCV.

The moſt natural figure is where the *calyx* is leſs ſpreading than the *corolla*, which is gradually widened upwards, and furniſhed within with the filaments and *piſtilla* ſtanding upright and tapering: when all theſe parts (except the *calyx)* are fallen off, the *pericarpium* big with ſeeds ſwells and continues to grow in largeneſs.

SECT. XCVI.

The moſt natural proportion is where the *calyx* is leſs than the *corolla*, and the *ſtamina* and *piſtilla* of an equal length with the *calyx*, if it is an erect flower. In a drooping flower the *piſtillum* longer than the *ſtamina*. In a decumbent flower the *ſtamina* and

and *piſtilla* declining to the under ſide. In an aſcending flower the *ſtamina* and *piſtilla* placed cloſe under the upper ſide. The drooping flower is exemplified in *fritillaria*, *campanula*, *galanthus*, and *geranium*; the decumbent flower in *caſſia*, and all the leguminous plants; the aſcending flower in betony, mint, horehound, &c. and all the plants of the *didynamia gymnoſpermia*. When the *piſtilla* are ſhorter than the *ſtamina*, the *antheræ* meet at top, as in *ſaxifraga*, *parnaſſia*.

SECT. XCVII.

The moſt natural ſituation is where the *perianthium* or *calyx* ſurrounds the receptacle; the *corolla* is ſeated on the receptacle, and alternate with the *calyx*; the filaments are ſituated within the *corolla*, oppoſite to its ſegments; the *antheræ* are ſeated on the tops of the filaments; the *germen* occupies the center of the receptacle; the *ſtyle* ſtanding on the top of the *germen*; and the *ſtigma* ſeated on the top of the *ſtyle*. When theſe are fallen off, the *germen* grows to a ſeed veſſel, ſupported by the *calyx*, and including within itſelf the ſeeds fixed to the receptacle of the fruit. The receptacle of the flower moſtly grows under, ſeldom round or over, the ſeed veſſel.

SECT.

SECT. XCVIII.

The differing ſtructure, or the ſtructure differing from the moſt common, is taken from thoſe parts of the fructification, which are often found to differ in different plants.

The differences or variations of ſtructure are the foundation of the *genera*, and their characters. The more natural any claſs is, ſo much the leſs apparent is the differing ſtructure. Every ſingular ſtructure has differences or variations from the common, but every difference or variation is not ſingular.

SECT. XCIX.

The *calyx* differs in reſpect to, 1. number, compoſition, parts, ſegments; 2. figure, equality, margin, top or brim; 3. proportion; 4. place, and duration.

1. In reſpect to number, the *calyx* is either ſingle, as in *primula*, and moſt other plants; or double, as in *malva*, *hibiſcus*, and *bixa*; or wanting, as in *tulipa*, *fritillaria*, and ſeveral of the lily tribe. In reſpect of compoſition, the *calyx* is either imbricated with various ſcales laid over each other like tiles, as in *hieracium*, *ſonchus*, *camellia*; or *ſquarroſe*; *i. e.* compoſed of ſcales ſpreading wide open all round, as in *carduus*, *onopordum*, *conyza*, or augmented; *i. e.* when a ſhorter and different row of leaves ſurrounds the

the baſe of the *calyx* externally, as in *coreopſis*, *bidens*, *crepis*, *dianthus*; or *multiflorous*; *i. e.* common to many florets, as in *ſcabioſa*, and all the compound flowers of the *ſyngeneſia*. In reſpect to parts, the *calyx* conſiſts either of one leaf, as in *datura*, *primula*; or of two leaves, as in *papaver*, *fumaria*; or of three leaves, as in *tradeſcantia*; or of four leaves, as in *ſagina*, *epimedium*, and the plants of the *tetradynamia*; or of five leaves, as in *ciſtus*, *adonis*, *cerbera*; or of ſix leaves, as in *berberis*; or of ten leaves, as in *hibiſcus*. In reſpect of ſegments, a monophyllous *calyx* is either entire, as in *genipa*; or cut into two ſegments, as in *utricularia*; or cut into three ſegments, as in *aliſma*, *cliffortia*; or cut into four ſegments, as in *rhinanthus*; or cut into five ſegments, as in *nicotiana*; or cut into ſix ſegments, as in *pavia*; or cut into eight ſegments, as in *tormentilla*; or cut into ten ſegments, as in *potentilla*, *fragaria*; or cut into twelve ſegments, as in *lythrum*.

2. In reſpect to figure, the *calyx* is either globular, as in *cucubalus*; or club-ſhaped, as in *ſilene*; or reflexed, as in *aſclepias*; or erect, as in *primula*, *nicotiana*. In reſpect to equality, the *calyx* is either even, as in *lychnis*; or uneven, as in the *helianthemum* of Tournefort; or hath every other ſegment ſhorter, as in *potentilla*, *tormentilla*.

In reſpect to margin, the *calyx* is either quite entire, as in moſt plants; or ſerrated, as in ſome of the *hypericums*; or ciliated, as in ſome of the *centaureas*. In reſpect to the top or ſummit, the *calyx* is either acute, as in *primula*, *androſace*; or acuminated, ſharp-pointed, as in *hyoſcyamus*; or obtuſe, as in *nymphæa*, *garcinia*; or with one ſegment ſtumped or lopped off, as in *verbena*.

3. In reſpect to proportion, the *calyx* is either longer than the *corolla*, as in *agroſtemma*, *ſagina*, and ſome ſpecies of *antirrhinum*; or of the ſame length with the *corolla*, as in ſome ſpecies of *ceraſtium*; or ſhorter than the *corolla*, as in *ſilene*.

4. In reſpect to place, the *calyx* is either ſituated under the flower, as in *linnæa*, *morina*; or under the fruit, as in *linnæa*, *morina*; or under the fructification, as in *pæonia*. Obſ. that *linnæa* and *morina* have each of them two *calyces*, the one of the flower, and the other of the fruit. In reſpect to duration, the *calyx* is either caducous, falling off, as ſoon as the flower is blown, as in *papaver*, *epimedium*; or deciduous, falling off with the *corolla*, as in *berberis*, and the plants of the *tetradynamia* claſs; or abiding till the fruit is ripe, as in plants of the *didynamia*.

The *involucrum*, another ſpecies of *calyx*, is either of one leaf, as in *bupleurum*; or of two leaves, as in *euphorbia*; or of three leaves, as in *butomus*, *alifma*; or of four leaves, as in *cornus*; or of five leaves, as in *daucus*; or of fix leaves, as in *hæmanthus*.

The *fpatha*, another fpecies of *calyx*, is either of one leaf, as in *narciffus*; or of two leaves, as in *ftratiotes*; or imbricate, as in *mufa*.

SECT. C.

The differences or variations of the *corolla* are in refpect to, 1. the petals, fegments, *nectaria*; 2. figure, equality, margin; 3. proportion; 4. place, and duration.

1. In refpect to the petals, the *corolla* confifts either of one petal, as in *convolvulus*, *primula*; or of two petals, as in *circæa*, *commelina*; or of three petals, as in *alifma*, *fagittaria*; or of four petals, as in plants of the *tetradynamia*; or of five petals, as in the umbelliferous plants; or of fix petals, as in *tulipa*, *lilium*, *podophyllum*; or of nine petals, as in *thea*, *magnolia*, *liriodendrum*; or of many petals, as in *nymphæa*. In refpect to fegments of polypetalous flowers, they are either two, as in *alfine*, *circæa*; or three, as in *holofteum*, *hypecoum*; or four, as in *lychnis*; or five, as in *refeda*. In monopetalous flowers the fegments of the *corolla* are much more common than in the poly-

polypetalous. Of the variations of the *nectaria* we ſhall treat below under Sect. 110.

2. In reſpect to figure, the petals are either waved, as in *glorioſa*; or plaited, as in *convolvulus*; or rolled back, as in *aſparagus*, *dodecatheon meadea*; or twiſted, as in *nerium*, *aſclepias*, *vinca*, *apocynum*, *cynanchum*, *ſtapelia*. In reſpect to equality, the petals are either equal, as in *primula*; or unequal, as in *butomus*; or regular, as in *aquilegia*; or irregular, as in *aconitum*, *lamium*. In reſpect to margin, the petals are either crenated, as in *linum*; or ſerrated, as in *tilia*, *aliſma*; or ciliated, as in *ruta*, *menyanthes*, *tropæolum*; or denticulate, *i. e.* with little teeth between the diviſions, as in *ſamolus*, *ſideroxylon*, and the rough-leafed plants of Ray; or with a hairy ſurface, as in *menyanthes*.

3. In reſpect to proportion, the petals are either very long, as in *cateſbæa*, *ſiphonanthus*, *brunsfelſia*, *craniolaria*; or very ſhort, as in *ſagina*, *centunculus*, *ribes*.

In reſpect to place, the baſe of the *corolla* is commonly cloſe to the *calyx*, if there be one; or, as in very few inſtances, the *corolla* is ſeparated from the *calyx* by the *germen*, viz. in *adoxa*, *ſanguiſorba*, *mirabilis*. In reſpect to duration, the *corolla* either continues till the fruit is ripe, as in the *nymphæa*;

phæa; or falls off at the firſt opening of the flower, as in *actæa*, *thalictrum*; or falls off with the flower, as in moſt plants; or does not fall, but withers, as in *campanula*, *orchis*, *cucumis*, *cucurbita*, *bryonia*, and ſeveral others.

SECT. CI.

The filaments of the *ſtamina* vary in reſpect to, 1. number, ſegments; 2. figure; 3. proportion; 4. or ſituation. The *antheræ* in reſpect to, 1. number, cells, deficiency; 2. figure, opening; 3. connection; 4. and ſituation.

1. In reſpect to number, the filaments vary from one to ten, twelve, twenty, and upwards, as in the ſexual ſyſtem. The number of ſegments are ſometimes two, as in *ſalvia*; in ſome three, as in *fumaria*; and in others nine, as in moſt plants of the *diadelphia* claſs.

2. In reſpect to figure, the filaments are either capillary, *i. e.* like hairs, as in *plantago*; or plane and flat, as in *ornithogalum*; or wedge-ſhaped, as in *thalictrum*; or ſpiral, as in *hirtella*; or tapering, as in *tulipa*; or notched, as in *porrum*; or reflexed, turned back, as in *glorioſa*; or rough and hairy, as in *tradeſcantia*, *anthericum*.

3. In reſpect to proportion, the filaments are either unequal, as in *daphne*, *lychnis*, *ſaxifraga*;

ſaxifraga; or irregular, as in *lonicera*, and the plants of the claſs *didynamia*; or very long, as in *trichoſtema*, *plantago*, *hirtella*; or very ſhort, as in *triglochin*.

4. In reſpect to ſituation, the filaments are either oppoſite to the leaves of the *calyx*, as in *urtica*; or alternate with them, as in *elæagnus*; or inſerted into the *corolla*, as in the monopetalous flowers, but ſcarce ever in the polypetalous; or inſerted into the *calyx* ſometimes in flowers which have no petals, as in *elæagnus*, and always in plants of the *icoſandria* claſs, and alſo in *epilobium*, *Oenothera*, *juſſiæa*, *ludwigia*, *oldenlandia*, *iſnarda*, *ammania*, *peplis*, *lythrum*, *glaux*, *rhexia*: but the filaments are moſt commonly inſerted into the receptacle, as are alſo the *calyx* and *corolla*.

1. In reſpect to number, the *anthera* is either one only on each filament, as in moſt flowers; or one common to three filaments, as in *cucurbita*; or one common to five filaments, as in plants of the *ſyngeneſia*; or two *antheræ* on each filament, as in *mercurialis*; or three on each filament, as in *fumaria*; or five on three filaments, as in *bryonia*; or five to each filament, as in *theobroma*. In reſpect to cells, the *antheræ* have either one cell, as in *mercurialis*; or two, as in *helleborus*; or three, as in *orchis*; or four, as in *fritillaria*. Deficient or

wanting, ſometimes one *anthera*, as in *chelone*, *martynia*; or two, as in *pinguicula*, *verbena*; or three, as in *gratiola*, *bignonia*, ſome of the *geraniums*; or four, as in *curcuma*; or five, as in *pentapetes*, and ſome of the *geraniums*.

2. The figure of the *antheræ* is either oblong, as in *lilium*; or globular, as in *mercurialis*; or arrow-ſhaped, as in *crocus*; or angular, as in *tulipa*; or horned, as in *hamamelis*, *erica*, *vaccinium*, *pyrola*. The *antheræ* burſt either on the ſide, as in *leucoium*, and moſt plants; or at top, as in *galanthus*, *kiggleria*; or from the baſe to the top, the whole length, as in *epimedium*, *leontice*.

3. The *antheræ* are connected or faſtened by their baſe, as in moſt flowers; or by their tops, as in *galanthus*, *kiggleria*; or on their ſides, as in *canna*; or grow to the *nectarium*, as in *coſtus*.

4. The *antheræ* are ſituated or placed on the tops of the filaments, as in moſt flowers; or on the ſides of the filaments, as in *paris*, *aſarum*; or on the *piſtillum*, as in *ariſtolochia*; or on the receptacle, as in *arum*.

The figure of the particles of the *farina*, or fecundating duſt, viewed with a microſcope, is very different in different flowers; as for inſtance, it is quite round and prickly like a hedge-hog in *helianthus*, perforate in *geranium*,

geranium, double in *ſymphytum*, wheel-ſhaped and teethed in *malva*, angular in *viola*, kidney-ſhaped in *narciſſus*, or, laſtly, like a thin leaf rolled up, as in *borrago*.

SECT. CII.

The *piſtilla* varies in, 1. number, ſegments; 2. figure; 3. length, thickneſs; and, 4. ſituation of all its three component parts; to wit, the *germen*, *ſtyle*, and *ſtigma*.

Of the *germen*, which is only the rudiment of the ſeed veſſel, we ſhall treat in the next ſection, where the variations of the *pericarpium* are enumerated.

The *ſtyles*, which are always diſtinct from the *calyx* and *corolla*, vary in number, as may be ſeen in the ſexual ſyſtem, where the number of *piſtilla* is always taken from the *ſtyles*, if there are any, and if not, from the *ſtigmata*. In reſpect to ſegments, the *ſtyle* is either *bifid*, *i. e.* cut into two ſegments, as in *perſicaria*, *cornutia*; or into three ſegments, as in *clethra*, *frankenia*; or into four ſegments, as in *rhamnus*; or into five ſegments, as in *geranium*; or forked, as in *clutia*.

2. The figure of the *ſtyle*, is either cylindrical, as in *monotropa*; angular, as in *canna*; tapering, as in *geranium*; capillary, *i. e.* like a hair, as in *ceratocarpus*; or thicker above than below, as in *leucoium*.

3. In reſpect to length, the *ſtyle* is either very long, as in *tamarindus*, *caſſia*, *campanula*, *ſcorzonera*, *zea*; or very ſhort, as in *papaver*; or of an equal length with the *ſtamina*, as in *nicotiana*, and moſt other flowers. As to thickneſs, the *ſtyles* are either thicker than the *ſtamina*, as in *leucoium*; or ſmaller than the *ſtamina*, as in *ceratocarpus*; or of the ſame thickneſs, as in *lamium*.

4. In point of ſituation, the *ſtyle* is placed either on the top of the *germen*, as in moſt flowers; above and below the *germen*, as in *capparis*, *euphorbia*; or on one ſide of the *germen*, as in plants of the *icoſandria polygynia*; and others, as *hirtella*, *ſuriana*. In reſpect to duration, the *ſtyle* is ſometimes permanent or abiding, as in plants of the *tetradynamia*.

1. The *ſtigma* is either one, as in the generality of flowers; or two, as in *ſyringa*; or three, as in *campanula*; or four, as in *epilobium*, *parnaſſia*; or five, as in *pyrola*. The ſegments of the *ſtigma* are either rolled together, as in *crocus*; or capillary, like hairs, as in *rumex*; or rolled back, as in *dianthus*, *campanula*, and the plants of the *ſyngeneſia* claſs; or bent to the left, as in *ſilene*; or divided into ſix parts, as in *aſarum*; or divided into many parts, as in *turnera*.

2. As

2. As to figure, the *ſtigma* is either formed into a round head, as in *tribulus*, *hugonia*, *vinca*, *ipomæa*, *cluſia*; or globular, as in *primula*, *hottonia*, *linnæa*, *limoſella*; or egg-ſhaped, as in *genipa*; or obtuſe, as in *andromeda*; or ſtumped, as in *maranta*; or depreſſed obliquely, as in *actæa*, *daphne*; or notched, as in *melia*; or orbicular, *i. e.* round and flat, as in *lythrum*; or target-ſhaped, as in *ſarracena*, *nymphæa*, *cluſia*, *papaver*; or like a crown, as in *pyrola*; or croſs-ſhaped, as in *penæa*; or hooked, as in *viola*, *lantana*; or channeled, as in *colchicum*; or concave, as in *viola*; or angular, as in *muntingia*; or ſtreaked with parallel lines, as in *papaver*; or feathered, as in *rheum*, *triglochin*, *tamarix*, and the graſſes; or hairy, as in *cucubalus*, *lathyrus*.

3. As to length, the *ſtigma* is either long and ſlender, as in *zea*; or of the ſame length with the *ſtyle*, as in *genipa*. As to thickneſs, the *ſtigma* is ſometimes like a petal or flower-leaf, as in *iris*.

4. In point of duration, the *ſtigma* is ſometimes abiding, as in *ſarracena*, *hydrangea*, *nymphæa*, *papaver*; but moſt commonly withers, as in the generality of flowers.

SECT. CIII.

The *pericarpium*, or ſeed veſſel, varies in, 1, number, cells, valves, partitions; 2. ſpecies, figure, burſting; 3. confinement of the ſeeds; and, 4. ſituation.

1. As to number, which reſpects only the external diviſion, the *pericarpium* is either wholly wanting, as in *thymus*, and all the other plants of the *didynamia gymnoſpermia*; or the *pericarpium* conſiſts of one capſule only, as in *lychnis*; or of two capſules, as in *pæonia*, *aſclepias*; or of three capſules, as in *veratrum*, *delphinium*; or of four capſules, as in *rhodiola*; or of five capſules, as in *aquilegia*; or of many capſules, as in *caltha*, *trollius*, *helleborus*. As to cells, reſpecting only the internal diviſion, the *pericarpium* conſiſts either of one cell only, as in *primula*, *trientalis*; or of two cells, as in *hyoſcyamus*, *ſinapis*, *nicotiana*; or of three cells, as in *lilium*; or of four cells, as in *euonymus*; or of five cells, as in *pyrola*; or of ſix cells, as in *aſarum*, *ariſtolochia*; or of eight cells, as in *linum radiola*; or of ten cells, as in *linum*; or of many cells, as in *nymphæa*. As to valves, the ſeed veſſel conſiſts either of two, as in *chelidonium*, *braſſica*; or of three valves, as in *viola*, *polemonium*, *helianthemum*; or of four valves, as in *ludwigia*, *œnothera*; or of five valves, as in *hottonia*. The internal partitions are either parallel, as in *lunaria*, *draba*; or run croſs the ſeed veſſel, as in *biſcutella*, *thlaſpi*.

2. As to the different ſpecies of ſeed veſſels, they are enumerated in ſection 86.

The

The figure of the ſeed veſſel is either like a top, as in *pyrus*; or blown up like a bladder, as in *ſtaphylæa*, *cardiſpermum*; or like thin membranes or films, as in *ulmus*; or having three, four, or five angles and ſides, as in *averrhoa*, *zygophyllum*; or jointed, as in *ornithopus*, *hedyſarum*, *raphanus*. The burſting of the ſeed veſſel, when the fruit is ripe, is either on the top in four ſegments or parts, as in *dianthus*; or in five parts, as in *alſine*; or in ten parts, as in *ceraſtium*; or this burſting is on the lower part of the *pericarpium*, either into three parts, as in *triglochin*, *campanula*; or into five parts, as in *ledum*; or the opening is lengthways at the angles, as in *oxalis*, *orchis*; or by a little hole, as in *campanula*; or the opening is horizontally, as in *anagallis*, *plantago*, *amaranthus*, *portulaca*, *hyoſcyamus*. All jointed fruit ſplit at the joints, which contain each one ſeed, as in *ornithopus*, *hedyſarum*, *hypecoum*, *ſcorpiurus*, *raphanus*.

The confinement of the ſeeds is ſometimes elaſtic, burſting like a ſpring, as in *oxalis*, *elaterium*, *momordica*, *impatiens*, *cardamine*, *phyllanthus*, *euphorbia*, *juſticia*, *ruellia*, *dictamnus*, *hura*, *ricinus*, *tragia*, *jatropha*, *croton*, *cluſia*, *acalypha*.

4. The ſituation of the *pericarpium* is at the receptacle of the flower, either below it, as in *vaccinium*, *epilobium*; or above

it; as in *arbutus*, *tulipa*; or both above and below it, as in *ſaxifraga*, *lobelia*.

SECT. CIV.

The ſeeds are obſerved to differ or vary in, 1. number, cells; 2. figure, ſubſtance, *coronula*, or little crown of the ſeed, *arillus*, or exterior coat; 3. ſize; 4. ſituation; 5. *corculum*, or little heart of the ſeed; and, 6. receptacle.

1. The ſeeds are in number either one, as in *polygonum*, *colinſonia*; or two, as in the umbelliferous and ſtarry plants; or three, as in *euphorbia*; or four, as in the rough-leafed and verticillated plants. In moſt plants each ſeed has one cell, but ſometimes there are two, as in *cornus*, *xanthium*, *locuſta*, *valeriana*, *cordia*.

2. The figure of the ſeeds is either girt, as in *arenaria*, *bryonia*; or heart-ſhaped, as in *medeola*; or kidney-ſhaped, as in *phaſeolus*, *anacardium*; or egg-ſhaped, as in *polygala*, *iſatis*; or prickly, as in *myoſotis*, *lappula*. The ſubſtance of ſeeds is either bony, as in *corylus*, *lithoſpermum*, and the various kinds of nuts; or callous, as in citron, lemon, orange. The little crown of the ſeeds is either a ſmall *calyx* formed of the *perianthium* of the flower, as in *ſcabioſa*, *knautia*, *ageratum*, *arctotis*; or of a *pappus*, conſiſting of ſingle thread-like hairs, as in *hieracium*,

hieracium, ſonchus; or a feathered or compound woolly *pappus*, as in *crepis, ſcorzonera, tragopogon*; or a chaffy *pappus*, as in *bidens, ſilphium, tagetes, coreopſis*; or wholly wanting, as in *tanacetum*. The *arillus*, or exterior coat of the ſeed, is to be ſeen in *coffea, jaſminum, cynogloſſum, cucumis, dictamnus, dioſma, celaſtrus, euonymus*.

3. The ſize of ſeeds is ſometimes very ſmall, as in *campanula, lobelia, trachelium, ammania*; and ſometimes very large, as in *coccus*.

4. The ſituation of the ſeeds is either neſtling, *i. e.* diſperſed in the pulp, without any order, as in *nymphæa*; or connected to the *ſuture*, or ſeam, as in the podded plants; or fixed to little pillars, which ſerve to connect the partitions to the ſeeds, as in *malva*; or placed on receptacles, as in *nicotiana, datura*.

5. The receptacle of the ſeeds is chiefly to be conſidered in the compound flowers. Its figure is either plain, as in *achillea*; or convex, as in *matricaria*; or conical, as in *anthemis, melampodium*. Its ſurface is either naked, as in *matricaria*; or dotted, as in *tragopogon*; or woolly, as in *andryala*; or briſtly, as in *centaurea*; or chaffy, as in *hypochæris, anthemis*.

The receptacles of the fruit of ſome ſimple flowers is very ſingular, viz. in the *magnolia, uvaria, michelia*.

6. The

6. The *hilum*, or ſcar of the ſeed, is moſt evident in *cardioſpermum*, *ſtaphylæa*. The *corculum* is cloſe to the *hilum*. The ſeat of the *corculum* (ſays *Cæſalpinus*) is either in the top or bottom of the ſeed.

SECT. CV.

A ſingular ſtructure of the parts of fructification is ſuch a one as occurs but in a very few *genera*, and is directly oppoſed to the natural ſtructure mentioned in ſect. 93. This ſtructure is exemplified in the *arum*, whoſe *ſtamina* are within the *piſtilla*; in the *adoxa*, where the *germen* is between the *calyx* and *corolla*; in the *ſalvia*, whoſe filaments are jointed; in the *eriocaulum*, whoſe *ſtamina* are placed upon the *germen*, and the *corolla* and *calyx* are below the *germen*; and in the *magnolia*, where the receptacle of the fruit is a large round head, and the ſeeds, which are like berries, hang by a ſlender thread out of the capſule.

SECT. CVI.

The *calyx* is generally of a green colour, and ſeldom of thoſe gay colours which the *corolla*, or painted leaves of the flower have; but in the *bartſia Americana* the *calyx* is blood-red; in the *cornus herbacea* the *involucrum* is as white as ſnow, and the petals black; in the *cornus Americana* the *involucrum*

volucrum is red, and heart-ſhaped; in the *aſtrantia* the *involucrum* is coloured; in the palms the *ſpathæ* are of a blood colour.

Where the *corolla* is wanting, the *calyx* is uſually more coloured, eſpecially at the time of flowering; as in *ornithogalum*, *perſicaria*, *polygonum*.

When the *calyx* or *corolla* are leſs coloured, the leaves often take a colour; as in *amaranthus tricolor*.

SECT. CVII.

In plants of the *icoſandria*, and ſome others, the inner ſide of the *perianthium* or *calyx* ſurrounds the receptacle of the flower; and in the gourd kind, and ſome others, the inner ſide of the *calyx* grows to the receptacle of the flower, quite round.

This aphoriſm is thus explained:

In moſt plants the *ſtamina* and petals are inſerted into the receptacle, in the bottom of the flower; but plants of the *icoſandria* claſs, and many others, have a monophyllous *calyx*, *i. e.* conſiſting of one piece, the inner ſide of which is girt round with a line, into which the *ſtamina* and petals are inſerted. The ſame ſort of *calyx* ſupporting the flowers is obſerved in other plants; as in *lythrum*, *epilobium*, *œnothera*, *ammania*, *iſnarda*, *peplis*, *elæagnus*. In the gourd kind, viz. *cucumis*, *cucurbita*, and others of the ſame

ſame natural order, as *paſſiflora*, *fevillea*, *momordica*, *trichoſanthus*, *bryonia*, *ſicyos*, *melothria*, *gronovia*, the *calyx*, to which the *corolla* is, as it were, glued, lines the receptacle of the flower quite round, and the ſame thing holds in the *cactus*. There are ſome where the receptacle elevates the *pericarpia*, or ſeed veſſels; as *paſſiflora*, *capparis*, *breynia*, *arum*, *calla*, *dracontium*, *pothos*, *zoſtera*, *nepenthes*, *clutia*, *helicteres*, *ſiſyrinchium*.

SECT. CVIII.

In a polypetalous flower the filaments of the *ſtamina* are diſtinct or ſeparate from the petals, but in monopetalous flowers the filaments of the *ſtamina* are inſerted into the *corolla* moſt commonly. This rule holds in general: there are exceptions in both caſes. For in *ſtatice*, which is pentapetalous, the filaments are inſerted into the claws of the petals; and in *melanthium*, which has ſix petals, the filaments are alſo inſerted into the petals; and in *lychnis*, *ſaponaria*, *cucubalus*, *ſilene*, and *agroſtemma*, which are pentapetalous, every other *ſtamen* is faſtened to the claws of the petals. Theſe are exceptions to the firſt part of the rule. And in ſome monopetalous flowers the *ſtamina* are ſeparate or diſtinct from the *corolla*, viz. in *ledum*, *azalea*, *andromeda*,

clethra,

clethra, *erica*, *myrſine*, *memecylum*, *ſantalum*, *vaccinium*, *arbutus*, *royena*, *dioſpyros*, *meloſtoma*, and *pyrola*, which conſtitute the natural order called *bicornes*, *i. e.* plants with horned *antheræ*. This holds alſo in *ciſſus* and *aloe*.

SECT. CIX.

The *antheræ* are commonly placed upon the tops or ſummits of the filaments. But there are ſome exceptions to this general rule; *e. g.* where the *antheræ* are faſtened to the ſides of the filaments, as in *paris*, *aſarum*. And in *ariſtolochia* the *antheræ* adhere to the *ſtigma* without any filaments.

SECT. CX.

When the *nectarium* is diſtinct from the petals, it is commonly very irregular, and affords many ſingular variations.

That the *nectaria* commonly make a part of the *corolla*, is undeniable; but that they alſo often grow diſtinct or ſeparate from the *corolla*, will clearly appear from the following examples, viz. *aconitum*, *aquilegia*, *helleborus*, *iſopyrum*, *nigella*, *garidella*, *epimedium*, *parnaſſia*, *theobroma*, *cherleria*, *ſauvageſia*. The chief diſtinctions of the *nectaria* are, 1. ſpur-ſhaped *nectaria*, which are found both in monopetalous flowers, as *antirrhinum*, *valeriana*, *pinguicula*, and *utri-*

cularia; and alſo in polypetalous flowers, as in *orchis*, *delphinium*, *viola*, *impatiens*, *fumaria*. 2. Such as are on the inner ſide of the petals, as in *fritillaria*, *lilium*, *ſwertia*, *iris*, *hermannia*, *uvularia*, *hydrophyllum*, *myoſurus*, *ranunculus*, *bromelia*, *erythronium*, *berberis*, *valliſneria*. 3. *Nectaria* which crown the *corolla*, as in *paſſiflora*, *narciſſus*, *pancratium*, *olax*, *lychnis*, *ſilene*, *coronaria*, *ſtapelia*, *aſclepias*, *cynanchum*, *nepenthes*, *cherleria*, *cluſia*, *hamamelis*, *dioſma*. 4. *Nectaria* of a ſingular conſtruction, as in *reſeda*, *cardioſpermum*, *amomum*, *coſtus*, *curcuma*, *grevia*, *urtica*, *andrachne*, *epidendrum*, *helictores*, *ſalix*. 5. *Nectaria* that are found on the *calyx*, as thoſe in *tropæolum*, *monotropa*, *biſcutella*, *malpighia*. 6. Such as are found on the *antheræ*, as in *adenanthera*; or on the filaments, as in *laurus*, *dictamnus*, *zygophyllum*, *commelina*, *mirabilis*, *plumbago*, *campanula*, *roëlla*. 7. *Nectaria* that are found on the *germen*, as thoſe of *hyacinthus*, *iris*, *butomus*, *cheiranthus*, *heſperis*. 8. *Nectaria* that are found on the receptacle, as in *lathræa*, *helxine*, *collinſonia*, *ſedum*, *cotyledon*, *ſempervivum*, *mercurialis*, *kiggleria*, *clutia*, *phyllanthus*, *melianthus*, *dioſma*.

SECT. CXI.

The *piſtillum* is commonly placed within the *antheræ*, but the *arum* is a ſingular exception;

exception; for, in this, the receptacle is lengthened in the form of a club, on the lower part of which are ſituated the *piſtilla*, and the *antheræ* on the upper; ſo that the *piſtilla* ſtand on the outſide and round the *ſtamina*. The ſame thing holds in the *calla Æthiopica*; and in *rumex* there is a ſingularity in the inſertion of the *ſtamina*.

SECT. CXII.

The *ſtyle* is commonly placed on the top of the *germen*, except in a few *genera*; as the *roſa*, *rubus*, *fragaria*, *potentilla*, *tormentilla*, *dryas*, *geum*, *comarum*, *ſibbaldia*, *agrimonia*, *alchemilla*, *aphanes*, *ſuriana*, *hirtella*; to which we may alſo add, *paſſerina*, *gnidia*, *ſtruthea*, *ſtelleria*. See ſect. 102.

SECT. CXIII.

The *pericarpium*, or ſeed veſſel, is commonly ſhut, nor does it ever contain within it other leſſer *pericarpia*, but often forms a berry when it is of a pulpy ſubſtance.

The ſeed veſſel is exactly ſhut in moſt plants, but in *reſeda* and *datiſca* it always gapes. In *parnaſſia* it gapes at the time of flowering, and afterwards is ſhut. It does not appear that there is any ſeed veſſel which naturally contains within itſelf other leſſer ſeed veſſels; for when ſeveral ſmall ſeed

veſſels

veſſels ſeem as it were to be contained within one larger, this outer one is only a common receptacle, as appears in *magnolia*, *uvaria*, *michelia*. Berries are diſtinguiſhed into proper and improper. That pulpy fruit which is formed of the *pericarpium* is a berry properly ſo called, and that which is formed of any of the other parts is an improper berry. The end and deſign of berries is, that being ſwallowed by divers animals, they may thereby be diſſeminated by their dung, as in the *miſſeltoe*, and many others. The following are improper berries, and conſequently ſo many examples of ſingularity in this part of the fructification: 1. when they are formed of the *calyx*, as in *blitum*, *morus*, *baſella*, *ephedra*, *coix*, *roſa*, *coriaria*; or 2. of the receptacle, as in *taxus*, *rhizophora*, *anacardium*, *ochna*, *laurus*, *dorſtenia*, *ficus*, *fragaria*; or 3. of the ſeed, as in *rubus*, *magnolia*, *uvaria*, *michelia*, *praſium*, *uvularia*, *panax*, *adonis*, *crambe*, *oſteoſpermum*; or 4. of the *arillus*, as in *euonymus*, *celaſtrus*; or 5. of the *nectarium*, as in *mirabilis*; or 6. of the *corolla*, as in *poterium*, *adoxa*, *coriaria*; or 7. when the berry is a capſule, as in *euonymus*, *androſæmum*, *cucubalus*, *epidendrum*; or 8. when the berry is a dry fruit, as in *linnæa*, *gallium*, *tetragonia*, *myrica*, *trientalis*, *tropæolum*, *xanthium*, *juglans*, *ptelea*, *ulmus*,

comarum,

comarum, *amygdalus*, *mirabilis*; or 9. when it is a capſule externally, as in *dillenia*, *cluſia*, *nymphæa*, *capparis*, *breynia*, *moriſona*, *ſtratiotes*, *cyclamen*, *ſtrychnus*; or, 10. when it is hollow, as in *ſtaphylæa*, *cardioſpermum*, *capſicum*; or, 11. when it is a *folliculus*, or little bag, as in *actæa*; or, 12. when it is a cod, as in *hymenæa*, *caſſia*, *inga* of Plumier, *ceratonia*; or, laſtly, when it is a cone, as in *annona*, *juniperus*.

The berry naturally does not ſplit or burſt, becauſe it is ſoft, and made to be diſperſed by the means of animals.

In the *adonis capenſis* the berries are evidently aggregate, *i. e.* ſeveral united into one.

SECT. CXIV.

Compleat flowers are either ſimple or aggregate.

A compleat flower has both the *calyx* and *corolla*; and an incompleat flower wants either the *calyx* or *corolla*. An apetalous flower wants the *corolla*, but not the *calyx*. A naked flower wants the *calyx*, but not the *corolla*; though this laſt would more properly be called a naked flower, if both *calyx* and *corolla* were wanting, which is a thing that very rarely happens.

SECT. CXV.

A ſimple flower is that where no part of the fructification is common to more than one only. A compound fruit, or one with many capſules, does not conſtitute a compound flower; for a compound fruit may be, and often is, where the flower is ſimple.

SECT. CXVI.

An aggregate flower is one which has ſome part of the fructification common to ſeveral flowers or florets, and it is divided into the aggregate properly ſo called, the compound, the umbelliferous, the cymoſe, &c. A flower is ſaid to be aggregate, when ſeveral florets are ſo joined by the mediation of ſome part of the fructification common to them all, that the taking away of one floret would deſtroy the form of that whole, of which it made a part. The part which is common in aggregate flowers is either the receptacle or *calyx*, and each partial flower in them is called a floret. The primary modes of aggregate flowers (ſee Pl. VIII. & X.) are the ſeven following, viz. 1. The umbellate or umbelliferous flower has a receptacle divided into ſeveral flower-ſtalks, all riſing from the ſame center to an equal height. 2. The cymoſe flower has a receptacle divided into ſeveral flower-ſtalks, riſing from the ſame center

center to an equal height; but the partial foot-ſtalks are irregularly diſperſed without any order, as in *lauruſtinus*. 3. A compound flower has a large and entire receptacle, with the florets ſeſſile. 4. An aggregate flower, properly ſo called, has alſo an enlarged receptacle, with the florets not ſeſſile as in the former, but each furniſhed with a foot-ſtalk; as in *ſcabioſa*, *knautia*, *dipſacus*, *cephalanthus*, *globularia*, *leucadendron*, *protea*, *brunia*, *barreria*, *ſtatice T.* 5. An amentaceous aggregate flower has a ſlender thread-like receptacle, furniſhed with chaffy ſcales; as in *xanthium*, *ambroſia*, *parthenium*, *iva*, *alnus*, *betula*, *ſalix*, *populus*, *corylus*, *carpinus*, *juglans*, *fagus*, *quercus*, *liquidambar*, *cynomorium*, *ficus*, *dorſtenia*, *parietaria*, *urtica*, *pinus*, *abies*, *cupreſſus*, *thuia*, *juniperus*, *taxus*, *ephedra*. 6. A glumoſe aggregate flower has alſo a ſlender thread-like receptacle, whoſe baſe is furniſhed with a common glume, or chaffy huſk; as in *bromus*, *feſtuca*, *avena*, *arundo*, *briza*, *poa*, *aira*, *uniola*, *cynoſurus*, *melica*, *elymus*, *lolium*, *triticum*, *ſecale*, *hordeum*, *ſcirpus*, *cyperus*, *carex*. 7. A ſpadiceous aggregate flower has a receptacle common to many florets, contained within a *ſpatha*. The receptacle in theſe is called a *ſpadix*, which in the palms is always divided; but ſimple, and covered all round with florets, in the *calla*, *dracontium*, and *pothos*; on the lower ſide of the receptacle only in *arum*; and upon one ſide only in *zoſtera*.

SECT. CXVII.

A compound flower is a ſpecies of aggregate that contains many ſeſſile florets, on a common entire receptacle, and within one *perianthium* or *calyx*; each floret being furniſhed with *antheræ* which grow together in form of a cylinder. The properties then of a compound flower are the five following, viz. 1. A common, enlarged, and undivided receptacle; 2. a common *perianthium* or *calyx*, ſurrounding all the florets; 3. five *antheræ* grown together in form of a cylinder; 4. monopetalous ſeſſile florets; 5. a *germen* containing only one ſeed under each floret. It is eſſential to compound flowers to have the *antheræ* grown together in form of a cylinder, and a ſingle ſeed under each floret; but we muſt obſerve, that there are compound flowers, whoſe *calyx* is furniſhed with only one floret, as *echinops*, *ſtæbe*, *corymbium*; and one ſpecies of *artemiſia*. There are commonly reckoned three kinds of compound flowers, viz. 1. The ligulate, or ſemifloſcular of Tournefort; *i. e.* half florets both in the diſk and *radius*; 2. tubular, or floſculous of Tournefort; *i. e.* whole florets,

florets, and nearly equal throughout; 3. radiated, when the florets of the diſk are tubular or whole, and thoſe of the circumference of another form; for they may have in the circumference, 1. either half florets, which are properly the radiated flowers of Tournefort; or, 2. whole florets, but unlike to thoſe of the diſk, as in *centaurea*; or, 3. naked florets, as in *gnaphalium* and *artemiſia.* A compound flower for the moſt part conſiſts of many florets, but ſeldom of a determinate number, except in the following inſtances, ligulate, *prenanthes* of five florets, tubular, *eupatorium ſcrophulariæ fol.* of 20 florets, *eupatorium perfoliatum* of 15 florets, *eupatorium digitatum*, *eupatorium zeylanicum*, *eupatorium ſecundum H. upſ. eupatorium quartum H. upſ.* each of five florets, *eupatorium volubile* of four florets, radiated. *Arctotis* has in the *radius* or circumference 20 florets, *rudbeckia* 12, *tetragonotheca* and *oſteoſpermum* each ten, *coreopſis* and *othonna* each eight, *achillæa*, *eriocephalus*, *micropus*, *ſeriphium*, *ſigeſbeckia*, *acmella*, *melampodium*, *chryſogonum*, *tagetes*, each five florets in the *radius*,; one ſpecies of the *ſigeſbeckia* three florets in the *radius*; and the *milleria* one only in the *radius*, and three in the diſk.

SECT. CXVIII.

An umbellate flower is another of the aggregate kind. It confifts of many florets on a common receptacle, which is divided into foot-ftalks, rifing to the fame height, and all fpringing from the fame center. A *cyma* is alfo of the aggregate kind. It confifts of many florets placed on a common receptacle, which is divided into feveral foot-ftalks, all rifing to the fame height, the primary foot-ftalks fpringing from the fame center, but the fecondary or partial ones difperfed, without any order.

An *umbel*, then, is that mode of flowering, where all the foot-ftalks fpring from the fame center with an even circumference. A fimple *umbel*, where the receptacle is thus divided only once. A compound *umbel* is where all the common foot-ftalks are fubdivided into little *umbels*, commonly called partial *umbels*. The properties of umbelliferous flowers, properly fo called, are the following; 1. a common receptacle, divided into feveral foot-ftalks, which fpring from the fame center, and are equal in their circumference, whether the *umbel* at top be plane, convex, or concave; 2. a *germen* under each floret; 3. five diftinct and deciduous *ftamina* to each floret; 4. a bifid *piftillum*; 5. two feeds connected at their upper extremities. In umbellifer-

ous

ous flowers the univerſal *involucrum* may vary, ſome conſiſting of four leaves, as in *hydrocotyle*, *ſiſon*, *cuminum*; ſome of five leaves, as in *bupleurum*, *ſcandix*, *bubon*; ſome of ſeven leaves, as in *liguſticum*; ſome of ten leaves, as in *artedia*. The partial *involucrum* in ſome is halved, or goes half round only, as in *ethuſa*, *coriandrum*, *ſanicula*; in others it is caducous, as in *ferula*, *heracleum*. The diſk or middle of the *umbel* alſo varies, being in ſome all male flowers, as in *aſtrantia*, *caucalis*, *artedia*, *oenanthe*, *ſcandix*: again, an *umbell* may be radiated, *i. e.* when the petals in the circumference or margin are larger than thoſe of the diſk, as in *tordyllium*, *caucalis*, *coriandrum*, *ammi*, and one ſpecies of *heracleum*.

The *cyma*, in the ſame manner as an *umbel*, has all the primary foot-ſtalks produced from the ſame center; but the partial ones ſcattered or diſperſed irregularly, as in *opulus*, *cornus ſanguinea*, and *ophiorrhiza*. That the receptacle is thus produced appears from the *involucrum*; and the *cornus mas*, or *umbellata*, clearly demonſtrates the ſame; another ſpecies of which is the *cornus ſanguinea*, whoſe flower-ſtalks are branched in the ſame manner as thoſe in the *lauruſtinus*.

SECT. CXIX.

In a luxuriant flower the covers of the fructification, viz. the *calyx* and *corolla*, are ſo multiplied, or increaſed in number, as to exclude or deſtroy the eſſential parts of the ſame. Luxuriant flowers are of three ſorts; 1. multiplied; 2. full; and, 3. proliferous: but the mutilate flower is that which excludes the *corolla*. A flower then is ſaid to be luxuriant, when ſome parts of the fructification are augmented in number, and others excluded. This is occaſioned for the moſt part by the luxuriancy of nouriſhment. That flower which wants the *corolla*, though it ought naturally to have one, is called mutilate, and this defect is commonly owing to a want of ſufficient heat. It often happens in *ipomæa*, *campanula*, *ruellia*, *viola*, *tuſſilago*, *cucubalus*.

SECT. CXX.

We commonly ſay a flower is multiplied, when the *corolla* is ſo increaſed as to exclude only a part of the *ſtamina*; and ſuch a flower is either duplicate or triplicate, &c. The *perianthium* and *involucrum* are very rarely increaſed, ſo as to conſtitute a multiplied flower, and the *ſtamina* ſcarce ever. The multiplied flower is diſtinguiſhed from the full one, in that the *corolla* is ſo increaſed in the latter, that the *ſtamina*

ſtamina are totally excluded. But the multiplied flower has only a double, triple, or quadruple row of petals. Therefore a double flower is the firſt and loweſt degree of plenitude or fullneſs. Inſtances of the triple *corolla* are *campanula fol. urticæ, flore duplici* and *triplici* of Tournefort, *ſtramonium flore violaceo duplici triplicive* of Tournefort, *ſtramonium flore altero alteri innato* of Vaillant. Monopetalous flowers are often multiplied, but ſeldom become full. The polypetalous flowers are alſo frequently multiplied, as in *hepatica, anemone.* The *perianthium* ſeldom conſtitutes a multiplied flower, though there are ſome inſtances of this; as in *dianthus caryophyllus ſpicam frumenti referens,* where the ſcales of the *calyx* are ſo prodigiouſly multiplied, as to conſtitute an entire ſpike in a very ſingular manner. Some of the Alpine graſſes become, as it were, full, the chaff growing into leaves; as in the *feſtuca vivipara.* In the *ſalix roſea,* where the *ſtamina* or *piſtilla* are deſtroyed by inſects, the ſcales of the catkin grow into leaves. In the *plantago roſea* the *bracteæ* of the ſpike grow into leaves. A coloured *perianthium* is not to be taken for a multiplied flower, though it be in ſome degree unnatural; as in *primula prolifera odorata* of Tournefort, *primula prolifera flore majore* of Tournefort, *primula prolifera flore purpureo* of Tournefort.

SECT.

SECT. CXXI.

A flower is ſaid to be full, when the *corolla* is ſo multiplied or increaſed, that all the *ſtamina* are excluded. This is brought about by the *ſtamina* growing into petals, which fill the flowers, and often ſuffocate the *piſtillum* after all the *ſtamina* are excluded. Polypetalous flowers are chiefly ſubject to plenitude or fullneſs, as in *malus*, *pyrus*, *perſica*, *ceraſus*, *amygdalus*, *myrtus*, *roſa*, *fragaria*, *ranunculus*, *caltha*, *hepatica*, *anemone*, *aquilegia*, *nigella*, *papaver*, *pæonia*, *dianthus*, *ſilene*, *lychnis coronaria*, *lilium*, *fritillaria*, *tulipa*, *narciſſus*, *colchicum*, *crocus*, *cheiranthus*, *heſperis*, *malva*, *alcea*, *hibiſcus*. Plenitude or fullneſs very rarely takes place in monopetalous flowers, though there are ſome inſtances of this; as in *primula*, *hyacinthus*, *datura*, *polyanthus*, *&c.* It is evident that full flowers, having the parts of generation deſtroyed, muſt be barren. Nor ought we ever to conſtitute a *genus* from full flowers; becauſe they are imperfect, or want thoſe parts of fructification from which the *generic* characters are deduced. And here we muſt not omit to add, that full flowers are the greateſt glory and delight of your profeſſed floriſts and gardeners, &c.

SECT.

SECT. CXXII.

There are many of the natural orders of plants which never produce luxuriant flowers. Of this kind are the following, viz. 1. All the apetalous plants (*ord. nat.* 12. 15.), *i. e.* thoſe which have no petals. 2. The verticillated plants (*ord. nat.* 42.), *i. e.* ſuch as have their flowers growing in whorls; they are the *labiatæ* of Tournefort, or the *didynamia gymnoſpermia* of Linnæus. 3. All the *perſonatæ* of Tourn. (*ord. nat.* 40.), plants with maſked flowers, except the *antirrhinum*. 4. All the *aſperifoliæ* (*ord. nat.* 41.), or rough-leafed plants of Ray (*didynamia angioſpermia* of Lin.). 5. All the *ſtellatæ* of Ray (*ord. nat.* 47.), *i. e.* ſtarry plants, with two naked ſeeds, and leaves round the ſtem in form of a ſtar, as the *rubia*, *&c.* 6. The *umbellatæ* of Ray (*ord. nat.* 45.), or umbelliferous plants, except ſome which produce proliferous *umbels*. 7. The papilionaceous (*ord. nat.* 32.), or leguminous plants are not ſubject to any luxuriancy, except a few, which produce full flowers, as *ternatea flore pleno cæruleo*, of Tourn., *coronilla herbacea flore vario pleno* of Tourn., *anthyllis vulgaris flore pleno*, *ſpartium*.

SECT. CXXIII.

A flower becomes proliferous when one grows out of another, which happens for the moſt part in full flowers. A proliferous flower is ſaid to be leafy, when its offspring produces leaves. Luxuriancy of nouriſhment, which is the cauſe of plenitude in flowers, being ſtill more increaſed, occaſions alſo their prolification. In all proliferous flowers (except the compound), the *piſtillum* ſprings up into another flower, therefore the offspring always ſhoots from the center of a full flower. A leafy proliferous flower is very rare, but inſtances of this have been ſeen in *roſa*, *anemone*, and ſome others; but the other ſort of prolification is frequently ſeen, as in *ranunculus*, *anemone*, *&c.*

SECT. CXXIV.

Prolification of ſimple flowers is always from the *piſtillum*, but of aggregate flowers from the receptacle.

Prolification is brought about in two different ways; 1. from the center; 2. from the ſide.

1. Prolification from the center is, when the *piſtillum* ſhoots up into another flower ſtanding on a ſingle foot-ſtalk, and this happens always in ſimple flowers, as, *e. g.* in *dianthus caryophillus altilis major*, *flore pleno prolifero*; *ranunculus radice tuberoſa flore pleno et prolifero* of Tourn.; *ranunculus tuberoſus Anglicus polyanthos* of Vaill.; *anemone latifolia pavo dicta*, *prolifera* of Tourn.; *anemone pavota latifolia multiplex* of Valent.; *geum*

flore

flore uno alteri innato of Tourn.; *geum flore triplici, ſecundo primi, tertio ſecundi calyce innato* of Tourn.; *roſa rubra prolifera.*

2. Prolification from the ſide, which happens in the aggregate flowers properly ſo called; is, when ſeveral flowers, each ſupported on a ſingle foot-ſtalk, ſpring out of one common *calyx*, as in *bellis hortenſis prolifera, C. B. calendula prolifera, C. B. hieracium falcatum, C. B. ſcabioſa foliis gingidii prolifera.*

The prolification of umbelliferous flowers is, by increaſing the *umbel*, ſo that from a ſimple one another ſprings up; as in *cornus, periclymenum humile flore flori innato.* In the ſame manner is a double compound *umbel* from a compound one; as in *ſelinum, thyſſelinum paluſtre lacteſcens*, it often happens.

SECT. CXXV.

The impletion or filling up of ſimple flowers is either by the petals or *nectaria*; for, the plenitude of ſimple flowers and that of compound ones is different. The impletion of *aquilegia* is in three different ways. 1. By the petals being multiplied, and all the *nectaria* excluded, which is the *aquilegia flore roſeo, C. B.* 2. By the *nectaria* being multiplied, and all the petals excluded, which is the *aquilegia flore multiplici, C. B.* 3. By the *nectaria* being multiplied,

tiplied, and the five petals retained, the ſpaces between the petals being each filled up with three *nectaria* one within another. The impletion of the *nigella* is by the *nectaria* only, for the five lower petals are, as in a natural ſtate, egg-ſhaped and entire; but the other, which fill up the flower, are cut into many ſegments, three-lobed and plain; therefore theſe laſt are the multiplied *nectaria*. The impletion of the *narciſſus* is from the multiplication both of petals and *nectaria*, or from the multiplication of the *nectaria* alone. The impletion of the *delphinium* is generally with plain petals, and the *nectarium* totally excluded. The change which is brought about in the *ſaponaria Anglica* is very ſingular, for this plant from a pentapetalous becomes a true monopetalous flower. And very remarkable alſo is the alteration in the *peloria*, a ſingular variety of the common toadflax.

SECT. CXXVI.

Polypetalous flowers are moſt ſubject to multiplication; but the monopetalous flowers ſeldom go beyond a double *corolla*, which ſpecies of luxuriancy is moſt frequently met with in them. Yet plenitude of monopetalous flowers is no contradiction, as it has been reckoned by ſome; for there are inſtances of it in *colchicum*, *crocus*, *hyacinthus*,

cinthus, *polyanthes*. The impletion or filling of monopetalous flowers is by the ſegments of the *corolla*; but that of the polypetalous by the multiplication of the petals. The *opulus flore globoſo* of C. B. which is the gelder roſe, is a moſt ſingular inſtance of plenitude; for the common *opulus* bears a *cyma*, which conſiſts of a number of bell-ſhaped hermaphrodite flowers in the diſk, and, in the *radius* or circumference, of barren flowers, *i. e.* wanting the *piſtilla*, with plain wheel-ſhaped *corollæ*; but in the *opulus flore globoſo* all the flowers of the diſk become like thoſe of the *radius*, with large barren wheel-ſhaped *corollæ*, ſo that, like the compound flowers, the impletion is here only by a number of large barren flowers filling the diſk. Hence the nature of a *cyma* comes neareſt to that of an *umbel*, which thing, the *cornus mas*, which has an umbelliferous flower, compared with the *cornus femina*, which bears a *cyma*, plainly ſhews.

SECT. CXXVII.

The impletion of compound flowers of the *ſyngeneſia* claſs is, either by tubular or plain petals.

The compound flowers, as we obſerved before, are either, 1. tubular, *i. e.* floſculous of Tournefort, which have whole florets,

rets, and nearly equal both in the diſk and in the *radius*; or, 2. ligulate, *i. e.* ſemi-floſcular of Tournefort, which have half florets only both in the diſk and in the *radius*; or, 3. radiated, where the florets of the diſk are tubular or whole, and thoſe of the circumference ligulate or half florets. Now the impletion of compound flowers is in two different ways; 1. by the *radius* only in radiated flowers, where the *radius* is ſo far multiplied as totally to fill the diſk; as is the caſe in *helianthus*, *calendula*, *chryſanthemum*, *anthemis*, *matricaria*, *ptarmica*, *tagetes*, and the *centaurea cyanus*; 2. by the diſk, in which caſe the *radius* is not multiplied, but the florets of the diſk are lengthened, and become leſs divided at their brims; and in ſome the plain florets of the *radius* become tubular. Examples of this ſort of impletion may be had in *bellis*, *matricaria*, and *tagetes*. In the *carduus ſerratula*, or ſaw-wort, the florets are both larger and longer. The impletion of the *xeranthemum*, or everlaſting flower, which is by the multiplication of the *paleæ* or chaff, is very ſingular, and indeed proper only to itſelf.

SECT. CXXVIII.

Simple flowers in a ſtate of impletion differ from compound ones in their natural ſtate,

ſtate, becauſe the ſimple luxuriant flowers have each but one common *piſtillum* in the center of the flower, whereas in compound flowers each floret has its own *piſtillum* and *ſtamina*.

SECT. CXXIX.

Compound flowers, filled with plain petals, may be eaſily diſtinguiſhed from thoſe of the ſame ſort in a natural ſtate, by the former having their *ſtigmata* lengthened, and their *germina* enlarged and diverging. By this rule, we may diſtinguiſh the full ſemifloſcular flowers from thoſe in a natural ſtate, as in *ſcorzonera* and the *lapſana vulgaris*; which laſt is frequently found with a full flower at Upſal; as was alſo the *tragopogon vulgare*, in the year 1733, at the ſame place.

SECT. CXXX.

Compound flowers of the radiate kind, filled with plain petals, may be eaſily known from compound flowers with plain petals in a natural ſtate, which are the ſemifloſcular of Tournefort: by this rule, the full flowers have no *antheræ*, which the natural ones are furniſhed with.

This rule then ſerves to diſtinguiſh between the ſemifloſcular flowers of Tournefort, and the radiate with a full flower;

 e. g. be-

e. g. between the *hieracium* and *chryſanthemum.*

The compound full flowers, with plain petals, are the radiate of Tournefort, with the whole diſk filled with plain petals, or half florets, ſimilar to thoſe of the *radius*; as in *chryſanthemum, helianthus*, and *calendula.*

On the other hand, the compound natural flowers, with plain petals, are the ſemifloſcular of Tournefort, as *hieracium, leontodon, ſonchus.* Now in the ſemifloſcular the florets are always hermaphrodite; but the full radiate flowers never are furniſhed with *antheræ.* Thus the full flowers of the *tagetes* have *piſtilla* in each floret, without *ſtamina*; but the *leontodon* has each floret furniſhed both with *ſtamina* and a *piſtillum.*

SECT. CXXXI.

In a compound natural flower, if the florets in the *radius* are furniſhed with *piſtilla,* all the full flowers alſo of the ſame ſort have each of the florets furniſhed with a *piſtillum*; but if in the compound natural flower, the *piſtilla* in the florets of the *radius* are wanting, the florets alſo of all the full flowers of the ſame ſort want the *piſtilla.*

In radiated flowers the florets of the *radius* are ſo multiplied (as has been obſerved above

above, in ſect. 127.), as wholly to fill the diſk, in which caſe all the florets which fill the diſk are entirely ſimilar to thoſe of the *radius* in a natural ſtate, *e. g.* in *matricaria*, *bellis*, *chryſanthemum*, *tagetes*, with full flowers, each floret is furniſhed with its proper *piſtillum* or *ſtyle*. But in *helianthus*, *calendula*, *centaurea*, with full flowers, we may obſerve, that each petal or floret wants the *ſtyle*, as the florets of the *radius* in a natural ſtate alſo do.

Seeing, therefore, that in a radiated flower in its natural ſtate, none of the florets of the *radius* are ever furniſhed with *antheræ*; this affords an eaſy and infallible diſtinguiſhing mark between the ſemifloſcular flowers of Tournefort, and the radiated full flowers, as we obſerved in the laſt ſection.

CHAP. V.

Of the SEXES of PLANTS.

SECT. CXXXII.

IN the firſt place we ſhall ſhew, that there was only one pair of every living thing, whether animal or vegetable ſpecies, created at the beginning.

SECT. CXXXIII.

Though vegetables are deſtitute of ſenſes, they are nevertheleſs endued with life, as well as animals. This will appear, if we conſider the propulſion of their ſap, their origin, nutrition, age, motion; their diſeaſes, death, anatomy, and organization.

SECT. CXXXIV.

Every living thing derives its origin from an egg; conſequently vegetables alſo, whoſe ſeeds are eggs; as appears by the producing offspring ſimilar to the parent plant.

SECT. CXXXV.

That every vegetable is produced from an egg, reaſon and experience teach; and the cotyledons or ſeed lobes farther confirm it.

SECT.

SECT. CXXXVI.

The cotyledons of animals proceed from the yolk of the egg, on which is produced the ſpeck of life; therefore the ſeminal leaves, in which is wrapped up the *corculum*, or eſſence of the ſeed, are alſo cotyledons.

SECT. CXXXVII.

That the offspring proceeds not from the egg alone, nor from the male ſperm alone, undeniably appears from the conſideration of mules, the reaſon of the thing, and the ſtructure of the parts.

SECT. CXXXVIII.

That the egg, not impregnated, ſhould produce an animal, is contrary to all experience; the ſame holds true in vegetables.

SECT. CXXXIX.

Every ſpecies of vegetable is furniſhed with flower and fruit, even when theſe are not diſcoverable to the naked eye.

SECT. CXL.

Every fruit is preceded by a flower, as every birth by generation.

SECT. CXLI.

Fructification conſiſts in the genitals of plants; ſo that their flowering is analogous to generation, and the ripe fruit to the compleat *fœtus*.

SECT. CXLII.

Every flower is furniſhed with *antheræ* and *ſtigmata*.

SECT. CXLIII.

That the *antheræ* are the male organs of plants, and their duſt the true ſperm, will appear, if we conſider their eſſence, their preceding the fruit, their ſituation, time, cells, caſtration, and the ſtructure of their duſt.

SECT. CXLIV.

That the *ſtigmata*, which are always connected to the *germen*, are the female organs, will appear, if we conſider their eſſence, their preceding the fruit, their ſituation, time, their pulling off, and their beiug cut off.

SECT. CXLV.

That vegetable generation is performed by the falling of the duſt of the *antheræ* upon the moiſt *ſtigmata*, where the particles burſt and ſhed their ſeminal virtue, which is abſorbed by the moiſture of the *ſtigmata*, is confirmed by our ſight, by their proportion, place, time, rains, culture of palm trees,

trees, nodding, ſunk, and ſyngeneſious flowers; nay, by the genuine conſideration of all ſorts of flowers.

SECT. CXLVI.

The *calyx* then is the marriage bed, the *corolla* the curtains, the filaments the ſpermatic veſſels, the *antheræ* the teſticles, the duſt the male ſperm, the *ſtigma* the extremity of the female organ, the *ſtyle* the *vagina*, the *germen* the ovary, the *pericarpium* the ovary impregnated, the ſeeds the *ovula* or eggs.

SECT. CXLVII.

The ſtomach of plants is the earth, the lacteal veſſels the root, the bones the trunk, the lungs are the leaves, and the heart is heat; hence a plant was by the antients called an inverted animal.

SECT. CXLVIII.

A flower which is furniſhed with *antheræ* only, is called a male flower; one which contains *ſtigmata*, a female flower; and that which has both theſe, an hermaphrodite flower.

SECT. CXLIX.

A plant, which has only male flowers, is called a male plant; that which has only female flowers, a female plant; that which has only hermaphrodite flowers, an hermaphrodite plant; that which bears male and female flowers both together, is called an androgynous plant; and that which bears hermaphrodite and female or male flowers together, is called a polygamous plant; but these last mostly consist of male hermaphrodites or female hermaphrodites.

SECT. CL.

No luxuriant flowers are natural, but all monsters; full flowers are eunuchs, and therefore always miscarry; multiplied flowers do not always; proliferous flowers increase the deformity.

The foregoing aphorisms are the contents in brief of the following Treatise, called *The Nuptials of Plants*; in which the Author has endeavoured fully to illustrate and prove the several doctrines contained in these propositions.

Of the Sexes of Plants.

SECT. CXXXII.

LINNÆUS sets out on this subject, by endeavouring to shew, that there was only one pair of every living thing, whether animal or vegetable species, created at the beginning.

According

According to Moſes's account, ſays he, we are ſure that was the caſe in the human ſpecies; and that this firſt pair was placed in Eden, and that Adam gave names to all the animals. Now, that he might be enabled to do this, it was neceſſary that all the ſpecies of animals ſhould be in paradiſe, which could not be unleſs the ſpecies of vegetables had been there likewiſe. This appears from the nature of their food, particularly that of inſects, moſt of which live upon one plant only. If the world had been formed in its preſent ſtate, all the ſpecies of animals muſt have been diſperſed over the globe as they are at this preſent time; in which caſe Adam could not have given names to them. But theſe difficulties will vaniſh, if we ſuppoſe, that at the beginning all the earth was covered with ſea, except one iſland large enough to contain all animals and vegetables. This ſuppoſition will appear highly reaſonable, if we conſider that the earth has been, and is ſtill, gaining upon the ſea; and that there are many *foſſil ſhells* and plants found every where, which cannot be accounted for by the deluge. Now all vegetables and animals might in this iſland have a ſoil and climate proper for each, only by ſuppoſing it placed under the Æquator, and crowned with a very high mountain. For it is well known,

known, that the ſame *plants* are found on the Swiſs, the Pyrenean, the Scotch Alps, on Olympus, Lebanon, Ida, as on the Lapland and Greenland Alps. And Tournefort found at the bottom of Mount Ararat, the common plants of Armenia; a little higher up, thoſe of Italy; higher, thoſe which grow about Paris; afterwards, the Swediſh plants; and, laſtly, on the top, the Alpine plants of Lapland. Again, it will appear that, from one plant of each ſpecies, the immenſe number of individuals now exiſting might ariſe, if we conſider the amazing fertility of certain plants, *e. g.* the *elecampane*, one plant of which produced in one ſeaſon 3000 ſeeds, one of India wheat 2000, one of the ſunflower 4000, one of the poppy 3200, one of tobacco 40,320. But ſuppoſing any annual plant to produce yearly only 2 ſeeds, even of this plant after 20 years there would be 1,048,576 individuals; for they would increaſe yearly in a double proportion, viz. 2, 4, 8, 16, &c. Add to all this, that many plants propagate ſurprizingly by the roots; others, by being perennial, produce every ſeaſon, for many years ſucceſſively, a vaſt number of ſeeds from one individual; and others, which bear buds, may be ſaid to produce ſo many individuals as there are buds, ſo that one tree of a very moderate ſize ſhall often produce 10,000. Laſtly, the

the vaſt variety of ways which nature has provided for the diſſemination of ſeeds is truly wonderful; for ſome are blown by the winds to a great diſtance, eſpecially by the ſtormy winds in ſpring and autumn. In moſt plants the fruit is raiſed above the ground by firm ſtalks or ſtems, and where theſe are weak, the plants often climb, that the fruit may be elevated above the ground, and by that means the plants may be more eaſily ſhaken by the winds. For the ſame reaſon, all that ſpecies of ſeed-veſſel called the capſule, open at the top, that the ſeeds may be more readily diſperſed. Many ſeeds are winged, and by that means are ſpread far and near. Theſe wings, for the conveyance of ſeeds to a great diſtance, conſiſt either of a fine feathered or hairy down, beard, or tail, as in moſt of the compound flowering plants, and alſo valerian, ſcabious, thrift, paſque flower, poplar, cats-tail, reed-graſs; or of a thin membrane or film, as in the fir, birch, meadow-rue, maple, aſh, elm, hops, dock, &c. Some ſeeds, and ſeed veſſels, are blown up, that their volume being increaſed they may become the lighter, as the winter cherry, campion, trefoil, bladder ſena, fumitory, bladder-nut, chiches. Many ſeed veſſels are endued with a remarkable elaſticity, by which means they throw their ſeeds at a great diſtance,

diſtance, as *touch me not*, wood-ſorrel, dittany, cucumber, lady's-ſmock, oats, cranes-bill, horſe-tail, ferns, &c. Many ſeeds, and ſeed veſſels, are armed with hooks, &c. by which they ſtick to animals, and ſo are diſperſed, as burdock, agrimony, dock, nettle, pellitory, arrow head, martynia, liquorice, enchanter's nightſhade, croſs-wort, gooſe-graſs, hounds-tongue, mouſ-ear, vervain, wild carrot, ſanicle, hemp, agrimony. Many ſeeds and fruits are ſwallowed whole by animals, and thereby diſſeminated or returned with intereſt, as miſletoe, oats, juniper, vanelloe. Berries and other fruits are allotted by nature for food to animals, that while they eat the pulp, they may ſow their ſeeds, which always paſs through them unhurt. Many ſeeds alſo are ſcattered and diſperſed by mice, ſquirrels, and other animals. The earth-worms alſo, the hedge-hog, the mole, the ſwine, prepare the ground for the reception of ſeeds. Not to mention ſeas, lakes, rivers, ſhowers, tides, by the help of which ſeeds are often conveyed unhurt to diſtant countries; a rare and wonderful inſtance of which we have in *anaſtatica*, or roſe of Jericho. Some ſeeds retain their power of vegetation for many years, and others are preſerved long by nature's wiſe contrivance, as *mimoſa*, *caſſia*, cucumber. The bottom

of

of the ſea does not deſtroy the vegetative quality of ſome ſeeds. The likeneſs of ſome ſeeds to ſnails preſerves them from becoming a prey to animals, as in *ſalicornia*, *medicago*. Some plants hide their ſeeds in the ground, as the ground nut *(arrachis)*, *trifolium ſubterraneum*, ſome ſpecies of the *lathyrus*, *valantia*, or croſs-wort. Many are defended from animals by proper armour, as ſpines, prickles, thorns, tall ſtems, &c. Fleſhy plants are propagated by the leaves. Among trees, each individual is, as it were, a garden hedged round by nature's wonderful contrivance. The ſeed bud, and the *corculum*, or little heart of the ſeed itſelf, both proceed from the pith of the plant; hence it follows, that all generation, properly ſpeaking, is no more than a continued multiplication.

SECT. CXXXIII.

Though vegetables are deſtitute of ſenſes, they are nevertheleſs endued with life, as well as animals. This will appear if we conſider, 1. the Propulſion of their ſap; 2. their Origin; 3. Nutrition; 4. Age; 5. Motion; 6. their Diſeaſes; 7. Death; 8. Anatomy; and, 9. Organization.

Though it may ſeem at firſt like a paradox, that plants as well as animals are endued with life, yet, I believe, no one will readily

readily deny it, who attentively confiders this truth, and duly weighs the arguments that are brought to confirm it. Though every one feems to know what life in an animal body is, yet the true definition thereof we owe to the great Dr. Harvey. He firft difcovered the circulation of the blood, and rightly maintained that life confifted in the circulation. Agreeable to his opinion, we may define life to be the fpontaneous propulfion of the fluids or juices through their proper veffels. 1. *Propulfion of the Sap.*— If any limb of an animal be tied fo tight with a ligature that the fluids cannot pafs, a gangrene or compleat mortification is thereby produced. This is a common experiment in phyfiology, to demonftrate the propulfion of the fluids in the animal body. And likewife, if a branch or twig of any tree or plant be tied fo tight that the fluids cannot be propelled beyond the ligature, then that part beyond the ligature withers and dies, in the fame manner as in animals. The antients were perfuaded that the fluids of plants paffing from the root into the afcending trunk, defcended again to the roots; but the moft famous naturalift of this age, Dr. Hales, has refuted this opinion; for he has demonftrated that the fluids which are carried from the root through the trunk to the branches do not defcend again, but are carried off by the tranfpiration of the leaves. Wherefoever then there is a fpontaneous propulfion of the fluids, there is life. In vegetables of every kind there is a propulfion of fluids; therefore every one muft allow that they are endued with life. It appears alfo, that fome of the antients were of the fame opinion, but they carried things too far, by afcribing fouls alfo to plants; and thus, while they would be thought to be very quick-fighted, they were blind with their eyes open. For they taught that there were three forts of fouls; the rational, which they afcribed to man; the fenfitive, to brutes; and the vegetative, to plants. But barely to enumerate fuch notions is a fufficient confutation of them; yet we muft allow, that the difference betwixt animal and vegetable life confifts in the former having fenfation, and the latter none. Though what has been faid may be fufficient to fhew, that plants as well as animals are endued with life, yet it will not be foreign to the purpofe to confirm the fame truth by other arguments.

2. *Origin.*—Of the origin of plants we fhall fpeak in the following fection.

3. *Nutrition.*—The next argument we fhall draw from nutrition. Wherever there is nutrition, it is manifeft there is a propulfion

pulſion of fluids, and conſequently life; this being implied in the very ſenſe and meaning of the word nutrition or nouriſhment. Now all herbs and plants receive their nouriſhment from the earth, and therefore are endued with life. That the food or nouriſhment of plants is derived from the fineſt and moſt ſubtle part of the earth, which by the means of water enters the pores of the roots, has been clearly ſhewn, by various arguments, in Kylbel's Diſſertation on this ſubject. Hence it is, as daily experience in all ſort of ſoils evinces, that plants which are not ſupplied with a ſufficient quantity of fluid impregnated with this very fine and ſubtle earth, decline, wither, and at laſt die, being ſtarved for want of proper nouriſhment. For this reaſon plants growing in a dry and parched ſoil become poor and ſlender, and ſhew evident ſigns of a want of nouriſhment. But it is quite otherwiſe with plants that grow in a ſoil of copious nouriſhment, which are not only green, ſtrong, and thriving, but alſo ſeem to rejoice and grow luxuriant in their happy ſtate, in the ſame manner as the lacteal veſſels of the human body abſorb much nouriſhment from a plentiful ſupply of food, and render the body fat and well-favoured; and the contrary, from a defect of food.

4. *Age.*

4. *Age.* — No one can doubt but that every living thing has its beginning and ending, and undergoes innumerable changes. Thus we fee, that infancy is weak, feeble, barren; but youth is comely, flouriſhing, and luxuriant; manhood is fertile, plump, ſtrong, and of full ſtature; and laſtly, old age flags, droops, becomes dry, hoary, languid, the ſad preſages of its approaching diſſolution. And are not plants ſubject to the ſame viciſſitudes, and go through the ſame ſtages? In their infant or very young ſtate they are ſmall and weak, deſtitute of flowers and fruit; when more advanced, they wanton in beautiful and ſhining flowers, being then moſt agreeable, and, as it were, in the joyous ſpring of life; in ſummer, being then more plump, firm, and ſtrong, but leſs ſplendid, they bear fruit; in autumn, or old age, they droop, grow dry, and wither, returning to duſt from whence they ſprang. The ivy in its firſt or tender ſtate has ſpear-ſhaped leaves, and bears neither flower nor fruit. This is that variety which Bauhine calls *hedera humi repens*, ivy creeping on the ground. The ſame plant, when more advanced, bears five lobed leaves, climbs on trees and walls, and is barren. This variety Bauhine calls *hedera major ſterilis*, the greater barren ivy. In its next or more mature ſtate it ſends forth

three lobed leaves, and, leaving its props and ſupporters, it riſes by its own ſtrength, and puts on the appearance of a pretty tall tree, being loaded with flowers and fruit. This is the *hedera arborea* of C. B. tree ivy. But when old, it puts forth egg-ſhaped leaves without lobes. This is the *hedera poetica* of C. B. poets ivy. Daily experience abundantly ſhews, that all plants, as well as the ivy, undergo the ſame fate. From the ſeed ſpring up tender ſhoots, which at firſt are not larger than ſmall ſhrubs; then, by degrees, they acquire a firm trunk, and alſo bear flowers and fruit; laſtly, the branches flag, and are covered, as well as the trunk, with moſs, firſt one branch decaying, and then another, till the whole tree is decayed; and, having run through its ſeveral ſtages of exiſtence, at laſt dies.

5. *Motion.*—It is evident that a dead *body* has no motion of its own; if therefore any *body* has ſpontaneous motion, it muſt alſo have life. For proper and internal motion in every *body* depends on the ſpontaneous propulſion of fluids, and where ſuch a propulſion of fluids is, there is life. That there is motion in plants is apparent to every one; *e. g.* herbs in green-houſes or ſtoves incline or turn towards the light, and if they find a hole in the walls, ſhutters, or frames, there they endeavour to

pene-

penetrate. Several plants, eſpecially thoſe with compound yellow flowers, nod, and during the whole day turn their flowers towards the ſun; to wit, to the Eaſt in the morning, to the South at noon, and to the Weſt toward evening; as the ſame is obſervable in the *ſonchus arvenſis*, tree ſow-thiſtle. And I believe every body knows, that a great part of plants in a ſerene ſky expand their flowers, and, as it were, with chearful looks behold the light of the ſun; but before rain they ſhut them up; *e. g.* the tulip (See ſect. 145.). The flowers of the *draba Alpina*, Alpine whitlow graſs, the *parthenium foliis ovatis crenatis*, baſtard feverfew with egg-ſhaped crenated leaves, and the *trientalis*, or winter-green, hang down in the night, as if the plants were aſleep, leſt rain or the moiſt air ſhould injure the fertilizing duſt. The trefoils, and one ſpecies of wood-ſorrel, ſhut up or double their leaves before ſtorms and tempeſts, but in a ſerene ſky expand or unfold them, ſo that the huſbandman can pretty clearly foretell tempeſts from them. And it is well known that the *bauhinia*, or mountain ebony, ſenſitive plants, and *caſſia*, obſerve the ſame rule. The flowers of goatsbeard open in the morning at the approach of the ſun, and ſhut about noon; hence it is called by the Engliſh John-go-to-bed-

 at-

at-noon. *Parkinſonia*, tamarind tree, *æſchynomene*, or baſtard ſenſitive plant, and ſeveral others of the *diadelphia* claſs, in ſerene weather, expand their leaves in the daytime, and contract them in the night. The tamarind tree is ſaid by Alpinus and Acoſta to enfold within its leaves the flowers or fruit every night, to guard them from cold or rain. This ſeemed like a paradox to Syenus and Ray: but the flower-ſtalk with the flower or fruit lies upon the winged leaves, from the boſom of which it ſprings; hence it is, that while the leaves fold themſelves up every night, they ſhut up or encloſe the fructification within them. Some of the *mimoſæ*, or ſenſitive plants, and the *oxalis*, or wood-ſorrel with pinnated leaves, upon being touched roll up their leaves, and turn downwards or ſhrink, and after a little ſpace extend them again, as if they had both life and ſenſation. (See ſect. 145.). As it cannot be denied, but that man, or any other animal, deſtitute of motion, grows pale and weak; ſo, on the other hand, it is a certain truth, that motion or exerciſe renders them florid, ſtout, fat, and healthy; ſince exerciſe enlarges the limbs, as Avicenna rightly obſerves. Hence the ruſtic excels the courtier in ſtrength of body and larger limbs, being uſed to much walking, and other exerciſe; and it is well known

known that the right hand of mechanics, and other people inured to labour, is for the moſt part bigger than the left. Theſe obvious truths need no laboured demonſtration. Plants in ſtoves and green-houſes, though they have ſufficient heat and nouriſhment, are ſlender, weak, and loſe the colour of their leaves, and ſeem to languiſh for want of motion: and trees, ſurrounded with high walls or buildings, and confined within narrow bounds, are ſlender, and grow tall, but not ſtrong. Pines in very thick woods, where the high winds have not free acceſs to ſhake them, grow tall and ſlender, and chiefly fit only for hop poles; while others planted in open fields, and frequently ſhaken by ſtormy winds, have not only thick and ſtrong ſtems, but alſo ſtrike deep root, and raiſe beautiful and ſpreading branches.

6. *Diſeaſes.*—When life, in any manner of way, is hurt or injured, that ſtate we call diſeaſe; to which vegetables as well as animals are ſubject. By too great heat they are parched, languiſh and droop; by too much cold they are often killed, or at leaſt are ſubject to cold tumours, analogous to kibes and chilblains in the human body. Sometimes they are liable to canker, ſometimes to vermin, from whence they are ſaid to be louſy.

 7. *Death.*

7. *Death.*—Death is the privation of life. Every living thing is ſubject to death, as conſtant experience teaches. Since then we know that vegetables as well as animals die by diſeaſes and external injuries, we may aſk how can vegetables exchange life for death, if they were not previouſly endued with life. For if we break a ſtone, which has no life, into a thouſand parts, it by no means undergoes ſuch a change as we obſerve in vegetables.

8. *Anatomy.*--Whoſo is deſirous of knowing the internal fabrick of plants, let him conſult Malpighi and Grew's Anatomy of Plants, who have in a wonderful manner laid down the compoſition, and enumerated and delineated the fibres, membranes, tubes, cells, *tracheæ* or air veſſels, and other parts of thoſe organical bodies; though I make no doubt, but poſterity will explain theſe parts in a quite different manner.

9. *Organization.* — We have already ſhewn that the fluids or ſap of vegetables is propelled through the veſſels, and tranſpires by the leaves. The ſtructure of their parts informs us, that thoſe fluids are ſeparated through glands, in which other fluids alſo are prepared for the fruit, the fertilizing duſt, the nectar or honey juice. Almoſt all the hairs we ſee on plants are nothing but excretory ducts; and almoſt all the

indentures

indentures of the leaves have their glands, which ſeparate a peculiar fluid or juice. To ſuppoſe, with the vulgar, that the moiſture we ſee in a ſummer's morning on the leaves of plants is always a dew, is a great miſtake; for it is generally a fluid ſeparated from them by their own peculiar glands. All which arguments here adduced, abundantly prove, that plants as well as animals are endued with life.

SECT. CXXXIV—CXXXVII.

It is well known that the antients ſuppoſed two ſorts of generation, to wit, equivocal and univocal. This latter, they ſaid, took place, when any thing was produced from its proper egg or *matrix*; the æquivocal, when any living thing was generated fortuitouſly or by chance, and the confuſed mixture of particles. Thus, *e. g.* fleas were generated from urine and ſaw-duſt; that myriads of little inſects like atoms came up out of ſlimy water; and maggots out of cheeſe in the ſummer; that ſeveral ſorts of herbs quickly ſprang up out of mould taken from a conſiderable depth below ground; and laſtly, they believed that worms were produced from putrid carcaſes, having, they ſaid, had ocular demonſtration of the ſame. Others thought that the Creator, at the beginning, mixed ſeeds and eggs with the earth every where; ſo that when ſuch earth was dug up, and the ſun by his heat had hatched the ſeeds, from thence, I ſay, they imagined that herbs, plants, and animals ſprung up, which were concealed therein from the creation. But all the ingenious men of this age, who have imbibed the ſound principles of natural philoſophy and natural hiſtory, have long ago rejected this opinion, which abounds with ridiculous *chimæras*. For God at the firſt gave to every living thing its own proper ſeed; and to each a tendency or propenſity to propagate its ſpecies; and eſtabliſhed this firſt and great law to remain unalterable, "Increaſe and multiply." If from putrefaction, and the heat of the ſun, living creatures and plants could be produced, it would be needleſs, and conſequently highly unworthy of the Supreme Being, to have created ſo many and ſo amazingly curious veſſels for the preparation of the ſeed, for in that caſe putrefaction would be equivalent to creation. And if very minute inſects and other animals could be produced from putrefaction, and hatched by the heat of the ſun, why might not horſes, elephants, and other large animals, be produced in the ſame way? For in large bodies the mechaniſm is eaſier, as the matter is more manageable; but in ſuch minute

minute inſects, and, as we may ſay, ſuch nothings, what wiſdom, what power, what inexplicable perfection is diſplayed, ſince nature is never more compleat than in her moſt minute works? Plin. N. H. He muſt be void of underſtanding who does not perceive the abſurdity of equivocal generation, when he ſees a body made with ſuch wonderful art, and adorned with ſo many thouſand pipes and canals, that no mechanic, even the moſt perfect of mortals, can find out all the contrivance, much leſs imitate this wonderful fabric; yet can, as it were by a wilful miſtake, ſay, that he believes all thoſe things were made by a fortuitous and confuſed concourſe of atoms. For it would follow from hence, that new ſpecies both of animals and plants would always occur, neither of which we obſerve, or have any account of. In this caſe too, there could be no arguing from the *genera* to the ſpecies. In a word, there would be no ſuch thing as certainty, but all confuſion. *Redi*, having a mind to examine equivocal generation, put recent fleſh into a glaſs veſſel, covered with a very thin linen cloth, and expoſed it to the ſun; after a little time, he found that flies laid their eggs upon the linen cloth; but no maggots were produced in the fleſh. We cannot conclude that inſects are produced

by

by equivocal generation, becauſe we ſee many thouſands of them about pools and ditches, where the putrifying filth of thoſe places furniſhes plentiful nouriſhment for them, which is the reaſon that their eggs are rather depoſited there, and are more eaſily hatched, and thrive better, even as lice on the ſcald heads of children abound more, becauſe of their plentiful nouriſhment. The *ſtapelia hirtuſa* produces a flower that ſtinks like carrion, for which reaſon the fleſh-flies, deceived by the ſmell, fill the whole flower full of their eggs, taking it for putrid fleſh. We have no reaſon to believe, what ſome have aſſerted, that wheat degenerates into barley, and barley into oats, and oats into brome-graſs; for every ſpecies produceth its own like; nor was it ever known that the fierce eagle produced the timorous dove. Having confuted equivocal generation, it will follow that every living thing is produced by univocal generation, or from an egg. Now vegetables we have proved before are endued with life, therefore they alſo proceed from eggs. And indeed the great Harvey long ago maintained this doctrine, that every living thing derives its origin from an egg. But ſome of the moderns have ſtrenuouſly endeavoured to overthrow this opinion; their cauſe being chiefly ſupported

ported by ſuch arguments as the following: If, ſay they, we take a part from the root, and ſet it in the ground, it ſtrikes root, and a new plant ſprings up; again, if a *polypus* is cut into ſeveral parts, from each of theſe parts an entire and compleat *polypus* is formed, according to the late diſcoveries of Trumbull and others. But do we not as frequently ſee that a plant produces from the ſame root ſeveral ſhoots or ſtems? for a ſtem is nothing but a root above ground; for which reaſon, if we turn a tree, *e. g.* the lime tree upſide down, the ſtem will become the root, and the root be changed into branches, which we may reckon among the late diſcoveries in gardening. Beſides, what we have ſaid is farther confirmed by the branches, all of which ſpring from the ſtem or root; but the ſtem or root from whence this branch or ſhoot was taken, roſe from a ſeed or egg. The ſame thing may be ſaid of the *polypus* among animals, and therefore a *polypus* lives a vegetable life, or a vegetable lives the life of a *polypus*; and this manner of propagation, though very rare in the animal kingdom, is moſt common in the vegetable kingdom. No one ought to wonder that new leaves are produced every year from the root or branches, for in the ſame manner do we daily ſee the feathers of birds produced.

A feather, which is a moſt curious piece of workmanſhip, conſiſts of a concave baſe, filled with a veſſel like a lymphatic, ſo that the aliment can paſs upward but not downward; next there is the mid-rib, and the lateral branches both partial and proper, ſo that a feather may be compared to a fern twice compounded. Now daily experience informs us that feathers, though adorned with ſuch curious mechaniſm, fall off every year, and that others, ſpringing from the body of the bird, ſucceed in their room. Moreover, it is evident that feathers grow only out of the body of the bird, that this body is their root, and that this root owes its origin at firſt to a ſeed or egg. The ſame alſo holds in plants: therefore *polypi*, and plants of every kind, have undoubtedly ſeeds or eggs, by which they are multiplied, without being cut or propagated by ſhoots, layers, branches, or ſuckers. Add to this, that the famous Bern. Juſſieu diſcovered eggs or ſeeds in the *polypi*; as may be ſeen in the Tranſactions of the Stockholm Society for the Year 1746.

Here we are to obſerve, that all viviparous animals have their eggs, out of which comes their offspring, though theſe eggs are contained in their proper *matrix*, and excluded in due time, in the ſame manner as an egg in the neſt, cheriſhed by the

incubation

cubation of the bird, whofe *uterus* is the neft. Nor can we deny, but the fmalleft vegetables have feeds, although often not difcoverable by the naked eye. In ducks-meat, Valifnerius has difcovered the feeds; and Michelius in the *mucor* and *byffus*; Bobart in the ferns; Linnæus in the moffes; and Reaumur in the *fungi*. The antients thought that miffeltoe was produced without feed, having feen it often grow from the underfide of branches; but how the feeds of the miffeltoe could be conveyed from one tree to another, and there adhere to the underfide of the branches, was very difficult for them to conceive. But time has difcovered, that the thrufh, fwallowing the berries on account of the pulp, afterwards voids the feeds entire, which ftick with the excrements to the branches. Thefe vifcous feeds are wafhed by the rains, fo that fome of them are often protruded to the lower fide of the branches, where they grow; and thus,

The thrufh, when he befouls the bough,
Sows for himfelf the feeds of woe.

Some people are perfuaded, that the feffile and flat *fungufes* on trees are morbid excrefcences, but it is plain they are true fpecies of thofe *agarics* which are furnifhed with caps and ftems, and grow on the ground, whofe feeds falling on a moift tree produce, as as it were, half caps without ſtems. That ſeeds are the eggs of plants appears from hence, that as every egg produces an offſpring ſimilar to the parent, ſo alſo do the ſeeds of vegetables, and conſequently they alſo are eggs. The containing parts of a hen's egg are the ſhell, the external film or membrane, the internal membrane lying immediately under the former, the *chalazæ* or membrane incloſing the yolk, twiſted at the extremities. The parts contained are, the air within the external membrane at the obtuſe end of the egg, the thinner and exterior part of the white, the interior and thicker part of the white, the yolk, the *hilum*, ſcar or cicatrice, in the center of which is the ſpeck of life. Pl. XI. fig. 15. When an egg is ſet under the hen, after two days incubation, the ſpeck of life becomes red, ſends out its blood veſſels through the yolk, and at laſt we find the whole chick is formed out of the ſpeck of life, the yolk becomes the *ſecundines*, the white, that fluid which nouriſhes the chick in the egg, or liquor of the *amnion*, and the two membranes become the *amnion* and *chorion*. A ſeed has alſo a ſhell, external membrane or film, a membrane including the yolk, the yolk itſelf, and the ſcar or point of life. Pl. XI. fig. 16. In ſeeds the white is wanting, there being no no uſe for it, as the moiſture of the earth ſupplies its place, and nouriſhes the embryo of the plant. Likewiſe the eggs of fiſhes have no white, becauſe they are always in the water. When the flower is going off, the ſeed begins to ſwell, and on its outſide there is ſeen a veſicle, which is the *amnion* of Malpighi, furniſhed with an umbilical cord or navel ſtring, which is produced through the *chorion* to the oppoſite ſide of the egg. While with the egg the *amnion* increaſeth, on its top is obſerved another ſmall body, which likewiſe increaſeth continually, till it has filled the whole *chorion* and egg; and the *amnion* and *chorion* are turned into the external ſhell or coat of the ſeed. Logan's Exper. 9. by which it appears that the ſame changes are brought about in the ſeed as in the egg; and therefore, that the ſeeds are the eggs of plants cannot be doubted. That plants ſpring from the yolk of the egg is farther confirmed by the lobes, which, when we ſpeak of cows and other ſimilar quadrupeds, are nothing elſe than ſeveral *ſecundines*, always adhering to the *fœtus*, drawing their ſupply of fluids from the *matrix*, which fluids they prepare for the nouriſhment of the tender *fœtus*. That moſt plants have ſeminal leaves or lobes is very well known. Now theſe ſeminal leaves once conſtituted

conſtituted the whole ſeed, except the *hilum*, or little heart, in which is the point of life; and theſe lobes prepare the nouriſhment for the very tender plant, until it be able to ſtrike root in the earth; in the ſame manner as the yolk in an egg, becoming the *placenta*, prepares the nouriſhment, and ſends it by the navel ſtring to the chick; after which they drop off. Hence it appears, that the ſeminal leaves are the lobes. But ſince all lobes come from the egg or ſeed, we may fairly conclude that plants are produced from eggs.

SECT. CXXXVIII.

From what has been ſaid it appears, that all vegetables have eggs from which they are produced. Now daily experience teaches us, that no egg can produce an animal, till it be impregnated or fecundated by the male: a hen indeed will lay eggs, but not ſuch as will produce chicken, unleſs they are impregnated or fertilized by the cock or male. That all generation precedes the birth appears throughout univerſal nature. In quadrupeds it does without doubt: but as to fiſhes there is a vulgar notion that their generation follows or comes after the birth or excluſion of their eggs, and that the male ſperm is emitted upon the eggs after they are excluded from the *matrix* of

the

the female. But this opinion will ſoon be laid aſide, when it is now made to appear, by modern obſervations, that the male fiſh emits his ſperm a day or two before; that the female, which follows him, greedily devours the ſame, and thus conceives by the mouth before the excluſion of the eggs. Amphibious animals have their proper laws; for they copulate as all other animals, but with this difference, that the male of ſerpents, in like manner as the crab, have two *penes*, and the rattle-ſnake four rough echinated *penes*. The generation of frogs is ſtill very obſcure; and is likely to be ſo, till Reaumur ſhall favour the public with his later obſervations, which is much to be wiſhed for. In the mean time however, there is no doubt to be made, but that the excluſion of their eggs follows after their copulation. There have been many different opinions of the phyſiologiſts, how, or in what manner, generation was brought about, or rather the fecundation, but this remains as great a myſtery as ever. The effervefcencies, precipitations, and other ridiculous notions, of the antients are now juſtly laid aſide; but the phyſicians have hitherto acquieſced chiefly in two opinions: the firſt was, that of the great Harvey, to wit, that in the ſpeck of life, or cicatrice, the entire

 rudiments

rudiments of the future *fœtus* were preſent, perfect in all its members, and that it was only requiſite that the male ſperm ſhould add or excite the firſt ſpirit, motion, and life. His followers alſo contend, that ſo curious and wonderful a machine as an animal body is, could never be formed and perfected by another machine. And that therefore in the *ovarium* of the firſt female there muſt needs be her offspring or *ova*, and in them others, and ſo on in an infinite ſeries through all the ſubſequent deſcending generations. In a word, that in the *ovarium*, or loins, of Eve, the whole race of mankind were contained, whether paſt, preſent, or future. Now allowing that matter were infinitely diviſible, yet it exceeds all belief, that ſo many myriads ſhould be contained in one egg. The ſecond *hypotheſis*, or ſuppoſition, how generation, or the fecundation of the egg, was brought about, was that of Leuwenhoek, that the cicatrice of the egg was empty, and the male ſperm replete with myriads of *animalcules*, which being admitted into the *ovarium* of the female, ſome of them entered the empty *ovula* contained therein, increaſed, and at laſt became a compleat *fœtus*. Thus his followers eſtabliſhed their opinion on vain figments inſtead of rational experiments. Gordon argued, that the

cicatrice

cicatrice was hollow, and that one *animalcule* of the male ſperm filled it, and by a wonderful *metamorphoſis* was transformed into a compleat animal. Dalempatius maintained, that theſe *animalcules* were compleat, wrapped up in a thin *involucrum*. Andry fancied imaginary valves and perforations in the *ovula*. Liſter maintained, that thoſe *animalcules* ſerved only to excite venery. Valiſnerius, that the male ſperm was by them only kept in motion. Many of the moderns have adopted this laſt opinion. For the *carina*, or keel-ſhaped appearance, which Malpighi obſerved as the firſt rudiments of the *fœtus* that appeared in the egg after incubation, was very like thoſe *animalcules*: but they have all erred in this affair. For, in the firſt place, thoſe *corpuſcles* which Leuwenhoek diſcovered in the male ſperm, are by no means *animalcules* having proper and voluntary motion, but mere inert particles diffuſed through the male ſperm, like ſo many oily particles ſwimming in a fluid, as we clearly obſerved by means of Liberkynius's choice microſcopes. 2. If they were really *animalcules*, according to Leuwenhoek's opinion, to be metamorphoſed in the *ovula*, they muſt neceſſarily have their own two *tunics*; and, by caſting thoſe *tunics* ſucceſſively one after another, they muſt be

 changed,

changed, firſt, from the ſtate of a *larva*, or grub, into the ſtate of a *pupa*, *nympha*, *chryſalis*, or *aurelia*, and next into a compleat animal: but the *amnion* and *chorion* of the *fœtus* derive their origin from the egg, and not from thoſe *animalcules*, as they are called. 3. That the Author of nature always acts in the moſt compendious way, as I think no one will readily deny; ſo, on the other hand, neither will any one believe that the ſame All-wiſe Creator formed ſo many myriads of *animalcules* for the ſake of one only. 4. How this *hypotheſis* will account for generation, I cannot ſee; for, ſuppoſing that thoſe *corpuſcles* were really *animalcules*, then they alſo would have their *animalcules* by which they were produced, and theſe laſt others, and ſo on without end, which is the greateſt abſurdity. 5. The *ſecundines* are from the yolk, and it is well known, that the yolk is found in an egg not fecundated; if, therefore, we ſhould aſcribe the rudiments of the *fœtus* to the male ſperm, then the umbilical cord, with its membranes, would be totally diſtinct from the yolk, and by that means not have the ſame common *tunic* with the yolk, which we know to be falſe. How then generation, or the fecundation of the *ovula*, is effected, we are wholly ignorant. When a horſe copulates with a ſhe-aſs, the ſpecies produced,

produced, which we call *hybrid*, mongrel or mule, is neither like the male nor female; which would certainly be the caſe, were the rudiments of the *fœtus* to derive their origin wholly from one ſex only. If a water ſpaniel is impregnated by a pointer, the female puppies are like the bitch, and the males like the dog. The ſame thing holds good, as I know from experience, when a Friſeland hen is impregnated by a common dunghill cock. Dr. Bartholin, in his obſervations, tells us of a certain Negro, who, during his confinement in jail at Copenhagen, got a wench with child. She in due time was delivered of a boy, who was in colour altogether like the mother, except the *penis*, which was black, a ſufficient indication who the father was. All theſe things plainly ſhew, that the rudiments of the *fœtus* are not derived wholly from one ſex only. We have now ſhewn that plants have eggs, which are their ſeeds, and that no egg can produce a *fœtus* till it be impregnated by the male, and of conſequence neither can the eggs of vegetables. Hence it will follow that plants muſt neceſſarily be furniſhed with the organs of generation.

SECT. CXXXIX.

That we may make a full enquiry into this ſubject of the generation of plants, it will be proper to inveſtigate the ſituation of their genital organs. Now we have proved that the ſeeds are the eggs of plants, and from the laſt ſection it appears that whereſoever the fecundated eggs are, there we are to ſeek for the organs of generation; and we ſhall find the genital organs of plants where the ſeeds are produced. But the ſeeds are produced where the flower and fruit are; therefore the flower and fruit are the genital organs of plants. Some have aſſerted that certain vegetables wanted flowers, and others both flowers and fruit. Tournefort maintained that the *algæ*, or flags and moſſes, had ſeeds, but no flower; and that the *fungi*, and ſome others, had neither flowers nor fruit. Hence ſome of the moderns have argued againſt the fructification. But for one to deny flowers and fruit even to the moſt minute vegetables, which he finds in all the larger ſpecies that can fall under his inſpection, is the part of a madman, not of a fair and rational enquirer. For it is the ſame as if we ſhould conclude concerning ſome minute ſpecies of inſects, that they had neither feet, nor eyes, nor mouth, nor genitals, becauſe we cannot diſcover them with the naked eye. Bobart ſowed the ſeeds of ferns, which grew very well. Plumier diſcovered the flowers in ſome of the fern kind, and the ſame

ſame may be eaſily inveſtigated in the *trichomanes* of Linnæus. Linnæus diſcovered the ſeeds of moſſes, and in the *polytrichum* we have pretty clear ſigns of both ſexes. In the *lycopodium ſelaginoides*, or prickly club-moſs, Linnæus obſerved, that one part of the fructification contained the fertilizing duſt, and the other the ſeeds, which were evident ſigns that the plant had both flower and fruit. B. Juſſieu traced the flowers of the *pilularia* or pepper-graſs. Reaumur diſcovered the fructification in the *fuci*. Linnæus numbered the *ſtamina* and *piſtilla* in the *jungermannia epiphylla*, or broad-leafed *jungermannia*. Valiſnerius has delineated in the *lemna* or duck's-meat, the *calyx*, the *ſtamina*, the *piſtillum*, the *capſula*, and the ſeeds. Michelius has frequently numbered the *ſtamina* of the *fungi*, and has ſown their ſeeds, which grew very well. Nov. Gen. Tab. 68. 73. and 74. Hence therefore we may conclude, that theſe loweſt tribes of vegetables are all furniſhed with flowers and fruit, although by reaſon of their exceeding minuteneſs they have not hitherto been diſtinctly known to botaniſts. In ſhort, there never was a clear and evident example produced of any plant which wanted flowers and fruit, and therefore we may juſtly ſay, that in their fructification conſiſts the eſſence of plants.

SECT. CXL.

Univerſal experience atteſts, that the flower always precedes or goes before the fruit, in the ſame manner as generation precedes the birth in animals; ſo that not one example of the contrary can be produced in any individual. The *colchicum autumnale*, or meadow-ſaffron, flowers in the autumn, but the fruit, with the ſtem and leaves, appears the following ſummer in the months of May and June. The hazle puts forth his flowers early in the ſpring, but ripens his fruit or nuts in Auguſt. In a word, the flowers always come before the fruit in every plant, without exception.

SECT. CXLI.

Since in animals all generation precedes the birth, and in vegetables every flower precedes the fruit, we muſt neceſſarily aſcribe fecundation to the flower, and the birth or excluſion of the ſeed to the ripe fruit.

SECT. CXLII.

Hence we may define a flower to be the genital organs of a plant ſerving for fecundation, and the fruit to be the genital organs ſerving for the birth or maturation of the ſeed. There has been much diſpute among botaniſts concerning the definition of of a flower; many have aſſerted that the eſſence of a flower conſiſted in the *corolla* or petals; this opinion Knautius embraced, and alſo denied that there ever were any flowers deſtitute of petals. But experience and our ſenſes tell us, that there are many plants, ſome of which want the *calyx*, as the tulip, fritillary, &c. others the *corolla*, as the graſſes, cats-tail, bur-reed, and pine; others the filaments of the *ſtamina*, as the birthwort; others the *ſtyle*, as the tulip, graſs of Parnaſſus, &c.; but that all flowers whatever, except the moſſes only, are furniſhed with the *antheræ* or *ſtigmata*, or both together; and as this holds univerſally in every ſpecies of plant (the moſſes only excepted), theſe parts muſt neceſſarily conſtitute the eſſence of a flower. If we find a flower with *antheræ*, but no *ſtigmata*, we may alſo aſſuredly find another flower either in the ſame, or a different plant of the ſame ſpecies, which has *ſtigmata* with the *antheræ*, or without them. Pontedera, on the authority of the *Hortus Malabaricus*, contends, that there are ſome plants which have no *antheræ*; *e. g.* the *cycas circinalis*, or ſagoe palm tree, the *celtis*, or nettle tree, with ſome others. But in this he is miſtaken, for even the number of the *antheræ* in thoſe plants he mentions is at preſent very well known to botaniſts.

The

The ſame objection has been made in regard to the *iſoetes*, or quill-wort; but Linnæus diſcovered the *antheræ* of this plant; It. Scan. Hence we perceive the error of the followers of Rivinus, who took the *nectaria* in the hellebore, *nigella*, and paſſion-flower, for flowers; which *nectaria* have properly no *piſtilla* nor *antheræ*. For the act of fecundation two things are requiſite, namely, the genital organs of both ſexes; becauſe, as was ſaid above, one of the ſexes alone cannot propagate the ſpecies. Now the act of fecundation is performed in the flower, therefore it follows, that the genital organs of both ſexes muſt be preſent in the flower. We are here however to obſerve, that the genital organs of both ſexes are not always preſent in one and the ſame flower. It is ſufficient that the genital organs of the male be in one flower, and thoſe of the female in another. Since every plant bears ſeeds by which its offspring can be propagated, and no egg can be hatched before fecundation, it will follow, that fecundation is as neceſſary as the ſeeds themſelves. Hence it appears, that the genital organs of both ſexes, which ſerve for fecundation, are altogether neceſſary, if the flower is perfect, and that they are the eſſential parts. But we find no parts of a flower that are eſſential but the

the *antheræ* and *ſtigmata*; therefore theſe parts are the genital organs of both ſexes, ſerving for fecundation.

SECT. CXLIII.

The male organs of generation in animals are very different. Some have a *penis*, as the quadrupeds, birds and ſerpents, ſome of the fiſhes, inſects and worms; others have no *penis*, as many of the true fiſhes, and thoſe called ſhell-fiſh. Some have ſeminal veſicles, as the greateſt part of quadrupeds; others have none, as the dog kind. Some have teſticles diſtinct from the ſeminal veſicles, as the quadrupeds; and others have both teſticles and ſeminal veſicles united in one, as the fiſhes. Now we maintain that the *antheræ*, the male organs of generation in flowers, are nothing elſe but the bodies which prepare and contain the male ſperm; therefore theſe *antheræ* are the teſticles together with the ſeminal veſicles, and their duſt the genuine male ſperm of plants, anſwering to thoſe particles which are called *animalcules* in the male ſperm of animals. The truth of this we ſhall prove by the following arguments.

1. *Preceding the fruit.*—The *antheræ* and their duſt always come before the fruit. When the fruit ſheds its ſeeds, it is come to maturation. This is the caſe with the *antheræ*;

antheræ; for when they ſhed their duſt, they are come to maturation, and have done their office; yet their duſt is always ſhed when the flower is in full vigour, and then the *antheræ* drop, and are uſeleſs. 2. *Situation.*—The *antheræ* are always ſo ſituated in the flower, that their duſt, which is the male ſperm, may reach the *piſtillum* or female organ; for the *ſtamina* either ſurround the *piſtillum*, as in moſt flowers; or, if the *piſtillum* incline to the upper ſide of the flower, the *ſtamina* do the ſame, as in the *didynamia*; or if the *piſtillum* nods, the *ſtamina* aſcend, as in the *caſſias*, and the common winter-green. Several plants in the *monœcia* claſs have the male flowers over the female, as Indian corn, *palma Chriſti*. 3. *Time.*—The *antheræ* and *ſtigmata* are in full vigour at the ſelf-ſame time, and this not only when both are in one and the ſame flower, but alſo when they are in diſtinct or ſeparate flowers, ſo that the long catkins of the hazle, birch, alder, never diſcharge the duſt of their *antheræ* before the *ſtigmata* below them are come out. The male hemp never ſheds his duſt before the *piſtilla* of the female plant appear. 4. *Cells.*—Tournefort was of opinion that the *antheræ* did the office of kidneys, purging the ſeveral parts of the plant from all ſuch particles as were

were not fit for its nouriſhment, by receiving them into their cells, and that their valves were burſt open by thoſe accumulated excrements. Pontedera's opinion was, that the *antheræ* are nothing elſe but a cluſter of cells, which receive a peculiar juice or fluid, and then tranſmit it through the filaments to the receptacle, from whence it is carried to the embryos of the ſeed; but the falſehood of this opinion will appear from the conſideration of all the plants of the *diæcia* claſs, the figure of the *pollen*, artificial fecundation, caprification, and the culture of palm trees. If we cut aſunder the *antheræ* before they ſhed their duſt, we find their ſtructure altogether as wonderful and curious as the ſeed veſſels themſelves. For within, they conſiſt either of one cell, as the *mercury*; or two, as *hellebore*; or three, as the *orchis*; or four, as the *fritillary*; and they open or ſplit either longitudinally, as the *leucoium*, or greater ſnow-drop; or at the baſe, ſeparating into pieces or valves, as the barren-wort; or from the top, as the common ſnow-drop; or at the two points or horns, as the whortle, heath, winter-green, and marſh roſemary. 5. *Caſtration.*—If we cut off the *antheræ* of any plant which bears but one flower, taking care at the ſame time that no other plant of the ſame ſpecies is near it, the fruit

proves

proves abortive, or at leaſt produces ſeeds which will not vegetate. This is a certain truth, which any one will find upon trial. 6. *Figure.*—The figure of the fertilizing duſt will clearly convince any one that this fine powder is not accumulated by chance, or from the dryneſs of the *antheræ*. Malpighi, Grew, Moreland, and Geofroy, who have all viewed the figure of theſe particles with good microſcopes, found all the particles exactly equal to one another, but in different *genera* as great a difference in ſhape and figure, as the ſeeds themſelves ever have. As for example, in the ſun-flower the particles are globular and echinated, or full of prickles; in the bloody cranes-bill, they are like a perforated globule of fire; in the mallows, they appear like wheels with teeth; in the *ricinus*, or *palma Chriſti*, they are ſhaped like a grain of wheat; in the panſies, they are angulated; in the Turkey wheat, flat and ſmooth; in the borrage, like a thin leaf rolled up; in the *narciſſus*, kidney-ſhaped; in the comphrey, like double globules, &c. The powder of the *antheræ* in point of fecundation anſwers to Leuwenhoek's *animalcules* in the male ſperm; and the *ſtigma*, which receives this duſt, is always moiſtiſh, that the duſt may inſtantly adhere or ſtick to it. The obſervation of the famous botaniſt Bernard Juſſieu

Juſſieu concerning the maple, deſerves our notice. “ Thoſe gentlemen (ſays he), who have examined the fertilizing duſt of the maple by microſcopes, have drawn the particles in form of a croſs. But I found their form to be globular, and as ſoon as the particles touched any moiſture, they burſt into four parts or valves, in the ſhape of a croſs.” From which obſervation we may infer, that thoſe particles are hollow globules containing ſome ſubtle matter within, and that as ſoon as the hollow globules touch the moiſture, they burſt and diſcharge their exceeding fine contents. This laſt obſervation throws ſome light on the generation of animals from its analogy to the ſeminal *animalcules*. Upon the whole it abundantly appears, that the *antheræ* are the male organs of generation, and their duſt the genuine male ſperm. Since in every flower the *antheræ* and *ſtigmata* are the genital organs ſerving for fecundation, and the *antheræ* the male organs, it is obvious to every one, that the *ſtigmata*, the other eſſential part of the flower, is the female organ of generation, which we ſhall more fully prove by the following arguments.

SECT. CXLIV.

The parts of the *piſtillum* are three, the *germen*, the *ſtyle*, and the *ſtigma*. The *germen*,

men, or ſeed bud, while the plant is in flower, is always imperfect and immature, being only the rudiments of the future *fœtus*; the *ſtyle* is no eſſential part, for it is wanting in many ſpecies of plants; but the *germen* can never bring the fruit to maturity, except it be within the flower along with the *ſtigma*. Hence it follows, that the *ſtigma* is that part of the flower which receives the impregnating duſt. This will farther appear; 1. From the *Situation*.—For we are to conſider that the *ſtigma* is always ſo ſituated, that the *antheræ*, or their impregnating duſt, can reach it, as we have ſhewn above. Hence the ſyngeneſious plants are rarely barren. Moreover the *ſtigma* has always a figure proper and peculiar to itſelf, ſo that in moſt (though not all) plants it is double, when the fruit conſiſts of two cells, as in the maſked and umbelliferous plants; triple, when the ſeed veſſel has three cells, as in the lilies; quadruple, when the ſeed veſſel has four cells, as in the graſs of Parnaſſus; there are five *ſtigmata* when the ſeed veſſel has five cells, or five ſeeds, as in the *geranium*, winter-green, wood-ſorrel; there are ſix *ſtigmata* when the ſeed veſſel has ſix cells, as in the *aſarabacca*; there are ten *ſtigmata* when the ſeed veſſel has ten cells, as in the pork-phyſic; there are many *ſtigmata* when the ſeed veſſel has

many

many cells, as may be ſeen in the mallows, or in the poppy, which is furniſhed with as many receptacles for the ſeed as there are *ſtigmata*. 2. *Time.*—The *ſtigmata* are always in full vigour at the ſame time with the *antheræ*. For, in the Indian wheat, as Logan obſerves, on the ſame day that the *antheræ* burſt their incloſure, and hang down in the open air, are ſeen the bundles and extremities of the *ſtyles* coming out of the ſheath of the ſpike to open view. 3. *Falling off.*—The *ſtigmata* in moſt plants, when they have diſcharged their office, drop off in the ſame manner as the *antheræ* do; which is a moſt evident ſign that the *ſtigmata* contribute nothing to the ripening of the fruit, but ſerve only for the purpoſe of generation. 4. *Being cut off.*—If the *ſtigmata* be cut off before they have received the impregnating duſt of the *antheræ*, the plant is caſtrated as to the female organs, and the fruit periſhes: a ſufficient demonſtration that the *ſtigma* is that part of the female organ of generation deſtined for conception. The *ſtigma* of a flower has, beſides, two other ſingular properties; namely, that it is always diveſted of the cuticle or film, nor has it any bark as the other parts, and then it is always bedewed with a moiſture. Hence it appears, that the arguments of Pontedera have no force to invalidate our doctrine. For when he would oppoſe the doctrine of the generation of plants, the whole force of his argument was drawn from the umbelliferous plants, whoſe *ſtyles* are not come up when their *ſtamina* appear. But the *ſtigma* is that part which ſerves for the purpoſe of generation, and not the *ſtyle*, which may be wanting in many, as it is not an eſſential part of the flower. It is ſufficient therefore, that the *ſtigmata* in the umbelliferous plants be in full vigour at the ſelf-ſame time with the *antheræ*, though the *ſtyle* be lengthened after conception, which is the caſe alſo in the maple.

SECT. CXLV.

The generation then of plants is brought about by the *antheræ* ſhedding their duſt on the *ſtigmata*. It is not ſufficiently clear in what way the generation of animals is accompliſhed; but thus far we are certain of, that the male ſperm muſt come in contact with the female organ, if there be any impregnation. In the vegetable kingdom the genital duſt is carried by the air to the moiſt *ſtigmata*, where the particles burſt and diſcharge their exceeding fine or ſubtle contents, which impregnate the ovary. That this is the caſe, will be ſhewn by the following arguments. 1. *Sight.*—When a plant a plant is in flower, and the duſt of the *antheræ* flying about, that part of this duſt lights upon and clings to the *ſtigma*, is obvious to every beholder. The flower of the panſies ſhews this in a moſt agreeable manner; for, when the flower is ſcarcely opened, you ſhall ſee the *ſtigma*, like a concave globe, gaping wide open on one ſide, and of a pure white colour; but, as ſoon as the five *ſtamina* have diſcharged their duſt, you may obſerve the whole *ſtigma* filled with this genital duſt, and covered all over with a yellow or browniſh colour, yet the tube of the *piſtillum* remains clear and tranſparent. Before this impregnation, if you gently ſqueeze the *ſtigma*, there oozes from it a certain ſweetiſh liquor, which retains and attracts the genital duſt. In the hedge-hyſſop alſo the *ſtigma* gapes or opens to receive the male duſt, upon which it ſhuts, and the ovary being thus impregnated ripens its ſeed. The *iris* ſhews us a particular ſtructure; for the *ſtigmata* ſpreading wide wholly cover the *antheræ*, yet they are ſo ſituated in regard to the petals, that by means of a gentle wind under the *ſtigmata* the male duſt can mount by the channels of the petals. The *campanula* differs from other flowers in this, that the male duſt adheres to the ſide of the rough *ſtyle*, and from thence is communicated to the *ſtigma* by certain canals. In the ſyngeneſious plants the *ſtigmata* riſe through a cylinder of the *antheræ*, and as each *ſtigma* comes up, it always brings along with it the fertilizing duſt; hence fecundation rarely fails in ſuch plants, as was obſerved before. 2. *Proportion.*—For the moſt part, the *ſtamina* and *piſtillum* are of the ſame height, that the male duſt may more eaſily come at the *ſtigma*; but in ſome plants it is not ſo, and then a ſingular proceſs of fecundation may be obſerved. In the *geranium inquinans*, or African tree cranes-bill, with a thick mallow leaf and ſcarlet flower, where the *piſtillum* is ſhorter than the *ſtamina*, the flowers before they blow are pendulous, but upon their opening they ſtand upright, that the powder may fall upon the *ſtigma*; after which they again nod till the fruit is ripe, and then they ſtand upright a ſecond time, that their ſeeds may be more eaſily ſcattered about. The ſame may be ſeen in the *claytonia ſibirica*. Some of the pinks have *piſtilla* longer than the *ſtamina*: the flowers do not nod, but the *piſtilla* are reflected or bent back like rams horns towards the *antheræ*. The flower of the *nigella arvenſis*, or horned field fennel flower, when it firſt opens, has the five *piſtilla* erect and longer than the *ſtamina*; but when the flower is well expanded, the *ſtyles* are bent

back

back that they may touch the *antheræ* which ſurround them: when they have received the male duſt, they are again elevated, and ever after remain erect. In the tamarind tree, paſſion-flower, and *caſſias*, the *ſtyles* are reflected nearly in the ſame manner towards the *antheræ*. 3. *Place.*—The *ſtamina* for the moſt part ſurround the *piſtillum*, ſo that ſome of the duſt is always blown by the wind on the *ſtigma*. Plants of the *didynamia* claſs, which have their flowers erect, and ſtanding at an acute angle with the ſtem, bend their *ſtamina* and *piſtilla* to the upper lip of the flower, where the *ſtigma*, placed among the *antheræ*, is generally defended from rain. Plants of the *diadelphia* claſs, which have their flowers nodding at an acute angle from the perpendicular line, have the *ſtamina* and *piſtilla* declining within the keel of the *corolla*, which is compreſſed or flat, that the fecundation may be thereby facilitated, while the *vexillum* keeps off the rain. Plants of the *monœcia* claſs have the male flowers moſtly placed above the female, that the duſt may more readily fall on the *piſtilla*, as may be ſeen in the *carex*, Indian wheat, Job's-tears, bur-reed, cats-tail, leſſer burdock, *caſſava*, *ambroſia*, water-milfoil, arrow-head, and *palma Chriſti*. Yet there are a few exceptions, among which we

 ſhall

ſhall reckon the pine and the fir, where the *antheræ* are ſo very numerous, that if any animal, or the wind, ſhake the tree, we may ſee the duſt flying upwards like ſmoke; and ſo plentiful is the duſt, that if, in the time of flowering of the pine, fir, or juniper, it chances to rain, the banks of the adjacent ſtanding waters are painted with yellow rings of the duſt from thoſe trees. The *teucrium flavum*, or ſhrubby germander, has a yellow *corolla*, the two upper ſegments of which aſcending, preſs like fingers the *antheræ*, which are placed on nodding filaments, to the *ſtigma*, that the genital powder may touch it, and they continue to cover it for ſome days after the fecundation, and then reſume their former place. The *veratrum album*, or white hellebore, has its male flowers placed below, but the others and upper flowers are all hermaphrodites; for which reaſon the male flowers, as not being ſo neceſſary, are placed lower. 4. *Time.* — Here we are to obſerve, that the *ſtamina* and *piſtillum* come at the ſame time, and that not only in one and the ſame flower, but alſo where ſome are male and others female, on the ſame plant, a very few only excepted. The wonderful contrivance of the great Author of Nature in the *jatropha*, or *caſſava*, and the plantain tree, is truely worth our obſervation. The

jatropha

jatropha urens, or prickly *caſſava*, has a *corymbus*, whoſe firſt or uppermoſt forks bear female flowers, which come out a day or two before the males, the other forks or branches of the *corymbus* produce male flowers, but the female flowers, which come out firſt, cannot be impregnated by their duſt, becauſe they were withered before the males expanded; and therefore thoſe female flowers prove abortive, unleſs they are impregnated from ſome other *corymbus* which has male flowers at the ſame time. The *muſa paradiſaica*, or plantain tree, produces a *ſpadix*, which contains often 200 *germina*, the few female flowers of which continue in blow for ſome days; when the female flowers have done blowing, the males ſucceed, and continue in flower till the fruit is ripe, in which are to be found no ſeed at all. Wherefore the authors of the *Hortus Malabaricus* have aſſerted that ſeeds were evidently wanting in the plantain tree, which ſeemed a paradox to me; but when I ſaw the firſt female flowers deſtitute of males, and that the males which followed came too late to impregnate the females, I clearly perceived that no ſeeds would ever be produced in this ſpecies, unleſs ſeveral plants placed together were to flower nearly at the ſame time, and then one could impregnate the other. There is one thing farther remarkable in the *muſa*, and that is, that it produces two ſorts of flowers very different in the ſame plant, ſome of which want the *ſtigmata*, and others the *antheræ*; the firſt may be called male hermaphrodites, and the latter female hermaphrodites. Here then we have an unexampled ſpecies of *polygamy*, where thoſe different flowers may impregnate each other, and one female joined with barren males is impregnated by the males belonging to another female, which is itſelf barren. Another thing which merits our obſervation in regard to time is, that when the male and female flowers are in diſtinct cups on the ſame plant, or on different plants of the ſame ſpecies, and where the male flowers are not erected perpendicularly over the females, there it is neceſſary that the flowering be over before the leaves come out, leſt the fecundation ſhould be hindered by the intervention of the leaves; *e. g.* in the mulberry, miſſeltoe, alder, birch, hornbeam, beach, oak, hazel, walnut, and alſo in the willow, ſea-buckthorn, *myrica* or Dutch myrtle, poplar, aſh, and dogs mercury.

5. *Rains.*—In almoſt all ſorts of flowers we ſee how they expand or open by the heat of the ſun, but in the evening, and in a moiſt ſtate of the air, they cloſe or con-tract

tract their flowers, left the moiſture getting to the duſt of the *antheræ* ſhould coagulate the ſame, and render it incapable of being blown on the *ſtigmata*; but (which is indeed wonderful) when once the fecundation is over, the flowers neither contract in the evening, nor yet againſt rain. Flowers with covered *antheræ* never ſhut up in the night time; *e. g.* thoſe of the *didynamia* and *diadelphia* claſſes. The *antheræ* of the rye hang out beyond the flower, and if rain falls while it is in flower, the duſt is clotted, and hence the huſbandmen do truely predict a bad crop of rye, for the kernels are not ſo numerous, becauſe many of the florets prove abortive. But the *antheræ* of the barley lie ſo cloſe within the huſk, that the rain cannot get at it. If rain falls upon the bloom of the apple, pear, or cherry, the gardiner immediately dreads the bloſſoms falling off, or proving abortive; and experience confirms the truth of this, for the powder of the *antheræ* is ſpoiled; yet this accident oftener happens in the cherry than the apple or pear, for all the *antheræ* of the cherry flowers diſcharge their duſt at once; but the caſe is not ſo in the others. Smoak alſo is injurious, by drying up the moiſture of the *ſtigmata*. 6. *Culture of Palm Trees.*—That the cultivators of the common palm tree, or or date tree, cut off the male *ſpadixes*, and place them over the females, is recorded by Theophraſtus, Pliny, Proſper Alpinus, Tournefort, Kempfer, and others; and if they neglect to do this, the dates are harſh, bad taſted, and many trees wholly deſtitute of nuts or fruit. The date tree is every year thus impregnated in Arabia, Perſia, and Egypt, by the inhabitants. "The male *ſpathæ* being ripe (ſays Kempfer) are taken from the top of the tree, the *ſpadixes* taken out, and divided into leſſer branches, that the rudiments of the fruit may be ſprinkled with the minute atoms of their duſt; a ſmall branch of the male *ſpadix* is fixed into the middle of the female *ſpadix*, and thus diſcharges its duſt on the ſeed buds. It is remarkable that the *ſpadixes* dried are ſtill proper to impregnate the females, and may be kept a whole year without loſing their virtue. It ſometimes happens that the females are impregnated by the duſt blown to them by the wind; but ſince this is precarious, it is better done by the hand. If there is no impregnation, the female trees inevitably drop all the rudiments of the fruit, which is a great calamity to the owners, and to the country people in general, who are ſupported by their crop of dates, as we are by our crops of corn. I remember it happened in my time, that the

the Grand Signior meditated an invaſion of the city and territory of Baſſora, which the Prince of the country prevented, by giving out that he would deſtroy all the male palm trees on the firſt approach of the enemy, and by that means cut off from them all ſupplies of ſubſiſtence during the ſiege." Thus far Kempfer. Hear alſo what Tournefort ſays on this ſubject. "Hagdi Muſtapha, ambaſſador from Tripoli, told me, that a branch of the flower of the male palm was inſerted into the *ſpatha* of the female juſt at the time the *ſpatha* uſed to open; for when the flower is fully expanded, it ſheds its duſt, without the aſſiſtance of which the dates would be harſh and ill-taſted, diſagreeable, and without ſtones or kernels, and only fit to be given to camels and other beaſts of burden." In the males and females of the *piſtachia* nut-tree they obſerve the ſame method as in thoſe of the date tree. For in Sicily (ſays Geofroy in his *Materia Medica)* the countrymen pluck cluſters of flowers from the male *piſtachia*, with the fecundating duſt of which they impregnate the female flowers. Others gather the male flowers, expoſe them to dry in proper bags, and ſcatter the proliferous duſt on the female flowers, that the fruit may not prove abortive, and the crop fail. 7. *Nodding Flowers.*—

Since

Since the male duſt is generally of a greater ſpecific gravity than the air, in moſt plants that have the *piſtillum* longer than the *ſtamina*, the All-wiſe Creator has made the flowers nodding, that the powder may more eaſily reach the *ſtigma*, as may be ſeen in the common ſnow-drop, greater ſnow-drop, ſow-bread, *narciſſus*, fritillary, *campanula*, and dogs-tooth violet, &c. Now it cannot be ſaid that this happens merely from the weight of the flower, for ſometimes the fruit in the ſame plants, which is ten times heavier than the flower, grows erect, as in the crown imperial, fritillary, and others. 8. *Sunk Flowers.*—The ſtems of many plants grow under water; but a little before they blow, the flowers emerge or riſe above the ſurface of the water, as we ſee in the water-lily, frogs-bit, broad-leafed pondweed, perennial arſmart, &c. There are others in which all the parts grow under water, as the water-milfoil, water-ſoldier, ſeveral of the pondweeds, all which, about the time of flowering, raiſe their flowering ſtems above the water, which ſtems ſink again as ſoon as the time of flowering is over. The *valiſneria* of Micheli, a kind of pondweed, which grows in Italy, bears a very long *ſcapus*, or flowering ſtem, but twiſted in form of a ſcrew; hence it appears very ſhort. This plant grows

grows in rivulets and ditches under water, and bears on the extremity of its ſtem one flower only. About the time of blowing the *ſcapus* is lengthened, till the *calyx* has reached the ſurface of the water; which done, the flower is expanded, and after a few days, the flowering and impregnation being over, it ſinks again, the ſtem turning in a ſpiral form as before. This is the female plant. The *valiſnerioides* of Micheli grows in the ſame places under water, having a flower ſtem ſcarce an inch high, which conſequently does not reach the ſurface of the water; this bears many flowers, which, when the time of flowering approaches, drop from the *ſcapus*, and riſe like little bladders; as ſoon as they have reached the ſurface of the water, though before ſhut, they then open, and ſwimming about ſhed their duſt on the female flowers, which are alſo ſwimming in the ſame places. This is the male plant of the former. H. Cliff. 454. Micheli, without attending to the ſex, has carefully obſerved and faithfully deſcribed this circumſtance. 9. *Syngeneſious Flowers.*—The compound flowers are formed in different ways. In the *polygamia æqualis* all the florets are furniſhed with *ſtamina* and *piſtilla*. In the *polygamia ſuperflua* all the florets have *ſtamina* and *piſtilla* in the diſk or middle

dle of the flower, but in the *radius* there are only female flowers, which are impregnated by the male duſt of thoſe in the diſk. In the *polygamia ſuperflua* the diſk is filled with hermaphrodite florets as in the former; but the female flowers, which conſtitute the *radius*, cannot ripen their ſeed, being all without *ſtigmata*. Laſtly, the florets of the *polygamia neceſſaria*, which fill the diſk, have the *ſtamina* and *piſtilla*, but for want of the *ſtigmata* theſe florets bear no ſeed, and the plants would all have been barren, had not the All-wiſe Creator furniſhed the *radius*, which conſiſts only of female florets, with compleat *piſtilla* that have the *ſtigmata*, and conſequently ripen the ſeed. 10. *Conſideration of all Sorts of Flowers.*—The tenth and laſt argument is drawn from the genuine conſideration of all ſorts of flowers. And here for brevity-ſake we ſhall examine only a few out of the many that might be adduced in proof of the Linnæan doctrine of the generation of plants. The *celoſia*, or cock's-comb, is furniſhed with a *piſtillum* ſurrounded by five *ſtamina*, whoſe filaments are joined below by a thin plaited film. In moiſt weather this film is relaxed, and the *antheræ* ſtand at a great diſtance from one another, but in dry weather the film is contracted, by which means the filaments come cloſe together,

gether, ſo that the *antheræ* almoſt touch the *ſtigma*, and hence the impregnation is aſſiſted. The ſaxifrage has ten *ſtamina*, in the center of which are two *piſtilla*. After being in flower for ſome days, two of the *ſtamina*, which ſtand oppoſite to one another, meet, that their duſt may fall perpendicularly down on the *ſtigmata*, while their *antheræ* force open, as it were, each others fariniferous cells by rubbing againſt one another; next day theſe two *ſtamina* recede from one another, and two others ſupply their place, and thus they continue to do till all the males have diſcharged their duſt in the ſame manner. The graſs of Parnaſſus has five ſhort *ſtamina*, one of which, as ſoon as the filament is ſufficiently lengthened, touches the *ſtigma* with its *anthera*, and, having diſcharged its fertilizing duſt, immediately riſes, and whereas it was bent inward before, it now bends backward, and the filament grows afterwards almoſt as high as the *corolla*; then the ſecond *ſtamen* comes forward in the ſame way and manner; then the third, fourth, and fifth, till they have all diſcharged their office. The *lychnis flos cuculi*, or meadow pinks, and the *gypſophila faſtigiata*, a kind of ſopewort, have procumbent ſtems; but when the time of flowering approaches, theſe are raiſed upright, that the duſt of the *antheræ*,

being

being expofed to the wind, may be more readily blown upon the *ftigmata*. This is alfo the reafon why the greateft part of flowers are elevated on flowering ftems above the ground, that the wind may more eafily fhake them. For the *narciffus*, fnow-drop, violet, crofs-wort, and fome others, have their ftems erect, but after the time of flowering their ftems recline to the ground. Almoft all the fpiked plants begin their flowering below, or in the lower part of the ftem, that in cafe the duft of the firft fhould not prove fufficient, that of the latter may make up the lofs. Of this fort are alfo the corymbiferous and umbelliferous plants, not to fay the compound flowers, where the florets conftituting the *radius* open firft, then follow the interior florets, and the difk is elevated or raifed, that the exterior florets may alfo receive fome of their duft, if they were not fufficiently impregnated before. This is fo certain and conftant a rule, that when I found the *hieracium præmorfum*, the greater broad-leafed hawk-weed, or greater upright moufe-ear, obferve a different order, *i. e.* the uppermoft flowers come out firft, I thought it a fingular inftance in nature. The *pellitory* clearly fhews us the procefs of generation; if we obferve it in a morning at a proper hour, we fhall fee how its *antheræ* burft

with

with great elaſticity, and emit their duſt all round; and, of conſequence, alſo upon the *piſtillum*. The ſame experiment ſucceeds, if we touch the *antheræ* with the point of a needle, as Vaillant has obſerved. The melons, pompions, cucumbers, gourds, &c. have two ſorts of flowers; the one male, which are called barren; the other female, which bear the *piſtilla* and fruit. The gardeners adviſe, that the barren flowers ſhould be carefully pluckt off, by reaſon they think theſe deprive the plant too much of its nouriſhment. But without doubt they are miſtaken; for they had better take the entire male flowers and ſprinkle the females with their duſt at noon, or roll the male flowers on the female, by which means the male duſt will readily reach the *ſtigmata*, and the females thus impregnated will ripen their fruit; for the reaſon why the fruit drops off is for want of being impregnated, and not for want of nouriſhment, as is the vulgar opinion. Hence it is, that if gardeners do not give air to their ſtoves, ſo that generation may be aſſiſted by the help of the wind, the fruit drops off, or miſcarries. In 1723, a pompion flowered in Stenbrohalt garden, the male flowers of which were carefully pluckt off every day, as ſoon as they appeared, leſt they ſhould draw from the female flowers too much of their nouriſhment; the confequence was, that not one fruit appeared on the plant that feafon. If one pluck the flowers of the male hemp, before thofe of the female plant are opened, he will get none, or but very few ripe feeds. Yet it happens fometimes, that the female hemp bears one or two male flowers, by which fome of the females may be impregnated; and this circumftance deceived Camerarius. The hops are of two forts, the one male, and the other female; and that which they commonly call the fruit, is only the *calyx* expanded and lengthened; hence the female plants, though not impregnated, can bear cones. This it was which deceived Tournefort, fo that he would not acknowledge the fexes of plants; becaufe a female plant of the hops in the Paris garden throve well, and bore fruit in plenty every year; when no male plants of the hops were within feveral miles of it. The fame thing happens in the mulberry and blite, the berries of which are only fucculent *calyxes*, but not feed veffels or *ovaria*. In the tulip there is an agreeable experiment of the gardeners. If one has only red tulips, out of any one flower of this fort let him take all the *antheræ*, before they fhed their duft; then let him take a tulip with a white flower, and fprinkle with its *antheræ* the *ftigma* of the red one; when its feed ripens, let

let him ſow it in a bed by itſelf, and he will have ſome flowers red, ſome white, and ſome of both colours; in the ſame manner as from two animals of different colours, the offspring is of various colours. One Richard Baal, a gardener at Brentford, ſold a great quantity of cauliflower ſeed, which he raiſed in his own garden, to ſeveral gardeners in the ſuburbs of London, who carefully ſowed the ſeeds in good ground, but they produced nothing but the common long-leafed cabbage, for which reaſon they complained that they were impoſed upon, and commenced a ſuit againſt the aforeſaid Baal in Weſtminſter-hall; the judge's opinion was, that Baal muſt return the gardeners their money, and alſo make good their loſs of time and crops. Ray's Hiſt. I. p. 42. This cheat we ought not to lay to the poor gardener's charge, for it is wholly to be aſcribed to his good plants being impregnated by the common cabbage. Wherefore, if one has an excellent ſort of cabbage, he ought not to let it flower in the ſame bed with any other of an inferior ſort, leſt the good ſort ſhould be impregnated with the duſt of the other, and the ſeeds produce a degenerate race. If one intends to plant the poplar or willow for walks, let him take only the male plants for this purpoſe; for if the females are planted, they will multiply ſo faſt as to form a grove inſtead of a walk. The juniper does not produce fruit every year in equal plenty, for if rain falls during its time of flowering, the fruit is deprived of the *farina*, and falls off. A female plant of the juniper grew for many years in Clifford's garden, but never produced any fruit for want of a male plant. The *rhodiola*, or roſe-wort, grew in the Upſal garden from the year 1696, at which time profeſſor Rudbeck brought it thither from the mountains of Lapland; but it never ripened its ſeeds, being without a male plant. It is needleſs to mention more examples, though I could eaſily deduce ſome ſingular experiments from many more plants, to corroborate our doctrine of the generation of plants, which the brevity of this diſſertation does not allow. I ſhall not ſpeak of the maize, the generation of which is denied by Siegeſbeck and others, from the ſituation of the *antheræ* and *piſtilla*; but refer for this to a treatiſe written by Mr. Logan of Philadelphia, intituled, Experiments concerning the Generation of Plants. And as to the hazle, ſee the experiments of the famous Mr. Bradley, profeſſor of botany in Cambridge. As to the fig tree, we ſhall explain its peculiar manner of generation, which is called caprification, more at large. Tournefort, while he was in the iſlands of the Archipelago, accurately obſerved this, and has deſcribed it in the following manner. "There are three varieties of the *caprificus*, or wild fig, which is the male, called by the natives *fornites*, *cratirites*, and *orni*. Theſe produce their fruit at three different times of the year; the fruit of the *fornites*, or firſt variety, begin to bud in Auguſt, and hold to the end of November, at which time many ſmall inſects make their eſcape from them, and lay their eggs on the *cratirites*, or ſecond variety, whoſe fruit are now coming out. The *cratirites*, or ſecond variety, bud in the end of September, and hold till May following. The inſects ſometimes come out of theſe before the *orni*, or third variety, are budded; in which caſe, the huſbandmen carefully ſeek for thoſe trees of the *cratirites* whoſe inſects have not yet come out, and tie them on the branches of the *orni*, that the inſects may lay their eggs thereon. The *orni*, or third variety, bud in May, and are ripe in July. In all the three varieties, certain inſects are generated, which depoſite their eggs, and theſe eggs become worms, and afterwards are turned into flies before the fruit falls off. The countrymen chiefly gather the *orni* in June and July, a little before the dog-days, or when the inſects begin to fly, and tie them with threads to the cultivated fig tree; then the inſects, by wounding the orifices of the cultivated figs, make their way into the cavities of the fruit, which ripen after this in about fourteen days." This riddle we ſhall now explain. The *caprificus*, or wild fig, is the male plant, and the cultivated fig the female. The flowers are diſpoſed within the cavity of the receptacle, which is ſo cloſe ſhut, that often it will ſcarce admit the end of a common needle through the pore in its extremity. Now the fig-flies, which are of the *ichneumon* kind, being transformed, and furniſhed with wings, about the time the *farina* of the male fig is ripe, make their eſcape from thoſe male figs, and being wholly covered with their duſt, after copulation, they ſeek for a place to lay their eggs, and flying to every one of the female figs, they enter their cavities, which are filled with *piſtilla* from all ſides, by which means they muſt neceſſarily bruſh off that *farina*, or male duſt, with which they were covered, and thus the ſeeds are impregnated. It is true, the female fig can ripen its fruit, though the ſeeds are not impregnated, becauſe this fruit is not a *pericarpium*, or ſeed veſſel, but only a receptacle: ſo alſo the hop, mulberry, ſtrawberry, and blite, can produce fruit,

fruit, though their ſeeds do not ripen, becauſe their fruit is nothing but a receptacle or *calyx*. Some botaniſts who were ignorant of this, ſeeing thoſe trees produce fruit without previous impregnation, thought they had found an unanſwerable argument againſt the generation of plants; but they did not conſider, that the fruit of the fig is not a ſeed veſſel, but a common receptacle. Yet it appears, that the fruit of the fig, if the ſeeds are impregnated, grow to a much larger ſize than thoſe which are not; which Tournefort alſo obſerved; for he tells us, that a fig tree, in Franche Compte, where there is no caprification, produced every year only 25 pound weight of figs; but that another of the ſame ſize in one of the iſlands of the Archipelago, produced yearly 280 pound weight of figs, which is above ten times the quantity of the other. This age hath clearly refuted the opinion of Camerarius, who maintained that the ſeeds of figs never produced any plants. For Linnæus tells us, that fig trees are raiſed every year in Holland from the ſeeds, provided the fruit is brought from Italy. But if the fruit grew in France, England, Germany, or Sweden, where there are no wild figs, the ſeeds produce nothing; on the other hand, if thoſe ſeeds are ſown, which grew in Italy or the Greek iſlands, where the male fig abounds, the plants ſpring up with eaſe, putting forth leaves, which at firſt are like thoſe of the mallow. The ſame experiment was tried with good ſucceſs in the Upſal garden in the year 1744. I ſhall only briefly mention the utility of inſects in the fecundation of plants. In a great many flowers there is a *nectarium*, or honey juice, ſeparated by the flower, which Pontedera thinks is that balſam which the ſeeds imbibe, to make them keep and preſerve their vegetative quality longer; and as long as this balſam is not dried up or ſpoiled, ſo long the ſeeds are fit to germinate. Several inſects, as bees, flies, butterflies, live on this honey juice only. Quintilian, the Roman orator, has a very ſingular caſe in one of his orations. " A poor man and a rich man (ſays he) had each a ſmall garden adjoining to one another. The rich man had many fine flowers in his garden, and the poor man had bees in his. The rich man complained that his flowers were ſpoiled by the poor man's bees, which he warned him to remove. The poor man not complying, the other ſcattered poiſon on his flowers; on which the poor bees all died; and *Dives* is guilty of this great injury. The poor man pleads that the bees did no hurt at all to the rich man's man's flowers; that neither the Creator, nor any human laws, had ever reſtrained bees within any certain limits; and therefore the rich man might hinder the bees from ſettling on his flowers if he could." But the other might have objected, that the bees were ſo far hurtful to his flowers, that they ſucked the honey juice, and carried off the fertilizing duſt. But after all, my opinion is, that the bees are more uſeful than hurtful to flowers, ſince by their unwearied labours they ſpread the fertilizing duſt, ſo that it may reach the *piſtillum:* for it is not clear what uſe the honey juice is of in the œconomy of flowers. From what has been ſaid it appears, that the generation of plants is performed by the genital duſt of the *antheræ* falling on the moiſt *ſtigma*, or female organ, which duſt by the help of the moiſture adheres and burſts, diſcharging its contents, the ſubtle particles of which are abſorbed by the *ſtyle*, into the *ovarium*, *germen*, or ſeed bud. We deny, however, that the duſt of the *antheræ* penetrates through the *ſtyle* to the *germen* and rudiments of the ſeed, as Moreland, Geofroy, Logan, and ſome others, were of opinion; for one example from Vaillant of the poppy will be ſufficient to diſprove this, ſince it appears, by ocular inſpection, to be falſe. The ſpecies meant,

meant, is the *papaver orientale*, or the oriental rough poppy, with a large flower. If one opens a flower of this plant, cutting its *piſtilium* perpendicularly downwards, he ſhall find the *lamellæ*, or folds, the *placentæ*, and the ſmall ſeeds ſticking to them, all of a pure white colour, though at the ſame time the *ſtyle* and all the *ſtigma* are wholly tinged with a purple hue from the duſt of the *antheræ*. From whence we may fairly conclude, that not one grain or particle of the *farina* enters the folds of the receptacle, or the ſeeds themſelves. The *malva alcea*, and the *malva moſchata*, *i. e.* the vervain mallow, and the jagged-leafed vervain mallow, have kidney-ſhaped *antheræ*, or ſummits, which contain a duſt conſiſting of large globular particles conſpicuous enough to the naked eye, and having their diameters equal to thoſe of the *ſtyles*; whence it is evident they never can paſs through the *ſtyles*. Needham has obſerved, that the duſt of martagon lily conſiſts of rough or prickly globules, which as ſoon as they touch any moiſture burſt on the ſides, and, like an *æolipile*, with great impetuoſity diſcharge a gelatinous matter, filled with innumerable points and atoms, which impregnate the *ovula*, or rudiments of the ſeeds. All the females alſo among animals diſcharge a ſeminal fluid at the

the ſame time with the males, and therefore this ſeminal fluid is alſo neceſſary on the part of the female. This ſame viſcid and ropy fluid on the *ſtigmata* of plants is called by Malpighi a turpentine, or balſam. Hence Ray alſo ſays, that in no kind of animals that he knew did the ſperm enter the *ovarium*, and in many kinds not even the *uterus*, or womb itſelf, but only its exceeding ſubtle *effluvia* to impregnate the *ovula*, or eggs. Upon the whole I think that the flowering of plants may be truely called their generation, and that the Antients with great propriety named the flower, the joy of plants.

SECT. CXLVI.

The *calyx* then is the marriage bed, in which the *ſtamina* and *piſtilla*, the male and female organs, celebrate the nuptials of plants; and here alſo thoſe tender organs are cheriſhed and defended from external injuries. The *corolla*, or petals, are the curtains, cloſely ſurrounding the genital organs, in order to keep off ſtorm, rain, or cold; but when the ſun ſhines bright, they freely expand, both to give acceſs to the ſun's rays, and to the fecundating duſt. The filaments are the ſpermatic veſſels by which the juice, ſecreted from the plant, is carried to the *antheræ*. The *antheræ* are the

the teſticles, and may not improperly be compared to the ſoft roe or milt of fiſhes. The duſt of the *antheræ* anſwers to the ſperm and ſeminal *animalcules*; for, though it is dry, that it may the more eaſily be conveyed by the wind, yet it gets moiſture upon touching the *ſtigma*. The *ſtigma* is that external part of the female organ which receives the male duſt, and on which this male duſt acts. The *ſtyle* is the *vagina*, or tube, through which the *effluvia* of the male duſt paſs to the *germen* or ſeed bud. The *germen* is the ovary, for it contains the unimpregnated or unfertilized ſeeds. The *pericarpium*, or ſeed veſſel, anſwers to the impregnated ovary; and, in fact, is the ſame with the *germen*, or ſeed bud, only increaſed in bulk, and loaded with fertile ſeeds. The ſeeds are the eggs, of which we have ſpoken more fully in ſect. 136, and 137. We ought to obſerve, that the *calyx* is a production of the external bark of the plant; the *corolla*, of the inner bark; the *ſtamina*, of the *alburnum*, or white ſap; the *pericarpium*, or ſeed veſſel, of the woody ſubſtance; and the ſeeds of the pith of the tree; for in this manner they are placed; and in this manner alſo they are unfolded. Therefore in a flower we find all the internal parts of a plant unfolded. This, though obſcurely, was taken notice of by Cæſalpinus, and alſo by Mr. Logan of Philadelphia. Flowers then are nothing elſe but the genitals of plants, with this difference from thoſe of animals, that their organs of generation are reckoned obſcene, and modeſty forbids us to examine them; for which reaſon nature has taken care frequently to hide them from our ſight. But in the vegetable kingdom it is quite otherwiſe; for here thoſe parts are not hid, but rather expoſed to the view of all. Add to this, that they are the moſt beautiful of all the parts of plants, in which the ſtudy, love, and contemplation of men are converſant. As the genitals of all animals have a rank and ſtrong ſmell in rutting time, ſo the flowers or genitals of plants alſo ſend forth a ſmell, which, though very different in different plants, is for the moſt part very agreeable, ſo that one fancies himſelf drinking nectar with his noſtrils. We ſee then how the great Creator has enriched the moſt innocent nuptials of plants with the moſt ſingular and ſuperb ornaments. Let us behold the marriage bed, or *calyx*, with what art it is conſtructed; the curtain, or ſuperb covering called the *corolla*, how neat and elegant its extremity or termination, how ſplendidly cut or carved, how fine and thin, and with what lively and beautiful colours it it is adorned! that we may truely ſay, in the emphatical language of ſcripture, *that Solomon in all his glory was not arrayed like one of them.* The *amaranthus tricolor* wants this beautiful covering of the *corolla*; but here nature has taken care to cover the flowers with a ſhade or fine-coloured crown of the leaves, which is laid over the flowers, that the few males, being defended from ſhowers, might more eaſily and ſafely diſcharge their *farina* on the females below. All animals appear moſt beautiful and ſhewy juſt before their copulation. The hart toſſes up his prominent horns; the birds ſhine and glitter with gay colours; the fiſhes taſte then moſt deliciouſly. But when the time of copulation is over, the hart loſes his lofty or towering horns; the birds loſe much of their beauty; and the fiſhes a great deal of their former flavour or fine taſte. Now plants are ſubject to the ſame changes: for in the ſpring and flowering time their verdure and beauty is moſt amazingly gay; but, when that is over, they loſe much of their former ſplendor. Thus copulation weakens and debilitates. In the ſilk-worm, moths, and butterflies, one may ſee, when their copulation is over, how their wings droop, and their life expires; but if a butterfly is ſhut up in a room alone, and not ſuffered to copulate with others,

others, it will often remain in health and vigour for half the year. In the annual and biennial plants one may obſerve, that before they have flowered, they reſiſt the cold of winter, *e. g.* the pinks, lichniſes, and others; but if they flower the firſt year, as ſoon as winter approaches they generally die; if, on the other hand, they do not flower, they will often continue in vigour three or four years. The plantain tree has often continued in the gardens of Holland for a hundred years; but when it has once flowered, no art, ſkill, or experience, can prevent its lofty ſtem from periſhing the following year. The *corypha*, or *umbrella* palm tree, remains barren for thirty-five years, growing in that time to the height of ſeventy feet; and in the ſpace of four months after that time, it riſes thirty feet higher, puts forth its flowers, and produces its fruit the ſame year; which done, it totally dies, both root and ſtem. Hort. Cliff. 482. The *lavatera arborea*, or ſea-tree mallow, will riſe to the height of a common pear tree, bearing the winter froſts very well; but when it has once blown, though it were to produce but one flower only, not all the aſſiſtance of gardeners or green-houſes, or any art, can prevent its periſhing on the firſt approach of winter.

SECT.

SECT. CXLVII.

The ſtomach of plants is the earth, from which they receive their nouriſhment; and the fineſt and moſt ſubtle part of the ſoil is their *chyle*. The root, which carries the *chyle* from the ſtomach to the body of the plant, is analogous to the lacteals or chyliferous veſſels of animals. The trunk, which ſupports and gives ſtrength to the whole plant, is analogous to the bones. The leaves, by which plants tranſpire, are inſtead of lungs. The leaves may be alſo compared to the muſcles of animals; for by their agitation with the wind the plant is put in motion. For this reaſon, herbs furniſhed with leaves cannot thrive, except they have air; but ſucculent plants, which have no leaves; *e. g.* ſome of the *euphorbias*, torch-thiſtles, melon-thiſtle, prickly pear, and the *ſtapelia*, though ſhut up in green-houſes, and quite deprived of the external air, do thrive very well. If you ſhut up a tree or a ſhrub, which is full of leaves, in a cloſe room in the ſummer-time, it will die; but if in the winter, when it has loſt all its leaves, it will remain ſafe. Heat is to plants analogous to the heart in animals. Plants have no heart, nor indeed have they any occaſion for ſuch an organ, for they live in the ſame manner as *polypes* do in the animal kingdom:

kingdom: their juices mixed with air are propelled through their veſſels, but not circulated back again by returning veſſels. The blood-veſſels of animals are divided into various branches, ſo alſo are the veſſels of plants. Plants for the moſt part have their genital organs placed at their ramifications, in the ſame manner animals have theirs at the ramification of the iliac veſſels, with this difference however, that the ramifications of plants aſcend, whereas thoſe of animals go downwards or backward; hence the antients called a plant an inverted animal.

SECT. CXLVIII.

From what has been ſaid it follows, that a flower, which is furniſhed with *antheræ*, but wants the *ſtigmata*, is a male flower; that a flower which has *ſtigmata*, but no *antheræ*, is a female; and one that has both, is an hermaphrodite flower. Nor need we wonder, that in the vegetable kingdom many plants are hermaphrodite, though in the animal kingdom there are very few of this kind; for here one ſex can eaſily go to the other; whereas plants are fixed to one ſpot, and cannot go from it. Juſtly therefore has the All-wiſe Creator furniſhed ſnails and other ſlow-paced animals with the genital organs of both ſexes, left (ſeeing they rarely meet) the ſpecies ſhould be extinct or loſt: during their copulation then, the one acts on the other, and each acts the part of male and female, while both impregnate and are impregnated by each other.

SECT. CXLIX.

We call a plant which has only male flowers, a male plant; that which has only female flowers, a female plant; and that which has only hermaphrodite flowers, an hermaphrodite plant. A fourth ſort, having on one and the ſame ſtem both male and female flowers diſtinct, is called an androgynous plant. There is alſo a fifth ſort, namely, when on one and the ſame plant there are not only hermaphrodite flowers, but alſo male or female flowers; and this is called a polygamous plant. When male flowers are added to the hermaphrodite, they ſerve to impregnate thoſe which have not been impregnated by their own males, *e. g.* in the croſs-wort, and white hellebore; or, if female flowers are added, they are impregnated by the *farina* of the hermaphrodite flowers, as in the *pellitory* and *orrache*. It is very remarkable, that the ſeeds of the hermaphrodite flowers in the *orrache* are altogether unlike to the ſeeds of the female flowers both

in

in ſhape and ſize, yet they produce the ſame plant; as well as the ſeeds of compound flowers do, which grow in the diſk and in the *radius*, or in the center and margin of the flower. To this place we may refer a third ſort of polygamous plants, in which there are two ſorts of hermaphrodite flowers on one individual, one ſort wanting the *ſtigmata*, and the other the *antheræ*, as in the plantain tree.

SECT. CL.

When there are more petals in flowers than they ought to have, ſuch are ſaid to be luxuriant; and they are of three ſorts, viz. Full, when all the *ſtamina* are wanting, and petals only grow in their room; Multiplied, when ſome of the *ſtamina* are wanting, and ſome remain; or Proliferous, when another flower with its proper flower-ſtalk grows out of the *piſtillum*, or center of the flower. All luxuriant flowers are juſtly reckoned monſters, ſince the eſſential parts are changed into a different nature and figure; which notwithſtanding is much admired by floriſts, who take great delight in full and multiplied flowers, or double flowers as they commonly call them. It is remarkable, that when monopetalous flowers are changed into luxuriant or full ones, only the *corolla* is increaſed, as in the gelder roſe, African marygold, feverfew, &c. Yet this holds chiefly in compound flowers, and but ſeldom in any other. Hence we may ſee, that no full flowers are ever natural, but always propagated from ſingle ones, for nature never produces any race of mere monſters. Theſe full flowers are at firſt produced from a ſuperabundance of nouriſhment. And ſince theſe full flowers are deſtitute of all the *ſtamina*, they are alſo deprived of the male organs of generation, which ſhould impregnate the *ſtigmata*; but no ſeeds will germinate (as we have obſerved before), unleſs they have been fertilized by the male duſt; therefore ſuch flowers muſt neceſſarily be barren, or produce no ſeeds. Of this ſort are the pinks, the *hepatica*, ſtock-julyflower, Indian creſs, pomegranate, roſe, *ranunculus*, marſh marygold, *lychnis*, violet, wall-flower, piony, and *narciſſus*, &c. All theſe, with full flowers, never produce ſeeds, but are propagated by ſuckers, off-ſets, or ſlips, *i. e.* by dividing the roots. I am well aware, that the poppy, the fennel-flower, and ſome few among the compound flowers, do ſometimes produce good ſeeds, becauſe ſome of their *ſtamina* remain to impregnate the *piſtillum*. The ſame way of reaſoning may be applied to all proliferous flowers, *e. g.* the *ranunculus*, roſe, *avens*; for they are all barren, becauſe becaufe they want the *germen*, and female parts of generation, when the prolification is from the center of the flower; but their offspring fometimes produce good feeds, providing they are not full flowers. From this differtation the reader may perceive, how fimilar nature is to herfelf, and how exact in following her own laws in all her works. Who would ever believe fo many truths were difcoverable concerning plants? though, without doubt, there are many more that remain ftill undifcovered. I fhall conclude with the words of Pliny; "That there is in plants a natural inftinct to generation; and that the males, by a certain blaft and fubtle powder, do confummate the nuptials on the females." Nat. Hift. b. xiii. ch. 4.

CHAP. VI.

CHARACTERS of the GENERA, &c.

SECT. CLI.

THE foundation of botany conſiſts in a regular diſpoſition and denomination, or naming of the plants, both generical and ſpecific.

SECT. CLII.

Now a regular or ſyſtematical diſpoſition of vegetables is either *Theoretical*, which lays down the claſſes, orders, or ſubdiviſions, and the *genera*; or *Practical*, which teaches the ſeveral ſpecies and varieties.

SECT. CLIII.

A regular diſpoſition, or ordering of vegetables, may be laid down either in the form of *ſynopſis*, or ſyſtem; and both are commonly called by the name of a method: which, I think, ſhould firſt lay down the more perfect and complete plants, and then proceed to thoſe that are ſmall and imperfect.

SECT. CLIV.

A *ſynopſis* gives us ſuch a diviſion of the plants, as is, for the moſt part, merely arbitrary, and is therefore generally, now-a-days, rejected by moſt botaniſts. For a *ſynopſis* lays down a way to botany, but does not determine the limits, as may be ſeen in Ray; for he has two claſſes, one of herbs, and another of trees, which he calls anomalous, or irregular and uncertain, not reducible to any head or claſs, or diviſion of his method.

SECT. CLV.

A ſyſtem, or ſyſtematical method, conſiſts of five members or branches, which are peculiarly appropriated to itſelf, to wit, Claſſes, Orders, *Genera*, Species, and Varieties. This ſyſtematical method was firſt invented by Tournefort, and is infinitely preferable to a *ſynopſis*.

SECT. CLVI.

A ſyſtem is a clue to guide us to botany, which without any ſuch guide is a mere *chaos*, or rude and indigeſted heap of confuſion. As for example, let any unknown Indian plant be preſented to a lover of botany, who underſtands no ſyſtem, and he ſhall turn over all the deſcriptions, figures, cuts, plates, indexes, and catalogues in vain, nor ſhall he at laſt find out the plant, unleſs it be by mere chance: but the ſyſtematical botaniſt can ſoon determine, whether it be a *genus* which is already known, or whether it be a new *genus* never before deſcribed by any.

SECT. CLVII.

Of ſpecies of plants we reckon ſo many as there were different and conſtant forms of plants created in the beginning by the Infinite and Eternal Mind: and thoſe different forms, according to the laws of generation, have always produced others ſimilar or like to the parent plants, from whence they reſpectively ſprang. Neither have we any reaſon to think that there are any new ſpecies of vegetables ſince the creation.

SECT. CLVIII.

Of varieties there are as many as there are plants, differing in certain circumſtances of form and appearance, produced from the ſeed of the *ſame* ſpecies. The varieties of plants are accidental changes, generally owing to the climate, ſoil, expoſure, heat, winds, bruiſes, age, diſeaſes, too much or too little nouriſhment, culture, &c. and by a change of ſoil, &c. are generally reduced to their proper ſpecies.
The

The varieties of plants are chiefly in point of magnitude, plenitude, criſpation, *i. e.* curled leaves and petals, colour, taſte, ſmell. Varieties might be excluded from botany, but that for œconomical uſes the *large* and *curled* varieties are moſt eſteemed; and *full* or *double* flowers; as alſo the fine, beautiful-coloured, ſtriped, and blotched varieties are in great eſteem among gardeners and floriſts; and thoſe varieties which are moſt remarkable for taſte and ſmell are moſt valued by phyſicians; it becomes neceſſary therefore to enumerate the chief varieties under every ſpecies where there are any.

SECT. CLIX.

We ſay there are ſo many *genera* as there are ſimilarly conſtructed fructifications of diſtinct natural ſpecies; that is to ſay, when two or more diſtinct ſpecies agree in all or moſt of the parts of fructification, they are ſaid to be of the ſame *genus*; not but that there are in botany many *genera* which conſiſt of no more than one ſpecies each, as we ſhall have occaſion afterwards to obſerve under ſect. 203.

SECT. CLX.

A claſs is an aſſemblage of ſeveral *genera* agreeing in the parts of fructification, according

according to the principles of nature and art; or, in other words, a claſs is a collection of *genera*, to all of which one certain common character is ſo appropriated, as that thereby all the *genera* of this claſs may be diſtinguiſhed from all thoſe of the other claſſes. That there are natural claſſes (ſee above in ſect. 77.), ſuch as the umbelliferous plants, verticillate, ſiliquoſe, or podded plants, leguminous plants, or pulſe, compound plants, graſſes, &c. is evident enough. And the artificial claſſes are only to ſupply the places of the natural, till the whole of theſe laſt be diſcovered.

SECT. CLXI.

The orders are ſubdiviſions of the claſſes, that too many *genera* might not occur at once to be diſtinguiſhed, which might create trouble and difficulty; for ten or twelve *genera* are more eaſily diſtinguiſhed than an hundred.

SECT. CLXII.

The ſpecies and *genera* are always the work of nature. The varieties are often owing to culture; but the claſſes and orders are partly natural, and partly artificial.

SECT. CLXIII.

The habit or outward appearance of plants is a certain conformity or agreement between vegetables that are nearly allied to each other, or of the fame *genus* in refpect to placentation, radication, ramification, intorfion, gemmation, foliation, ftipulation, pubefcence, glandulation, lactefcence, inflorefcence, &c. which terms we fhall prefently explain, only firft obferving, that the natural method fo much fought after by botanifts, is in a great meafure deduced from the habit; and that the fructification, which is the invention of the moderns, is not yet fo thoroughly underftood, as to difcover all the claffes of the natural method, though it may be confidered as the primary guide thereto.

I. Placentation is the difpofition of the *cotyledons* or lobes of the feed, at the time when it begins to germinate or fprout. In refpect to placentation, plants are faid to be, 1. *Acotyledones*, *i. e.* without *cotyledons* or lobes, when thefe are wholly wanting; as in moffes, ferns, flags, and *fungufes*. 2. *Monocotyledones*, having a fingle *cotyledon* (though thefe are properly *acotyledons*, fince the *cotyledons* remain within the feed): thefe are *perforate*, as in the graffes; *unilateral*, on one fide, as in the palms; or reduced, as in the onion. 3. *Dicotyledones*, with two *cotyledons*; theſe are either *unchanged*, as in the leguminous plants, apples, ſtone-fruit, and the plants of the claſs *didynamia*; *folded*, as in *goſſipium*, or cotton; *doubled*, as in *malva*, the mallow, and the plants of the claſs *tetradynamia*; *rolled-up*, as in buck-wheat; *ſpiral*, as in the glaſs-wort, marſh ſamphire, *baſella*, or Malabar nightſhade, *ceratocarpus*, and all the oleraceous tribe, or pot-herbs; *reduced*, as in the umbelliferous plants.

II. Radication is the diſpoſition of the root, in reſpect to the deſcending and aſcending ſtock, and the radicles; ſee examples above in ſect. 80. Roots may be farther diſtinguiſhed into, 1. Bulbous, ſcaly, as in the lily; coated, as in the onion; double, as in the fritillary; ſolid, as in the tulip. 2. Tuberous, handed, as in *orchis*; in bundles, as in *piony*; pendulous, as in the dropwort, and wild olive. 3. Jointed, as in wood-ſorrel, toothwort, *lathræa*, and *marynia*. 4. Spindle-ſhaped, as in the carrot, parſnep, radiſh, &c. 5. Globular, as in the earth-nut, bulbous-rooted crowfoot, and the *chærophyllum bulboſum*, or bulbous wild chervil, Pl. VII.

III. Ramification regards the ſituation of the branches, which the leaves alſo obſerve. Some plants have no branches, though they have leaves on the ſtem; as in *dittany*,

piony,

piony, barrenwort, May-apple. Oppofite and alternate leaves on plants for the moft part fhew them to be widely different, if we except a few, of which fome of the fpecies have oppofite leaves, and others alternate; as in the *fpurges*, *ciftus*, *lantana*, or pliant-mealy tree, *antirrhinum*, or fnap-dragon, lily, and the willow-herb. The lower leaves at the branches are oppofite, and the upper leaves at the flowers alternate, in the jafmine, *veronica*, borrage, and calves-fnout. The lower leaves are alternate, the upper leaves on the branches oppofite, in the pondweeds, and the *potentilla fupina*, or leffer mountain cinquefoil. The lower leaves are oppofite, and the upper fet on by threes, in the *nerium oleander*, or rofebay. The lower leaves are fet on by threes, and the upper are alternate, in *rufcus*, or the butcher's-broom. The lower leaves are fet on by fours, and the upper are alternate, in *coreopfis alternifolia*, or Virginia corn marygold with a winged leaf, and *antirrhinum chalepenfe*, or the fnap-dragon of Aleppo. The natural fituation of the leaves on plants differently branched, is beft learnt from the radical leaves.

IV. Intorfion is the bending or turning of any part of a plant towards either fide. *Caules volubiles*, winding or twining ftems, either

either to the left thus (, as in black briony, yams, hops, honeyſuckle, buckwheat; or to the right thus), as in kidney-bean, ſpurge, *convolvulus*, hatchet-vetch, &c. *Cirrhi volubiles*, twining claſpers or tendrils, wind to the right, and back again. Moſt leguminous plants have claſpers of this ſort. The rough bindweed, and moſt ſpecies of pepper, have claſpers on the foot-ſtalks of the leaves. The *corolla* bends to the left (*i. e.* the curvature looks to the right, if you ſuppoſe yourſelf in the center, and looking towards the ſouth), in perriwincle, *oleander*, *aſclepias*, *periploca*, and *ſtapelia*; to the right, in *pedicularis paluſtris*, or marſh louſewort, &c. *Trientalis*, or winter-green, is ſingular in having all the petals imbricate, one ſide of each lying over the other to the right. The *gentian* is imbricate, contrary to the ſun, before the petals open. Some *piſtilla* bend to the left, as in *cucubalus*, and *ſilene*, or campions. Some *germina*, or ſeed buds, are twiſted to the left, as in the ſcrew tree, and meadow-ſweet. Of flowers ſome have a reſupination, that is, the upper lip of the *corolla* looking towards the earth, and the under lip towards the ſky, as in ſome of the violets, ſome ſpecies of the *ſatyrium*, and the *baſil*, &c.: others have an obliquity, as in that ſpecies of hyſſop

hyſſop called *lophanthus*, the Siberian catmint, and ſome ſpecies of the louſewort. Of ſpikes, ſome are *ſpiral*, as in *claytonia*, and many of the rough-leafed plants; or *crooked*, as in *ſaururus*, lizard's-tail, the ſenſitive plant, poppy, red *ſedum*, and martagon lily. In various plants there is found a twiſting of the fibres, which ſerves as an hygrometer for meaſuring the degree of moiſture of the air; *e. g.* in the oats, there is an awn, or beard, twiſted like a rope; in the *geraniums*, the *arillus* of the ſeed has a ſpiral tail; and in the *bryum hygrometricum*, the *peduncles*, or flower-ſtalks, are twiſted contrary ways above and below.

V. Gemmation is the conſtruction of the bud, which conſiſts of leaves, *ſtipulæ*, foot-ſtalks, and ſcales.

Buds of foot-ſtalks are either,

1. Oppoſite, as in *liguſtrum*, *phillyrea*, *nyctanthes*, *ſyringa*, *hypericum*, *coriaria*, *buxus*, *jaſminum*, *vaccinium*, *arbutus*, *andromeda*, *ledum*, *daphne*, *laurus*, *myrica*, *linnæa*, *diervilla*, *lonicera*, *euonymus*, *fraxinus*, *acer*, *eſculus*, *bignonia*, *opulus*, *ſambucus*, and *pſidium*: or,

2. Alternate, as in *ſalix*, *ſpiræa*, *geniſta*, *ſolanum*, *hippophäe*, *berberis*, *ilex*, *ribes*, *juglans*, *piſtacia*, and *plumbago*.

Buds of *ſtipulæ* are either,

3. Oppoſite, as in *cephalanthus*, and *rhamnus catharticus*, or,

4. Alternate,

4. Alternate, as in *populus*, *tilea*, *ulmus*, *quercus*, *fagus*, *carpinus*, *corylus*, *betula*, *alnus*, *ficus*, and *morus*.

Buds, partly of *ſtipulæ*, and partly footſtalks, are,

5. Alternate, as in *ſorbus*, *crategus*, *prunus*, *meſpilus*, *pyrus*, *malus*, *cotoneaſter*, *amygdalus*, *ceraſus*, *padus*, *melianthus*, *roſa*, *rubus*, *vitis*, *robinia*, *cytiſus*, *potentilla fruticoſa*, and *ſtaphylæa*.

Buds are,

6. Irregular, in *abies*, *pinus*, and *taxus*.

Buds are wholly,

7. Wanting in ſeveral plants, as has been ſhewn above in ſect. 85.

VI. Foliation is that complication or folding which the leaves have whilſt they lie concealed within the buds and firſt ſhoots of plants. This part of the habit of plants, which has been altogether overlooked by former botaniſts, contains the following diſtinctions. The leaves are either ſaid to be,

1. *Involuta*, rolled in; when their lateral margins are rolled inward in a ſpiral form on both ſides; as in the honeyſuckle called *diervilla*, ſpindle tree, buckthorn, apple tree, poplar, violet, plantain, ſtar-headed water plantain, *potamogeton natans*, water lily, lizard's-tail, annual ſtarwort, hops, nettle, *hepatica*, dwarf elder, and bladder-nut. See tab. XI. fig. 2.

2. *Revoluta*,

2. *Revoluta*, rolled back; when their lateral margins are rolled backwards in a ſpiral form on both ſides; as in roſemary, *oleander*, marſh roſemary, ſome of the docks, pellitory, primroſe, colts-foot, ſhrubby cinquefoil, &c. See tab. XI. fig. 3.

3. *Obvoluta*, when their alternate margins embrace the ſtrait margin of the oppoſite leaf; as in pinks, *lychnis*, ſopewort, teazel, ſcabious, valerian, horehound, ſage, &c. See tab. XI. fig. 7.

4. *Convoluta*, rolled together; when the margin of one ſide ſurrounds the other margin of the ſame leaf like a hood; as in *arum*, pepper, frogs-bit, plumb, apricot, lettuce, hawk-weed, goats-beard, bitter-vetch, tare, peaſe-everlaſting, ſtarwort, butterwort, whortle-berry, barberry, cabbage, horſe-radiſh, comfrey, hounds-tongue, eringo, marſh trefoil, ſaxifrage, dittany, barrenwort, and many of the graſſes. See tab. XI. fig. 1.

5. *Imbricata*, imbricate; when they lie over each other in parallel lines, and with a ſtrait ſurface; as in *ſyringa*, privet, *phillyræa*, St. John's-wort, croſswort, purſlane, bay tree, ſpurge-laurel, ſea-buckthorn, butcher's-broom, perennial blue-bottles, *campanula*, Greek valerian, &c. See tab. XI. fig. 6.

 6. *Equi-*

6. *Equitantia*, riding; when the ſides of the leaves are parallel, and approach each other in ſuch a manner, that the inner leaves are included within the outer (which is not ſo in the conduplicate, or following mode of foliation); as in the day-lily, *iris*, *calamus aromaticus*, *carex*, *poa*, and ſome other graſſes. See tab. XI. fig. 5.

7. *Conduplicata*, doubled together; when the ſides of the leaf are parallel, and approach each other; as in the oak, beach, hazle, hornbeam, lime, cherry, almond, black alder, walnut, aſh, ſorb, roſe-buſh, bramble, ſilver-weed, peaſe, parſnip, and moſt of the leguminous plants. See tab. XI. fig. 4.

8. *Plicata*, plaited; when their complications are in plaits lengthways, like the leaves of lady's-mantle, &c.; as in birch, alder, beach, vine, maple, water elder, currant, marſh mallow, common mallow, hops, nettle, paſſion-flower, and lady's-mantle. See tab. XI. fig. 8.

9. *Reclinata*, reclined; when the leaves are turned backwards and downwards to the foot-ſtalk; as in May-apple, leopard's-bane, *anemone*, paſque-flower, *hepatica*, and tuberous moſchatel.

10. *Circinalia*, lying in wreaths or ringlets; when the leaves are rolled in ſpirally downwards; as in the ferns, and ſome of the palm trees.

VII. Stipu-

VII. Stipulation is the ſituation and ſtructure of the *ſtipulæ* at the baſe of the leaves. For the *ſtipulæ*, as well as the leaves, are of different forms and ſtructure in different plants. 1. In ſome plants there are no *ſtipulæ*, as in the rough-leafed plants, borrage, &c.; plants of the *didynamia* claſs, ſtarry plants, madder, &c.; podded plants, as horſe-radiſh, &c.; thoſe of the lily kind, *orchiſes*, and many of the *ſyngeneſia* claſs. Others have *ſtipulæ*, as the papilionaceous plants, thoſe of the *icoſandria*, and alſo the *caſſia*, ſenſitive plant, log-wood, and ſeveral others. 2. Moſt plants have two *ſtipulæ*, one on each ſide of the footſtalk. Some have only a ſingle one, as the *melianthus*, or honey-flower, on the inſide; butcher's-broom on the outſide. 3. In ſome the *ſtipulæ* are deciduous; as in the cherry, almond, poplar, lime, elm, aſh, oak, beach, hornbeam, hazle, birch, alder, fig, and mulberry, &c. In others abiding, as in the plants of the *diadelphia* claſs, and thoſe of the *polyandria polygynia*. 4. In ſome they grow cloſe to the plant; as in the roſe, bramble, cinquefoil, honey-flower, &c. But in moſt plants they are looſe. 5. In ſome they are ſituated on the inſide of the leaf; as in the fig and mulberry. In others on the outſide of the leaf; as in alder, birch, lime, and the plants of the *diadelphia* claſs.

VIII. Pubeſcence is that armour of plants by which they are defended from external injuries. This is of ſeveral ſorts.

1. Roughneſs, which is compoſed of particles ſcarce viſible to the naked eye, that are ſcattered over the ſurface of the plant. 1. This roughneſs is glandular, conſiſting of little glands, which are either like millet-ſeed; like little bladders; as in fig marygold; like lentils; globular, as in *orrach*; ſerving for ſecretion; like little chains; or like little bottles. 2. This roughneſs conſiſts of ſmall briſtles, which are either cylindrical, conical, hooked, bearing glands, forked, hatchet-ſhaped, as in hops; aggregate and ſtarry, as in madwort, and ſcrew tree; or aggregate and ſimple, as in ſea-buckthorn. 3. This roughneſs conſiſts of joints, which are either ſimple, knotty, tailed, branching, as in mullein, or feathery.

2. Wool, which is a preſervative for many plants againſt the bad effects of too much heat; as in the Canary ironwort, Canary ſage, the ſage called Æthiopis, the horehound, baſe horehound, mullein, woolly-headed thiſtle, and the *onopordon*, another ſpecies of thiſtle.

3. Down, which has commonly a hoary appearance, ſerves to defend plants againſt winds; as in the woolly Malabar tree, *tomex*, ſnail-trefoil, ſea purſlane.

4. *Strigæ*

4. *Strigæ* (to expreſs the meaning of which the Engliſh language has no word) are hard, rigid, and ſharp-pointed prickles, diſpoſed in rows, and ſerve as a defence againſt the injuries of ſmall animals; as in the torch-thiſtle, prickly pear, Syrian mallow, bramble, Barbadoes cherry, &c.

5. Hooks: theſe ſtick to animals as they paſs by; and are either three-pointed, as in *lappula*; or crooked and bent inwards, as in burdock, horehound, leſſer burdock, Guinea henweed.

6. Stings, keep off naked animals by their venomous points; as in the nettle, *caſſava*, *acalypha*, *tragia*.

7. Prickles, ſerve to keep off particular animals; as in *braſiletto*, caper-buſh, *cleome*, or baſtard muſtard, *aralia*, the berry-bearing *angelica*, ſenſitive plants, *volkameria*, *piſonia* or *ſingrigo*, *parkinſonia*, coral tree, falſe *acacia*, *ſolanum*, rough bindweed, *convolvulus*, *duranta*, cotton buſh, *drypis*, ſome ſpurges, goats-thorn, goats-beard, and *hugonia*; in which laſt the prickles are ſpiral.

8. Forks, conſiſt of two or three prongs, and ſerve as a defence againſt various animals; as in barberry, gooſeberry buſh, triple-thorned *acacia*, fig marygold, hard-ſeeded *chryſanthemum*, black horehound, *barleria*, *fagonia*, and prickly burnet.

 9. Thorns,

9. Thorns, or ſpines, ſerve to keep off cattle. Theſe are either upon the branches, as in the buckthorn, pear, plumb, ſloe, and orange trees, ſea-buckthorn, *gmelina*, common buckthorn, boxthorn, lilythorn, ſtaff-tree, furze, baſe horehound, reſt-harrow, &c.; or on the leaves, as in aloe, *agave*, falſe *acacia*, holly, manchineel, carline thiſtle, artichoke, bears-breech, juniper, ſaltwort, milkwort, butcher's-broom, and ſome of the *ſolanums*; or on the *calyx*, as in the thiſtle, mad-apple, &c.; or on the fruit, as in *caltrops*, *ſpinach*, agrimony, and thorn-apple.

IX. Glandulation comprehends the ſecretory veſſels of plants, which are either,

1. *Glandulæ*, glands properly ſo called; ſome on the foot-ſtalks of the leaves, as in paſſion-flower; ſome on the ſerratures of the leaves, as in willow; ſome on the baſe of the leaf, as in the almond, gourd, quick-in-hand, bird-cherry, marſh elder; ſome on the back of the leaf, as in the tamariſk; ſome on the ſurface of the leaf, as in ſun-dew, butterwort; ſome on the *ſtipulæ*, as in the apricot; ſome like hairs, as in the currant-buſh; and others like ſmall pores, as in the tamariſk.

2. *Folliculi*, or little bags, are veſſels filled with air; as in *utricularia*, or water milfoil, and *aldrovanda*.

3. *Utriculi*,

3. *Utriculi*, or little bottles, are veſſels filled with a ſecreted fluid; as in *nepenthes*, *marcgravia*, and ſide-ſaddle flower.

X. Lacteſcence, or milkyneſs of plants, is when a quantity of juice flows out on any injury being done to them. The colour of this liquor is either white, as in the ſpurges, poppy, dogs-bane, ſwallow-wort, cardinal flower, ſheeps ſcabious, *campanula*, maple, *ſumach*, milk-parſley, one ſpecies of melon-thiſtle, ſow-thiſtle, dandelion, hawk-weed, goats-beard, nipple-wort, and ſeveral others, the compound ſemifloſcular flowers of Tournefort; or the colour is yellow, as in *celandine*, *bocconia*, *puccoon*, and gamboge; or red, as in *rumex ſanguinea*, or bloodwort.

XI. Infloreſcence is the manner in which flowers are connected by their foot-ſtalks to the plant; this by former botaniſts was called a mode of flowering. See tab. VIII. and X. In this reſpect plants are either,

1. Verticillate, producing their flowers in rings or whorls round the ſtem; as in horehound, &c.; or,

2. Corymbiferous, bearing their flowers in a *corymbus*; as in muſtard, horſe-radiſh, turnips, and all the plants of the *tetradynamia* claſs.

3. Spicate, producing their flowers in ſpikes; as in *arum*, American nightſhade, pepper, and many of the graſſes.

4. Paniculate, having the flowers in panicles; as in many of the graſſes.

5. Axillary, when the flowers come out from the boſom of the leaves or branches, as do moſt flowers; therefore the following modes of flowering are rare. 1. When the flowers come out directly oppoſite to the leaf, as in pepper, lizard's-tail, pork-phyſic, bitterſweet, vine, *geranium*, water crowfoot, the annual ciſtuſes, Jew's-mallow, and *ciſſus*. 2. When the flowers come out alternately between the oppoſite leaves, as in *aſclepias*, or ſwallow-wort. 3. When the flowers come out at the ſide of the baſe of the leaf, as in nightſhade, *claytonia*, and all the rough-leafed plants, as gooſe-graſs, madder, &c. 4. When the flower-ſtalk is inſerted into the foot-ſtalk of the leaf, as in Syrian mallow, and *turnera*. 5. When the flowers bear tendrils, as in heart-pea, and vine. 6. When the flowers come out above the wings of the leaves, as in the rough-leafed plants, and Montpelier cinquefoil. And here we might mention ſome other particulars belonging to this ſubject; *e. g.* the time of germinating, or how long time ſeeds take from ſowing to ſpringing out of the ground, which in ſome is very ſhort, as in plants of the *tetradynamia*; in others a year, as in *hypecoum*, horned poppy, corn cow-wheat,

and

and *ranunculus falcatus*; and in others two years, as in the medlar, roſe, cornel, and white thorn; alſo the time of opening their buds, and time of flowering, which in ſome is annual, in others oftener; and laſtly, the time they take to come to perfection, which is very different in different plants.

SECT. CLXIV.

The primary diſpoſition or arrangement of vegetables, ought to be derived from the parts of fructification only. Former botaniſts urged the inſufficiency of the parts of fructification in ſerving as a foundation for the claſſes and *genera*, when, perhaps, they were not all ſo accurately known as at preſent. However, they are now, as deſcribed by Linnæus, abundantly ſufficient and numerous. See above in ſect. 86. chap. IV. All *genera*, therefore, eſtabliſhed on the habit and other circumſtances of plants, and not on the fructification alone, are to be rejected. Thus the *limodorum* of Tournefort, or purple bird's-neſt, with a fibrous root, is by Linnæus made a ſpecies of *orchis*. *Biſtorta* of Tournefort, with a fleſhy root, is a *polygonum*. *Rapa* of Tournefort, with a gibboſe root, is a *braſſica*. *Siſarum*, or ſkirrets, of Tournefort, with a tuberous root, is a *ſium*. *Hermodactylus*

modactylus of Tournefort, with a tuberous root, is an *iris*. *Anacampſeros*, *orpine*, of Tournefort, with an upright ſtem, is a *ſedum*. *Pſyllium*, or fleawort, of Tournefort, with a branched ſtalk, is a *plantago*. *Suber*, or cork tree, of Tournefort, with a fungous bark, is a *quercus*. *Larix* of Tournefort, with the leaves in bundles or packets, is a *pinus*. *Geniſtella* of Tournefort, or dwarf-broom, with jointed leaves, is a *geniſta*. *Dracunculus*, or dragons, of Tournefort, with pedate leaves, is an *arum*. *Trichomanes*, Engliſh black maiden-hair, of Tournefort, with pinnated leaves, is an *aſplenium*. *Faba*, the bean, of Tournefort, with leaves without claſpers, is a *vicia*. *Ceraſus*, the cherry, of Tournefort *(facie propria)*, is a *prunus*. *Abſynthium*, wormwood, of Tournefort *(facie externa)*, is an *artemiſia*. *Moly*, of Boerhaave, with a ſweet ſmell, is an *allium*. *Colocynthis* of Tournefort, with a bitter fruit, is a *cucumis*. There are a great many more examples adduced, but theſe are ſufficient to illuſtrate our meaning.

SECT. CLXV.

Vegetables, which agree in the parts of fructification, are not to be arranged in different claſſes, orders, or *genera*. Geſner was the firſt who ſuggeſted this aphoriſm; Cæſalpinus

Cæſalpinus the firſt who reduced it into practice; Moriſon revived, and Tournefort improved, this grand diſcovery in the ſcience of botany.

SECT. CLXVI.

Vegetables, which differ or diſagree in the parts of fructification, are not to be arranged in the ſame claſſes, orders, or *genera*. The truth of this rule is evident, it being the reverſe of the former.

SECT. CLXVII.

The characteriſtic or diſtinguiſhing mark of each *genus* is to be fixed from the number, figure, proportion, and ſituation or connection, of all the parts of fructification. There are ſeven ſpecies of *calyx*, viz. *perianthium*, *involucrum*, *amentum*, *ſpatha*, *gluma*, *calyptra*, *volva*. Parts of the *corolla* two, viz. *petalum*, and *nectarium*. Of the *ſtamina* three, viz. *filamentum*, *anthera*, and *pollen*. Of the *piſtillum* three, viz. *germen*, *ſtylus*, and *ſtigma*. Of the *pericarpium* eight ſpecies, viz. *capſula*, *ſiliqua*, *legumen*, *conceptaculum*, *drupa*, *pomum*, *bacca*, *ſtrobilus*. Of the ſeed three ſpecies, viz. *ſemen*, *nux*, *propago*. Of the receptacle five, viz. *receptaculum proprium*, *receptaculum commune*, *umbella*, *cyma*, *ſpadix*: in all 38. By the help of theſe, like ſo many letters or characters,

racters, we are enabled to read the *genera*. And each of theſe parts is to be conſidered in reſpect to number, figure, ſituation, and proportion; by which means the characters are increaſed to four times the number, or 152, which being multiplied by 38, the number of parts, produces 5776; and therefore the fructification is ſufficient, at leaſt, for ſo many *genera*; and we are ſure that ſuch a great number of *genera* never exiſted. From this it plainly appears, that there is no occaſion to have recourſe to the habit, the colour, magnitude, or any other circumſtance in plants, but the fructification alone, in order to conſtitute, aſcertain, and determine, the *genera*.

SECT. CLXVIII.

In eſtabliſhing the *genera* we ought to have a particular regard to the habit, leſt an erroneous *genus* ſhould now and then be conſtituted on too ſlight an examination. An experienced botaniſt can often readily determine, from the habit of plants, the tribe or family to which they belong; by this means the habit becomes a check againſt conſtituting wrong *genera*. Thus *nigella*, *helleborus*, *caltha*, are known to be different *genera* at firſt ſight by their different habit, which is farther confirmed by

an

an accurate examination of their fructification. Again, *fambucus* and *ebulus*, agreeing in habit, are to be joined under one *genus*, as their fructifications alfo agree. The fame may be faid of *trifolium* and *triphylloides*. The firft is tetrapetalous, and the other monopetalous; yet they agree in habit, and are both found to be of the fame *genus*, notwithftanding this flight difference. Though we are clofely to confult the habit, yet no mark taken from thence is ever to be expreffed among the diftinguifhing characters of the *genera*.

Characters taken from the habit, though not fufficient in themfelves to diftinguifh all the *genera*, yet often ferve to difcover a plant at firft fight. Such characters may be made in the following manner: in the *caryophillei*, pink or carnation-like plants, fuch as *dianthus*, *cucubalus*, *agroftemma*, *lychnis*, *faponaria*, *filene*, *arenaria*, *alfine*, *ceraftium*, *holofteum*, *fagina*, *fpergula*, *ftellaria*, *&c.*; the *cotyledons* or lobes are two, the roots are fibrous, the branches oppofite, jointed, and erect; the bending of the *piftilla* is to the leftward; the leaves in their buds, or firft fhoots, are obvolute or rolled againft each other, lance-fhaped, and undivided; they have no *ftipulæ*; fcarce any armour offenfive or defenfive; and, laftly, their mode of flowering is dichotomous or forked.

forked. And thus may the characters be made out in the other tribes of Linnæus's fragments of a natural method in sect. 77. ch. II.

SECT. CLXIX.

Those parts of the fructification which serve to establish one *genus*, do not necessarily answer the same purpose in another *genus*; or, in other words, those parts of the fructification which are constant in one *genus*, are found to be inconstant in another: thus, in *carica*, the flowers of the male plant are monopetalous, and those of the female pentapetalous; in *myrica*, some species have naked seeds, others berries; in *fraxinus*, some have a naked flower, others a *corolla*; in *geranium*, some have regular *corollæ*, others irregular; in *linum*, some are tetrapetalous, others pentapetalous; in *aconitum*, some are tricapsular, others quinquecapsular; in *trifolium*, some are monopetalous, others polypetalous; some monospermous, others polyspermous. Some have urged, that a monopetalous and polypetalous, a monospermous and a polyspermous plant, can never belong to the same *genus*; and therefore, contrary to nature, they have formed many spurious *genera*.

SECT.

SECT. CLXX.

We rarely find a *genus* in which all the parts of fructification are conſtant throughout the ſpecies. To this inconſtancy is owing, the great number of factitious or ſpurious *genera* in Tournefort and others; for, although ſuch variations afford excellent ſpecific diſtinctions, they are not ſufficient to conſtitute real *genera*. All *genera* therefore grounded on the variation of ſome parts of the fructification, are to be rejected. Thus *cardaiaca* of Tournefort, motherwort, with a five-toothed *calyx*, is by Linnæus made a ſpecies of *leonurus*. *Linaria* of Tournefort, toadflax, with a tailed *corolla*, is an *antirrhinum*. *Glaucium* of Tournefort, yellow horned poppy, with a roſaceous *corolla*, is a *chelidonium*. *Polygonatum* of Tournefort, Solomon's ſeal, with a tubular *corolla*, is a *convallaria*. *Centaurium minus* of Tournefort, with a tunnel-ſhaped *corolla*, is a *gentiana*. *Auricula urſi*, with a ſaucer-like *corolla*, is a *primula*. *Oxycoccus*, with a tetrapetalous *corolla*, is a *vaccinium*. *Porrum*, leek with trifid *ſtamina*, is an *allium*. *Radiola*, all ſeed with a quadrifid flower, is a *linum*. There are many more examples, but theſe are ſufficient to illuſtrate the propoſition. For if *genera* were to be multiplied in this manner, without any neceſſity, we ſhould

ſoon

ſoon have as many *genera* as ſpecies, and the ſcience of botany, as far as it reſpects arrangement, be at an end.

SECT. CLXXI.

In many *genera* ſome ſtriking or ſingular mark of fructification is obſerved, which we call the eſſential character. Thus the eſſence of *brunella*, *torenia*, *euphraſia*, *alyſſum*, and *crambe*, conſiſts in the teeth of the *ſtamina*; that of *curcuma*, *chelone*, *bignonia*, *martynia*, in a mutilate *ſtamen*; that of *ranunculus* in its *nectarium*, which is a ſmall prominence in the claw of each petal; that of *hydrophyllum* in its cloſed chinks within the diviſions of the petal; that of *helleborus*, and *nigella*, in their hollow *nectaria*; that of *hyoſcyamus*, in the covering of its ſeed veſſel, by which it is diſtinguiſhed from winter-cherry; that of *pancratium*, ſea-daffodil, in the inſertion of its *ſtamina* into the upper part of the *nectarium*, by which it is diſtinguiſhed from *narciſſus*, where the *ſtamina* are placed within the *nectarium*, and faſtened to its tube; that of *reſeda*, in its lateral *nectarium*; that of *campanula*, in its five-valved *nectarium*; and that of *iris*, in its ſingular *ſtigma*, which reſembles three petals or flower-leaves.

SECT.

SECT. CLXXII.

When any ſingular mark of fructification, peculiar to any *genus*, is not found in all the ſpecies of that *genus*, we ſhould take care not to confound thoſe ſeveral *genera*, but keep them ſeparate; or, in other words, the ſtriking or ſingular characteriſtic mark of every *genus* muſt run through all the ſpecies. For want of attending to this rule, we are apt to confound *genera* that ſhould be diſtinguiſhed. Thus *aloe* and *agave* were formerly incorporated into one *genus*, as were likewiſe *ranunculus* and *adonis*, *andromeda* and *erica*. *Aloe* is now ſeparated from *agave*, American aloe, becauſe its *ſtamina* are inſerted, not into the petals, but into the common receptacle; *adonis* is ſeparated from *ranunculus*, becauſe it wants the prominence in the claws of the petal, which is the diſtinguiſhing mark of *ranunculus*; *andromeda* from *erica*, becauſe of the two horns of the *antheræ*, which are more conſpicuous in the *erica* than the *andromeda*.

SECT. CLXXIII.

When the ſtriking characteriſtic mark of any *genus* is found in another *genus* near akin to it, we ſhould be careful not to ſeparate one and the ſame *genus* into more than it naturally ſhould be, nor to accumulate a whole natural tribe under one *genus*.

 Thus,

Thus, in *ſedum*, *ſempervivum*, *rhodiola*, *craſſula*, *tillæa*, *cotyledon*, the *nectaria* adhere to the baſe of the *piſtillum*. Yet all theſe diſtinct *genera* are not, on this account, to be combined under one *genus*. So alſo in *epilobium* and *œnothera* the *calyx* is tubuloſe, yet they are diſtinct *genera*. In *meſpilus*, *cratægus*, and *ſorbus*, the ſtructure of the flower is alike, but they are not *therefore* to be united into one *genus*.

SECT. CLXXIV.

The more conſtant any part of fructification is throughout a great number of ſpecies, the more certainly it is to be depended on, as a characteriſtic mark in diſtinguiſhing the *genera*. The *nectarium* of the *genus hypecoum* is conſtant, but not the jointed pod. The ſpotted berry of the *convallaria*, is found in all the ſpecies; the *corolla* in lily of the valley, Solomon's ſeal, and one blade, which are three ſpecies of *convallaria*, is very different. The *corolla* of wild *ſena* is conſtant, but not the pod. In the *genus lobelia*, which includes ſeveral *genera* of other authors, the *corolla* is conſtant. The ſeed veſſel in cardinal-flower, *rapuntium* of Tournefort, *laurentia* of Michelius, and *lobelia* of Plumier, which are all ſpecies of the Linnæan *genus*, are all different. That of the *lobelia* of Plumier, is is pulpy; and of the cherry kind, containing a nut, or ſtone with two cells; whereas in the other ſpecies it is a dry membranaceous capſule. In vervain, the *calyx* and *corolla* are conſtant throughout the ſpecies; the *ſtamina* and ſeeds are different.

SECT. CLXXV.

In ſome *genera*, one part of the fructification, and in other *genera*, another part of the fructification, is obſerved to be more conſtant than the reſt; but every one of them is ſubject to variation ſometimes. Thus we find the *pericarpium* to vary in the congeners of *impatiens*, *campanula*, *primula*, *papaver*, *ciſtus*, *fumaria*, and *arbutus*; the *calyx* in thoſe of *nymphæa*, and *cornus*; the *corolla* in thoſe of *vaccinium*, *convallaria*, *andromeda*, *gentiana*, and *linum*; and the ſeeds in thoſe of *ranunculus* and *aliſma*.

SECT. CLXXVI.

If the flowers agree, though the fruits differ, ſuch *genera* ought to be joined. Thus, in *caſſia*, *hedyſarum*, *ſophora*, *lavatera*, *hibiſcus*, and *mimoſa*; the flowers are ſimilar, but the fruit different in the ſame *genus*.

SECT. CLXXVII.

The figure of the flower is more conſtant than that of the fruit; the proportion of the parts is very different, but it is always moſt conſtant. That the flower is more certain than the fruit, appears by many examples; as from *campanula*, *primula*, *antirrhinum*, *aliſma*, *hibiſcus*, *ciſtus*, *fumaria*, *arbutus*, *clematis*, *papaver*, *ranunculus*, *heſperis*, *datura*.

SECT. CLXXVIII.

The number of the parts is more ſubject to vary than the figure, yet it is beſt explained by the proportion of number; but flowers varying in number upon the ſame plant, are to be determined by the primary flower. Thus, in *ruta*, *chryſoſplenium*, *monotropa*, *tetragonia*, *euonymus*, *philadelphus*, *adoxa*, the number of the parts varies from five to four; the natural number therefore muſt be determined by the primary flower. But in the variations of the number of parts, there is a proportional affinity; thus in flowers, the *ſtamina* vary from ten to eight, and from five to four; the *corolla* and *calyx* from five to four, and the whole flower from four to three; and the fruit from five to three, and from five to four.

SECT. CLXXIX.

The ſituation of the parts is moſt invariable, ſcarce ever differing in plants of the ſame

ſame *genus.* For which reaſon Tournefort, in the orders of his claſſes, reckoned the ſituation of the receptacle of great moment.

SECT. CLXXX.

Rivinus and his followers have laid too great a ſtreſs on the regularity of the petals. For we ſee in the umbelliferous plants, ſome have regular *corollæ*, others irregular, in the ſame *genus*; and in the European *geraniums* the *corolla* is regular, but in the African *geraniums* irregular, &c.

SECT. CLXXXI.

Nature has made the *nectarium* of the greateſt conſequence. The *nectarium* had not ſo much as a name before Linnæus deſcribed it; but that it is of very great conſequence in determining the *genera*, is evident from the following *genera*, in which it is the diſtinguiſhing mark, viz. *orchis, ſatyrium, monotropa, fumaria, viola, malpighia, banniſteria, adenanthera, commelina, laurus, helxine, dictamnus, zygophyllum, ſwertia, lilium, fritillaria, hydrophyllum, ranunculus, hermannia, berberis, ſtaphylea, paſſiflora, narciſſus, pancratium, mirabilis, nerium, ſtapelia, aſclepias, dioſma, campanula, plumbago, hyacinthus, rhododendrum, cheiranthus, ſinapis, kiggleria, clutia, aquilegia, nigella,* *aconitum*, *parnaſſia*, *epimedium*, *theobroma*, *reſeda*, *grewia*, *helleborus*, *iſopyrum*, *tropæolum*, *impatiens*.

SECT. CLXXXII.

The *ſtamina* and *calyx*, being leſs liable to luxuriance, are far more certain than the petals; for there are many plants that vary in the figure of the *corolla* or petals in the ſame *genus*; as in *vaccinium*, *pyrola*, *andromeda*, *nicotiana*, *menyanthes*, *primula*, *veronica*, *gentiana*, *hyacinthus*, *ſcabioſa*, *narciſſus*. Some vary in the number of petals; ſome ſpecies, for example, of the *ranunculus* being pentapetalous, and others polypetalous; as alſo in *helleborus*, there are ſome pentapetalous, and others polypetalous; and in *ſtatice*, there are pentapetalous and monopetalous ſpecies; and in *fumaria*, dipetalous and tetrapetalous. And ſometimes the number of petals is found to vary in the ſame ſpecies, as in *carica*, *jatropha*.

SECT. CLXXXIII.

The ſtructure of the *pericarpium*, ſo much inſiſted on by former botaniſts, appears by innumerable examples to be of leſs conſequence than they believed it to be. All *genera* therefore eſtabliſhed on diſtinctions of the *pericarpium*, fruit, or ſeeds only, are to be rejected as fictitious; thus, the *lycoperſicon* of Tournefort, having a fruit with many cells, is made a *ſolanum* by Linnæus; *aſarina* of Tournefort, having a fruit with many valves, is an *antirrhinum*; *raphaniſtrum* of Tournefort, with a jointed fruit, is a *raphanus*; *onobrychis* of Tournefort, with a fruit having one ſeed, is an *hedyſarum*; *anemonoides* of Tournefort, with naked ſeeds, is an *anemone*; *perſicaria* of Tournefort, with triangular ſeeds, is a *polygonum*: there are ſixty or ſeventy examples brought in here by Linnæus of the ſame kind, but theſe few are ſufficient to illuſtrate the meaning of this aphoriſm.

SECT. CLXXXIV.

Luxuriant flowers, eunuchs and mutilate flowers, being all monſtrous productions of nature, are allowed no place in conſtituting the *genera*. In full flowers no number of petals can be aſſigned, and the *ſtamina* in moſt generic characters of this ſort would be totally excluded. Mutilate flowers have no *corolla*, and for this reaſon in ſome ſpecies of *campanula*, *ipomæa*, and *ruellia*, the *corolla* would be wholly excluded from the deſcription, contrary to the nature of the other ſpecies.

SECT. CLXXXV.

In multiplied and full flowers, the *genus* may be difcovered by the *calyx*, and the loweft feries of petals; and in proliferous flowers, by the offspring. The *calyx* in full flowers is never altered, and therefore from it we may often difcover the *genus*; as in *hepatica*, *ranunculus*, and *alcea*. And in polypetalous flowers, the loweft feries of petals remaining always the fame in number, even in full flowers, we may from thence often difcover the *genus*; as in *papaver*, *nigella*, and *rofa*.

SECT. CLXXXVI.

Characters (marks or figns) are the definitions or defcriptions of the *genera*; thefe characters are of three forts; the factitious, the effential, and the natural. For the habitual character, or that taken from the habit or outward appearance of plants, fo much made ufe of by former botanifts before the difcovery of the fructification, is now grown obfolete and out of ufe in determining the *genera*.

SECT. CLXXXVII.

The effential character furnifhes the *genus* to which it is applied, with a fingle mark fo particular and ftriking, as to diftinguifh the *genus* in which it is found, from

from every other *genus* at firſt ſight. It ſerves to diſtinguiſh ſuch *genera* as arrange themſelves under the ſame natural order. Its excellence conſiſts in its brevity. The knowledge of thoſe *genera* in which it is found, is moſt eaſily and quickly acquired; though perhaps not a tenth part of all the known *genera* can be thus characterized. Out of many examples that might be produced, we ſhall only mention the following *genera*, viz. *ſalvia*, *iris*, *plantago*, *parnaſſia*, *narciſſus*, *dianthus*, *ranunculus*, *acanthus*, *hibiſcus*, *paſſiflora*. Thus the eſſential mark of *ſalvia*, is its tranſverſe filament; of *iris*, conſiſts in its petal-ſhaped *ſtigmata*; that of *plantago*, in its capſule, which ſplits horizontally; that of *parnaſſia*, in its ſingular *nectaria* ciliated and globular; that of *narciſſus*, in its tunnel-ſhaped *nectarium*, with the petals faſtened to its inſide; that of *dianthus*, in having four ſcales at the baſe of the *calyx*; that of *ranunculus*, in its *nectarium*, which is a ſmall prominence at the claw of each petal; that of *acanthus*, in its *calyx* of three pair of leaves; that of *hibiſcus*, in its outer *calyx*, which conſiſts of many leaves; that of *paſſiflora*, in its crown-like *nectarium*.

SECT. CLXXXVIII.

The factitious, accidental, or artificial character,

character, can only diftinguifh the *genus* in the fame artificial order, by a greater or lefs number of characteriftic marks, but can never diftinguifh the *genus* in a natural order. Such therefore, whether effential or natural, as cannot fufficiently diftinguifh the *genus* in a natural order, are factitious or artificial characters; as thofe of Tournefort, Ray, Rivinus, &c. It is well defined by Ray, when he fays, " that no more characteriftic marks of the *genus* are to be collected, than are found abfolutely neceffary in determining the *genus* with certainty and precifion. The characters of the claffes and orders only, in the fexual fyftem, are artificial, as was before obferved at fect. 162.

SECT. CLXXXIX.

The natural character collects all the poffible marks of the *genera*, and therefore includes both the effential and factitious. Linnæus firft introduced thofe characters in his *Genera Plantarum*. As the natural character includes all the poffible marks of the *genera*, it ferves equally well for every fyftem; lays a foundation for other new fyftems; and remains unchanged, whatever number of new *genera* may hereafter be difcovered; and can only be amended, upon the difcovery of new fpecies, by excluding the fuperfluous marks.

SECT.

SECT. CXC.

The factitious character is only ſuccedaneous, or ſerves to ſupply the place of others; the eſſential is the moſt excellent, but ſcarce poſſible to be had in all the *genera*. The natural character is, with the utmoſt difficulty, made out; but, being once made out, is the baſe of all ſyſtems, preſerves the *genera* entire and unchanged, and is applicable to every true ſyſtem, that has been, or ſhall be, invented. The factitious characters are ſuch as thoſe of Ray, Tournefort, Rivinus, &c. The eſſential characters being ſuch as can diſtinguiſh *genera*, which have the greateſt affinity to one another in a natural order, ſerve equally to diſtinguiſh ſuch *genera* when ſeparate from one another. The natural character lays down all the poſſible characteriſtic marks, is uſeful in every method that is, or can be, invented; and affords a foundation to the old and new ſyſtems, that are built upon the fructification.

SECT. CXCI.

Every true botaniſt therefore ſhould be acquainted with the natural character. If the eſſential characters of all the *genera* were diſcovered, the knowledge of plants would become eaſy, and many of the natural characters would be of no value or importance;

importance; but we are to underſtand that no man can ever be a good botaniſt without the knowledge of the natural character; for whenever new *genera* were diſcovered without the natural character, a botaniſt would always be at a loſs. He who thinks himſelf an expert botaniſt from the eſſential character only, and neglects the natural character, both deceives, and is deceived; ſince the eſſential character, upon the diſcovery of new *genera*, muſt often be fallacious. The natural character is the foundation of the *genera*, and without it no one can judge rightly of any *genus*; and therefore I conclude, that it is, and always will be, the abſolute foundation of the knowledge of plants.

SECT. CXCII.

The natural character lays down all ſuch differing and ſingular marks of fructification as run alike through all the ſpecies, omitting the other marks as ſuperfluous. It is a work of infinite labour to limit the characters through all the ſpecies. All the parts of fructification are to be examined, even the moſt minute; ſince, without the knowledge of the fructification, there is no certainty of the *genus*.

SECT.

SECT. CXCIII.

No character is compleat and infallible, until it has been applied to all the ſpecies. The moſt finiſhed botaniſt, and he only, is proper to make out the moſt compleat natural character, ſuch as is applicable to the greateſt number of ſpecies, every one of which will neceſſarily exclude ſome ſuperfluous mark or other. The natural character is made out by the moſt accurate deſcription of the fructification of the firſt ſpecies; then all the other ſpecies of that *genus* ſhould be compared with the deſcription of the firſt, and all marks in which they diſagree ſhould be excluded, by which means the character will become at laſt complete.

SECT. CXCIV.

The mode of flowering does not afford a proper characteriſtic mark. That part of the plant on which the fructification is ſituated, is not a characteriſtic mark, though Ray, Rivinus, Heucher, Knaut, Kramer, &c. were of a different opinion; but, being hurtful to the ſcience, it has been rejected by the greateſt botaniſts, as Tournefort, Vaillant, and others. The ſeveral modes of flowering, as the verticillate, corymbiferous, ſpicate, paniculate, &c. we have mentioned above, ſee ſect. 163. Ray, Rivinus,

vinus, Boerhaave, have given the mode of flowering a place in their characters of the *genera*, that they might follow nature more closely, and have thereby lost sight of nature the sooner.

SECT. CXCV.

The character should have the name of the *genus* at top, whose description it is to contain.

SECT. CXCVI.

Every one of the seven principal parts or species of fructification should, in a natural character, begin a new line, sentence, or paragraph, by which means every thing will appear more distinct, the part in question presently found, and deficiencies quickly observed.

SECT. CXCVII.

The name of the part of fructification should begin the line in different letters or characters; for the same reason as in sect. 196.

SECT. CXCVIII.

No character should assume any mark of similitude, except it be common and obvious to every body; otherwise it will not be understood by those who are unacquainted with the art or ſcience from whence the ſimilitude is borrowed.

SECT. CXCIX.

The character ſhould deſcribe thoſe marks which run alike through all the ſpecies in the moſt compendious terms. The terms of art every botaniſt ſhould be well acquainted with. From your deſcriptive characters let all pompous expreſſions and flowers of rhetorick be excluded, for there is nothing more hateful than the ſtyle of an oration in botanical characters. By means of the terms of art, we are enabled to expreſs our ideas in a few words. Let the character of the *genus linum*, in the florid ſtile of an oration, ſerve as an example to illuſtrate this aphoriſm.

The external green tegument or covering, which incloſes the flower before its expanſion, is, as it were, divided at the baſe into five equal parts, yet in ſuch a manner that each part is of a greater length than breadth, and is narrow at each extremity; the tops of the ſections ending in ſharp points. Theſe five parts have a perpendicular ſituation, and are very ſhort, compared to the leaves of the flower; neither do they fall off with the inner-coloured leaves of the flower, but remain till the fruit is ripe. Within theſe outward leaves there are alſo five other leaves,

leaves, which are tender, of a fine colour, oblong, ſpreading more and more in breadth as they aſcend, almoſt in the ſhape of a tunnel; they are alſo much larger than the external green leaves. Then within theſe five large coloured leaves of the flower there are five thread-like parts at the upper extremity, gradually tapering to a point. Theſe are almoſt perpendicular, and in length do not exceed the external leaves of the flower. On the top of each is faſtened a ſmall, ſimple, thickiſh ſubſtance, which opens at the baſe into two acute ſegments, and ſcatters a duſt. Having taken an accurate view of theſe parts, we next obſerve in the center of the flower a certain ſubſtance, which afterwards grows into the fruit, and about the time of flowering is almoſt ſhaped like a little ball, on the top of which are fixed five ſlender threads, of the ſame thickneſs throughout. They ſtand almoſt perpendicular, and are of the ſame length with the five thread-like parts deſcribed above, but theſe have no thickiſh heads on their tops, but are turned a little outward. When the time of flowering is over, the fruit grows dry, is almoſt globular, but marked with five obſcure angles, having at the top a ſharp point. If we cut this fruit tranſverſely, we ſhall ſee it internally divided into ten apartments,

and

and when it opens ſpontaneouſly, we ſhall find that it opens into five equal parts, within which are contained ten ſeeds nearly of an oval figure, but longer, and ſharp-pointed at one end, being alſo a little flat, and their ſurface ſmooth and poliſhed.

Now let us hear the character of the ſame *genus* in the comprehenſive language of a botaniſt.

The *calyx*, or empalement, conſiſts of five *leaves*, which are erect, lance-ſhaped, acute, ſmall, and permanent.

The *corolla* has five *petals*, tunnel-ſhaped; each being in form of a wedge, obtuſe, ſpreading, and large.

The *ſtamina* are five tapering erect *filaments*, of the ſame length with the *calyx*. There are five other withered alternate filaments. The *antheræ* are arrow-ſhaped.

The *piſtillum* has an egg-ſhaped *germen*; five *ſtyles*, erect, filiform, of the length of the *ſtamina*. The *ſtigmata* are ſimple and reflexed.

The *pericarpium*, or ſeed veſſel, is a roundiſh five-cornered *capſule*, with five valves, and ten cells.

The *ſeeds* are ſingle, egg-ſhaped, flattiſh, ſharp-pointed, and very ſmooth.

SECT. CC.

Only the pure and proper terms of art (81—85) are to be uſed; obſcure and erroneous terms are never to be admitted. Neither ſhould doubtful terms be uſed; for, as Ray obſerves, the marks of the *genera* ought to be clear, diſtinct, and exactly defined; not in obſcure and indetermined expreſſions, of which we are uncertain how far their meaning extends.

Here follows an explanation of ſome terms made uſe of by Linnæus in his generic characters.

Maſculus flos, a male flower, is the *ſterilis*, or barren flower, of Tournefort; the *paleaceus*, or chaffy flower, of Ray; the *abortivus*, abortive flower, of other writers.

Apetalus, without petals, is the *imperfectus*, imperfect flower of Rivinus; the *ſtamineus* of Ray; the *incompletus*, incomplete flower of Vaillant.

Petalodes, having petals, is the *perfectus*, perfect flower of Ray, &c.

Calyculatus, having a *calyx*, is the *completus*, compleat flower, of Vaillant.

Irregularis, irregular, is the *difformis*, difformed flower, of Jungius; and the *anomalus* of Tournefort.

Ringens, gaping flower, is the *labiatus*, lipped flower, of Tournefort; *barbatus*, bearded flower, of Rivinus; the *perſonatus*, maſked flower, of Tournefort.

Multifidus,

Multifidus, jagged, is the *laciniatus*, cut flower, of Tournefort; *monopetaloides*, of others.

Compofitus, compound, is the *conglobatus* of Pontedera; *aggregatus* of Knaut; and the *capitatus* of Ray.

Planipetalus, flat florets, is the *femiflofculofus*, half florets, of Tournefort; *lingulatus*, tongued florets, of Pontedera; *cichoreaceus*, fuccory flowers, of Vaillant.

Radiatus, radiated, is the *ftellatus*, ftarry flowers, of Morifon.

Difcus, difk, is the *umbo*, the fhield, of Morifon.

Anthera is the *apex*, fummit, of Ray; *capfula ftaminis* of Malpighi.

Receptaculum, receptacle, is the *fedes*, the feat, of Ray; *placenta*, after-birth, of Boerhaave; *thalamus*, the bed, of Vaillant.

Amentum, catkin, is the *julus*, *nucamentum*, *catulus*, of others.

Strobilus, is the *conus* of other botanifts.

Drupa, ftone-fruit, is the *prunus* and *fructus mollis officulo*, a pulpy fruit with a ftone, of Tournefort.

Gymnofpermus fructus, is the *femina nuda* of Rivinus.

Angiofpermus fructus, is *femina percarpio tecta*, fruit covered with a feed veffel, of Rivinus.

Claffis is the *ordo* of Tournefort; *genus fummum*, the higheft *genus* of Ray.

Ordo is the *ſectio* of Tournefort; *genus ſubalternum* of Ray.

Linnæus has enriched botany with many new terms; as *involucrum, ſpatha, corolla, anthera, pollen, germen, ſtigma, legumen, drupa, cyma, axillus, ſtipula, ſcapus, bractea, pedunculus, glandula.* Terms of art have deterred fooliſh and ignorant people from meddling with anatomy, mathematics, and chemiſtry; whereas the want of terms has well nigh demoliſhed the ſcience of medicine. Terms of art are very uſeful as they aſſiſt in juſt thinking, and expreſſing any thing in the moſt compendious manner, providing ſuch terms have true and adequate definitions.

SECT. CCII.

The characters ſhould be kept immutable and unchanged in all ſyſtems, though ever ſo different one from another. As long as the chief ſyſtematic botaniſts introduced new characters and new ideas of a *genus*, ſo long was botany expoſed to barbariſm in the time of Ray, Tournefort, Rivinus, Boerhaave, Knaut, and others. But now things being a little more ſettled, although ſeveral new methods have been introduced ſince their time, no detriment has enſued to botany from thence; as appears from the writings of Gronovius, Royen, Wackendorf, Gmelin, Guettard, Dalibard, &c.

SECT. CCIII.

A *genus* may consist of one species only, though for the most part the *genera* consist of several species. There are many *genera* that consist of one species only, as *parnassia, epimedium, linnæa, limosella, valisneria, theophrasta, cannabis, humulus, butomus, subularia, nepenthes, &c.*; and there are many *genera* that consist of a great number of species, as *sedum, convolvulus, saxifraga, antirrhinum, aster, carex, euphorbia, geranium, campanula, silene, hypericum, gnaphalium, salix, allium, potentilla, centaurea, aloe, gentiana, ranunculus, chenopodium, buphthalmum, lichen, &c.*

SECT. CCIV.

What has been said of the generic characters (164—202) holds true also of the classic; though this last allows of greater latitude in all respects.

SECT. CCV.

The classes are less natural than the *genera*, and the orders less than either. From the affinity of some *genera* to natural tribes or orders, we frequently incur the danger of throwing all into confuſion, by reducing to one *genus* a whole natural tribe or family. In ſome of the natural orders the *genera* have a very ſimilar appearance. Many *genera* of the mallow tribe, as the common mallow, *malva*, marſh mallow, *althæa*, hollyhock, *alcæa*, tree mallow, *lavatera*, Indian mallow, *urena*, and Syrian mallow, *hibiſcus*, are of this kind. The following *genera*, taken from three other natural orders, are very ſimilar in their appearance, and might, by an inaccurate obſerver, be confounded under three *genera* only.—1. The houſeleek, *ſempervivum*, leſſer houſeleek, *ſedum*, navel-wort, *cotyledon*, leſſer *orpine*, *craſſula*, roſe-wort, *rhodiola*, and ſmall annual houſeleek, *tillæa*. 2. The torch-thiſtle, *cactus*, fig marygold, *meſembryanthemum*, *aizoon*, and *tetragonia*. 3. The campion, *lychnis*, cockle, *agroſtemma*, viſcous campion, *ſilene*, carnation, *dianthus*, ſope-wort, *ſaponaria*, mouſe-ear chickweed, *ceraſtium*, ſpurrey, *ſpergula*, ſand-wort, *arenaria*, mountain chickweed, *mæhringia*, and *ſagina*. In this manner ſeveral natural orders might each be reduced to a ſingle *genus*; and thus the ſcience be as effectually deſtroyed by the enormous ſize of the *genera*, as formerly by the unneceſſary multiplication of their number. Thus, for example, the ſtarry plants, umbelliferous, podded, and verticillate

cillate plants, the *orchifes*, &c. might each be reduced to a fingle *genus*.

SECT. CCVI.

The more natural the claffes are (all other circumftances being alike), fo much the better and more excellent they are. Thofe plants that are of the fame natural order, tribe, or family, agree in habit, manner of growing, properties, virtues, and ufes. The three principal obftacles that have hitherto ftood in the way of the natural method, are, 1. A neglect of the habit of plants, particularly the foliation, ever fince the doctrine of the fructification has been cultivated. 2. The want of many foreign *genera* not yet difcovered. 3. An affinity of the known *genera* to two or more natural orders; *e. g.* the *juncus*, to the *calamaræ*, *gramina* and *coronariæ*, which are the third, fourth, and tenth of the natural orders; fee fect. 77. and fo in many others.

SECT. CCVII.

Claffes and orders which are too numerous, or too long, create great trouble and difficulty; *ex. g.* the *pentandria* and *fyngenefia*, where the *genera* are very difficult to diftinguifh.

SECT. CCVIII.

In every order, the *genera* which have the greateft affinity one to another, ought to be placed next one another. Thus, for example, in the *tetrandria monogynia*, there are plants of three natural orders, (one example or two of each will be ſufficient to illuſtrate our meaning); of the *aggregatæ*, which is the 48 natural order, *ſcabioſa*, *leucadendron*; of the *ſtellatæ*, which is the 47 natural order, *rubia*, *aſperula*; and of the *calycanthemæ*, which is the 17 natural order, *epilobium*, *ludwigia*; now *leucadendron* ſhould be placed firſt, and then all thoſe of the *aggregatæ*, to which order it belongs, ſhould follow; then *aſperula*, and all thoſe of the *ſtellatæ*; then *ludwigia*, and all thoſe of the *calycanthemæ*.

SECT. CCIX.

Adhering to the habit for a character of plants, and wholly laying aſide or neglecting that of the fructification, the only true principle of ſyſtematic arrangement, is ſo far from true ſcience, that I cannot help pronouncing it great folly. The great uſefulneſs of an accurate knowledge of the habit of plants has been already allowed, and ſufficiently inſiſted upon, in ſome of the foregoing ſections; but Linnæus will not allow it any place in determining the generic characters, which, according to him, ought to be derived from the fructification only. This being granted, botany (ſays Linnæus) depends on, is ſupported

or

or upheld by, fixed *genera*; the progreſs of which is as follows:

Tournefort, who firſt formed the generic characters according to the rules of art, conſtituted about 632 *genera*.

Plumier added to them 92 *genera*.

Boerhaave 16.

Petit 3. and the

Members of the royal academy at Paris 8.

Vaillant 26, and alſo began the reformation of botany.

The two Juſſieus 4.

Ruppius and Dillenius in Germany, 45; afterwards

Dillenius, when profeſſor at Oxford, added 16 new *genera*.

Pontedera, in Italy, 4.

Micheli, alſo in Italy, 21.

Buxbaum, a German, 1.

Amman, in Ruſſia, 5.

Houſton, in America, 15.

Haller, in Switzerland, 1.

Gmelin, in Siberia, 1.

Monti added one *genus*.

Linnæus examined all theſe *genera* according to the rules of art, reformed the characters, and, as it were, formed them all anew in his *Genera Plantarum*, firſt publiſhed in 1737, and ſeveral times ſince. He added beſides 261 *genera* of his own, viz.

viz. 69 *genera* of European, 69 *genera* of Afiatic, 73 *genera* of American, and 50 *genera* of African plants, making in all 1136 *genera*.

In the *Syftema Naturæ*, 12 Edit. there are 1288 *genera*, and 7783 fpecies of plants.

CHAP. VII.

NAMES of the GENERA, &c.

SECT. CCX.

AFTER a regular diftribution, the next part of practical botany is denomination, or naming the plants: for without names the knowledge of things is entirely loft. Here Linnæus obferves, that the names of the antient Greek and Roman writers are generally preferable to thofe of the moderns.

SECT. CCXI.

To give true and proper names to plants belongs to the genuine fyftematic botanifts, and to them only. For fuch only are able to diftinguifh the *genera*, and to know the names which were formerly in ufe. Many foolifh people have given the moft abfurd names

names to plants; as *Pater noſter* for *cyperus*, *bonus Henricus* for *chenopodium*, *noli me tangere* for *impatiens*, *morſus diaboli* for *ſcabioſa*, *filius ante patrem* for *tuſſilago*, *mater herbarum* for *artemiſia*, *ſurge et ambula* for *gentiana*, *fuga dæmonum* for *hypericum*, *oculus Chriſti* for *aſter*, *palma Chriſti* for *ricinus*, *ſpina Chriſti* for *rhamnus*, *calceus Mariæ* for *cypripedium*, *chlamys Mariæ* for *alchemilla*, *ſtragula Mariæ* for *gallium*, *labrum Veneris* for *dipſacus*, *umbilicus Veneris* for *cotyledon*, *calceus Veneris* for *cypripedium*, *pecten Veneris* for *ſcandix*, *barba Jovis* for *ſempervivum*.

SECT. CCXII.

All names uſed to expreſs vegetables are either thoſe of the claſſes, orders, *genera*, ſpecies, or varieties. Every plant ought to have both a generic and ſpecific name. But the name of the claſs and order ſhould never make a part of the name of any plant, but always be underſtood.

SECT. CCXIII.

All plants of the ſame *genus* ought to have the ſame generic name. The citron, orange, and lemon, are all of the ſame *genus*; yet Tournefort gives each of them a different generic name, viz. *citrus*, *aurantium*, and *limon*. The apple, the pear, and the quince, are all of the ſame *genus*; yet

yet Tournefort gives each of them a different generic name, viz. *malus*, *pyrus*, and *cydonia*; and thereby tranſgreſſes againſt this rule.

SECT. CCXIV.

On the contrary, all plants of a different *genus* ought to have a different generic name. Authors have greatly tranſgreſſed againſt this rule; for inſtance, they have given the name of *conſolida* to many different *genera*; thus they have called *ſymphytum*, *conſolida major*; *ajuga*, *conſolida media*; *brunella*, *conſolida minor*; *bellis*, *conſolida minima*; *tormentilla*, *conſolida rubra*; *ciſtus*, *conſolida aurea*; *delphinium*, *conſolida regalis*; *ſolidago*, *conſolida ſarracenica*; *comarum*, *conſolida paluſtris*. In like manner they have given the name of *trifolium* to many different *genera*; thus they have called *cytiſus*, *trifolium arboreſcens*; *oxalis*, *trifolium acetoſum*; *lotus*, *trifolium corniculatum*; *medicago*, *trifolium ſalcatum*; *hepatica*, *trifolium hepaticum*; *menyanthes*, *trifolium paluſtre*, &c.

SECT. CCXV.

The ſame *genus* ſhall have no more than one generic name. Contrary to this rule, authors have given to many plants two different names; as *aconitum cæruleum*, or *napellus*; *aconitum ſalutiferum*, or *anthora*.

SECT.

SECT. CCXVI.

All botaniſts ſhall call the ſame *genus* by one and the ſame generic name. In contradiction to this rule, we find the *aſclepias* of Tournefort called *vincetoxicum* by Hk., and *hirundinaria* by Ray; the *limoſella* of Pontedera called *plantaginella* by Dillenius, and *menyanthoides* by Vaillant; the *hottonia* of Boerhaave called *ſtratiotes* by Vaillant, and *myriophyllum* by Ray; the *rhadiola* of Dillenius called *linoides* by Ray, and *chamælinum* by Vaillant.

SECT. CCXVII.

One and the ſame generic name, uſed for the deſignation of two or more different *genera*, is to be excluded from all but one. Thus the *aconitum* of Tournefort is the generic name, and ſhould be retained; but the *aconitum* of Ray is an *helleborus*, and ſhould be rejected: ſo alſo the *aſclepias* of Tournefort is the generic name for the ſwallow-wort, and ſhould be retained; but the *aſclepias* of Hk. is the *ſtapelia*, another *genus*, and conſequently this name of *aſclepias* ſhould not be uſed for it.

SECT. CCXVIII.

He who conſtitutes a new *genus*, ought alſo to give it a name. For it is highly abſurd and ridiculous to ſay with Pluk.

methonicæ

methonicæ folio planta; or with others, to give a plant no other name or title but *anonymos*, that is to ſay, the plant without a name.

SECT. CCXIX.

The generic name ſhould be immutably fixed, before any ſpecific name is given; that is, before we give names to any of the ſpecies. For a ſpecific name without a generic, is like a clapper without a bell, or a peſtle without a mortar.

SECT. CCXX.

Primitive generic names ought not to be introduced into botany. Such are many of the barbarous Indian names.

SECT. CCXXI.

Generic names, conſiſting of two entire and diſtinct words, ought to be baniſhed from the ſcience of botany. Such are the *bella donna* of Tournefort, for *atropa*; *centaurium majus* of Tournefort, for *centaurea*; *criſta galli* of Dillenius, for *rhinanthus*; *corona ſolis*, for *helianthus*; *dens leonis*, for *leontodon*, &c.

SECT. CCXXII.

Generic names, compounded of two entire Latin words joined in one, are ſcarcely tolerable. Such compound words are moſt beautiful in the Greek language, but the Latin does not often admit ſuch, as *comaurea*, *chryſocoma.* Linnæus has admitted a few ſuch compound Latin words, as *roſmarinus*, *cornucopiæ*, *ſempervivum*, *ſanguiſorba*, but forbids the imitation of them in future.

SECT. CCXXIII.

Generic names conſiſting of a Greek and Latin word, or two words of different languages, are mongrels, and ought not to be employed or uſed. Such are, *e. g. morinda*, *cardamindum*, *ſapindus.*

SECT. CCXXIV.

Generic names compounded of two generic names, the one whole, and the other mutilate, as for example, *linagroſtis*, are unworthy of a place in botany, except they are both of Greek extraction, as *elæagnus.*

SECT. CCXXV.

A generic name having one or two ſyllables prefixed, in order to make it ſignify a quite different *genus* from what it did before, ought to be wholly excluded; as, for example, *bulbocaſtanum*, *chamænerium*, *chamæpithys*, &c.

SECT. CCXXVI.

Generic names ending in *oides* ought to be baniſhed from the ſcience of botany; ſuch as *agrimonoides*, *alyſſoides*, *cyperoides*, *nymphoides*, *pentaphylloides*, *rhamnoides*, *ricinoides*, *telephioides*, *tribuloides*, *&c.*

SECT. CCXXVII.

Generic names, made by the addition of one or more ſyllables at the end of other generic names, are very improper; ſuch as *napellus*, *myrtillus*, *lappula*, *lupinaſter*, *alſinaſtrum*, *rapiſtrum*, *limonium*, *fabaria*, *balſamita*, *camphorata*, *lapathum*, *erucago*, *ſaliunca*, *linophyllum*, *fagopyrum*, *morocarpus*, *cotylifolia*, *&c.*

SECT. CCXXVIII.

Generic names beginning or ending with the ſame ſound, occaſion great confuſion; as *alſine*, *alſinoides*, *alſinella*, *alſinaſtrum*, *alſinaſtroides*, *juncus*, *juncoides*, *juncago*, *ſcirpus*, *ſcirpoides*, *cyperus*, *cyperoides*, *lycogala*, *lycoperſicon*, *lycoperdon*, *lycopodium*, *nymphæa*, *nymphoides*, *micronymphæa*, *leuconymphæa*, *&c.*

SECT. CCXXIX.

Generic names, which are not of Greek or Latin extraction, are to be rejected; ſuch as *boviſta*, *beccabunga*, *brunella*, *percepier*,

pier, *orvala*, *ſarſaparilla*, *galega*, *ketmia*, *alhagi*, *ribes*, *doronicum*, *tenga*, *adhatoda*, *jabctapita*, *&c.* Yet Linnæus has admitted many barbarous names by forming them like to ſome Latin or Greek word; thus, *thea*, tea, from the Greek word ΘΕΑ: *coffea*, coffee, of the Arabians, from ΚΩΦΕΩ, *obmuteſco*; *muſa* of the Arabians, plantain tree (*Anton. Muſa*), the name of a Roman phyſician; with many others.

SECT. CCXXX.

Generic names of plants borrowed from the *nomenclatures* of zoologiſts, lithologiſts, or any other, if henceforth aſſumed by botaniſts, ought to be given up to their reſpective ſciences; ſuch as *elephas* for *rhinanthus*, *erinaceus* for *hydnum*, *lagopus* for *trifolium*, *meleagris* for *fritillaria*, *natrix* for *ononis*, *bugloſſum* for *anchuſa*, *ephemerum* for *commelina*, *locuſta* for *valeriana*, *balanus* for *nepenthes*, *granatum* for *punica*, *ſol* for *helianthus*, *china* for *cinchona*, *patientia* for *rumex*, *concordia* for *agrimonia*.

SECT. CCXXXI.

Generic names uſed in anatomy, pathology, therapeutics, or mechanics, ought to be exploded; ſuch as *auricula* for *primula*, *epiglottis* for *aſtragalus*, *umbilicus* for *cotyledon*, *paralyſis* for *primula*, *ſphacelus* for *ſalvia*, *ptarmica* for *achillea*, *cardiaca* for *leonurus*, *ferra* for *bifferrula*, *mufcipula* for *filene*, *corona* for *helianthus*, *folea equina* for *hippocrepis*.

SECT. CCXXXII.

A generic name, which is contrary to any fpecies of that *genus*, is a bad one; fuch as *cyanus luteus*, *convolvulus erectus*, *pilofella glabra*, *unifolium diphyllum*; blue bottle with a yellow flower, &c. the abfurdity of which is evident.

SECT. CCXXXIII.

Generic names, borrowed from the *nomenclatures* of the natural claffes and orders, ought to be laid afide; fuch as *fungus*, *alga*, *mufcus*, *filix*, *palma*, *lilium*, *planta*, *arbor*, *frutex*, *fuffrutex*, *herba*, *vegetabile*.

SECT. CCXXXIV.

Many of the modern diminutive generic names, formed of Latin words, though none of the beft, are neverthelefs tolerable; as *pulfatilla (pulfare*, to beat); from its flowers being beaten and toffed with the wind; *nigella (niger*, black), from the blacknefs of its feeds; *gratiola (gratia*, favour, efficacy), from its ufe in medicine; *mitreola (mitra*, a mitre), from the fhape of its fruit; *pyrola (pyrus*, a pear), from its pear-fhaped leaves; *phafeolus (phafelus*, a boat, or fmall fhip), from the hufk of the feeds refembling a fhip; *gladiolus (gladius*, a fword), a ſword), from its ſword-ſhaped leaves; *ſpinachia* (*ſpina*, a thorn), from its prickly fruit; *tuſſilago* (*tuſſis*, the cough), from its great efficacy in coughs; with about 70 more names of the ſame ſort, which Linnæus has retained.

SECT. CCXXXV.

Generic names, which are adjectives, are not ſo good as ſubſtantive nouns, and therefore none of the beſt; as *arenaria*, *convallaria*, *clavaria*, *capraria*, *cochlearia*, *eriophorum*, *echinophora*, *imperatoria*, *hepatica*, *ſcabioſa*, *angelica*, *impatiens*, *glorioſa*, *mirabilis*, *pedicularis*, *Parnaſſia*, *Smyrnium*, *Colchicum*, *Samolus*, *carica*, *&c.* with above 60 more of the ſame ſort; all which, however, are retained by Linnæus.

SECT. CCXXXVI.

Generic names ſhould not be abuſed, by giving them to ſaints, or men renowned in any other art or ſcience, in order to preſerve the memory, or court the favour, of ſuch; as for example, *herba S. Alberti*, for *arabis*; *Antonii*, for *epilobium*; *Benedicti*, for *geum*; *Chriſtophori*, for *actæa*; *Gerardi*, for *ægopodium*; *Georgii*, for *valeriana*; *Gulielmi*, for *agrimonia*; *Jacobi*, for *ſenecio*; *Johannis*, for *hypericum*; *Kunigundis*, for *eupatorium*; *Ladiſlai*, for *gentiana*; *Laurentii*, for *ſanicula*; *Pauli*, for *primula*;

 Petri,

Petri, for *parietaria*; *Philippi*, for *isatis*; *Quirini*, for *tussilago*; *Ruperti*, for *geranium*; *Simeonis*, for *malva*; *Stephani*, for *circæa*; *Valentini*, for *pæonia*; *Zachariæ*, for *centaurea*; *Barbaræ*, for *erysimum*; *Catharinæ*, for *impatiens*; *Claræ*, for *valeriana*; *Crucis*, for *nicotiana*; *Mariæ*, for *tanacetum*; *Othiliæ*, for *delphinium*; *Rosæ*, for *pæonia*; *Divines*, as *uvedalia*, for *osteospermum*; or *Great Men*, as *bonarota*, for *veronica*.

SECT. CCXXXVII.

The generic names borrowed from the fables of the poets, fabulous names of their heathen deities, or those consecrated to the memory of antient kings, or other great men, who have promoted the knowledge of botany, ought to be retained. The names common among the antient Greek and Roman poets are the following; viz. *Ambrosia*, *Nepenthes*, *Cornucopiæ*, *Protea*, *Actæa*, *Narcissus*, *Hyacinthus*, *Adonis*, *Crocus*, *Centaurea*, *Chironea*, *Achillea*, *Pæonia*, *Cerbera*, *Amaryllis*, *Phyllis*, *Circæa*, *Andromeda*, *Daphne*, *Canna*, *Syringa*, *Medeola*, *Smilax*, *Mentha*, *Myrsine*, *&c.* From the names of heathen deities the following *genera* are denominated; viz. *Asclepias*, from Æsculapius, the god of physic; *Mercurialis*, from Mercury, the messenger of the gods; *Hymenæa*, from Hymen, the god of marriage; *Serapias*, from Serapis, an Egyptian

Egyptian deity; *Satyrium*, from the Satyrs, or woodland deities; *Tagates*, the name of Jupiter's grandſon; *Nymphæa*, from the nymphs who preſided over waters; *Naias*, from the Naiads, or goddeſſes of rivers and fountains; *Nyſſa*, the name of a nymph; *Dryas*, from the Dryads, deities of woods and trees; *Atropa*, the name of one of the Furies, &c. From names of antient kings and queens; as, *Eupatorium*, from Eupator, king of Pontus; *Gentiana*, from a king of Illyria; *Lyſimachia*, from Lyſimachus, king of Sicily; *Telephium*, from a king of Myſia; *Teucrium*, from Teucer, king of Troy; *Pharnaceum*, from Pharnaces, king of Pontus; *Artemiſia*, the wife of Mauſolus ſo called; *Althæa*, wife of Oeneus ſo called; *Helenium*, from Helen, wife of Menelaus, &c. From the names of the improvers and patrons of botany; *Eugenia*, from prince Eugene; *Petrea*, from Lord Petre; *Sherardia*, from William Sherard, Eſq; *Cliffortia*, from Geo. Clifford, J. U. D. *Stewartia*, from the right hon. John Earl of Bute, &c.

SECT. CCXXXVIII.

Generic names, made to preſerve the memory of any excellent botaniſts, ought to be kept ſacred. For as this is the only and higheſt reward of their labour, it ought to be of ſacred eſtimation, and only diſpenſed to thoſe of great merit in this de-

 partment,

partment, that others may thereby be incited to cultivate and adorn the ſcience. Of ſuch generic names Linnæus has upwards of 200, but I ſhall only mention a few; as *Aldrovanda*, *Alpinia*, *Bauhinia*, *Boerhavia*, *Cæſalpinia*, *Cateſbæa*, *Dillenia*, *Dodonæa*, *Frankenia*, *Fuſchia*, *Gerardia*, *Hermannia*, *Houſtonia*, *Jungermannia*, *Kempſeria*, *Linnæa*, *Martynia*, *Moriſona*, *Ovieda*, *Parkinſonia*, *Raiana*, *Sherardia*, *Sibbaldia*, *Sloanea*, *Theophraſta*, *Tournefortia*, *Valiſneria*, *Waltheria*, *Ximenia*, *Zanichellia*, *Zinnia*, *&c.*

SECT. CCXXXIX.

Generic names in uſe, and not contrary to the foregoing rules, other circumſtances being equal, ſhould be retained. Now generic names are faulty, or contradict the rules before laid down, in three ſeveral reſpects; 1. In being contrary to the *genus*: ſee what has been ſaid above in ſect. 215, 216, 217. 2. In being ill-conſtructed, or badly formed: ſee ſect. 220—229. 3. In being given improperly: ſee ſect. 231, 232, 233. 236. There are many obſcure Latin and Greek names of plants, the origin or derivation of which is not known, or at beſt but dubious; and alſo ſeveral which are conſiderably altered from the original words, ariſing from the erroneous reading of the antient manuſcripts. All theſe, which

which are above 200, ought to be retained according to this aphorifm, as they are not contrary to the rules before laid down. I fhall mention a few examples of each fort; as *aloe*, *boraſſus*, *cactus*, *daucus*, *eryngium*, *fucus*, *geum*, *hibiſcus*, *iſatis*, *lichen*, *melica*, *nardus*, *oryza*, *peziza*, *rhamnus*, *ſinapis*, *taxus*, *vella*, *ulex*, *xyris*, *zea*.—*Acer*, *bellis*, *carex*, *ervum*, *ficus*, *geniſta*, *hedera*, *ilex*, *laurus*, *malva*, *opulus*, *panicum*, *quercus*, *roſa*, *ſambucus*, *ſilia*, *verbena*, *ulmus*, *ulva*.—*Agrimonia* for *argemonia*, *aquilegia* for *aquilina*, *betonica* for *vettonica*, *braſſica* for ΠΡΑΣΙΚΗ, *coriandrum* for *coriannum*, *diapenſia* for *diapenthes*, *euphraſia* for *euphroſyne*, *gomphrena* for *gromphena*, *P. lupulus* for *upulus*, *malope* for *malache*, *borrago* for *corago*, *betula* for *betulla*, *equiſetum* for *equiſelis*, *P. myrſine* for *myrſinum*, *P. melothria* for *melothron*, *P. phleum* for *phleos*, *P. ſpiræa* for *ſpiræon*, *P. &c.*

SECT. CCXL.

Generic names, which exhibit the effential character or habit of plants, are preferable to all others. The effential character can but feldom be expreffed in the names; as *helicteres*, the fcrew tree, from ἙΛΙΞ a fcrew, and fome others. 1. The habit indicates fome fimilitude or likenefs, by which the idea is excited in the mind, and from the idea the name is derived. Of this fort there are near 400 generic names. I fhall give a few examples to illuſtrate the meaning of this aphoriſm. 1. From the habit; as *glycyrrhiza*, literally, the ſweet root; *liriodendrum*, the lily tree; *hæmatoxylum*, red wood; *eriocaulon*, woolly ſtem; *hydrophyllum*, water leaf; *chryſocoma*, yellow top; *galanthus*, milk-white flower; *melanthium*, black flower; *xeranthemum*, dry flower; *trichoſtema*, capillary *ſtamina*; *dianthera*, double *antheræ*; *ceratocarpus*, horny fruit; *tetragonotheca*, quadrangular *capſule*; *lithoſpermum*, hard or ſtony ſeed; *melampyrum*, black grain; *chryſobalanos*, golden *drupa* or ſtone fruit; *echinops*, like a hedge-hog; *eriocephalus*, woolly head; *leontodon*, lion's-tooth; *cynogloſſum*, hound's-tongue; *melaſtoma*, black mouth; *buphthalmum*, ox eye; *myoſotis*, mouſe ear; *tragopogon*, goat's-beard; *anthoceros*, horned flower; *alopecurus*, fox-tail; *polygonum*, many joints; *ornithopus*, bird's-foot; *chryſoſplenium*, golden ſpleen; *bupleurum*, ox rib; *dioſma*, Jupiter's perfume. 2. From animals; as *tragacantha*, goat's-thorn; *geranium*, like a crane; *orchis*, a teſticle; *pteris*, winged. 3. From inſtruments or utenſils; as *lychnis*, a lanthorn; *othonna*, flaxy. 4. From the ſtructure; as *adoxa*, inglorious; *aizoon*, live for ever; *gnaphalium*, downy; *droſera*, like dew. 5. From the medicinal virtue; as *panax*, univerſal medicine; *poterium*, a cup; *oxalis*, ſour; *picris*, bitter. 6. From the ſoil, or place

place of growth; as *origanum*, mountain's joy; *hydrocharis*, delight of the water; *potamogeton*, near the river. 7. From various circumſtances; as *theobroma*, food of the gods; *cypripedium*, Venus's ſhoe; *ornithogalum*, bird's-milk; *anemone*, wind flower; *crategus*, ſtrong; *ſcandix*, ſhepherd's needle, &c.

SECT. CCXLI.

The Greek names of plants, made uſe of by the antients, are to be found in the writings of Hippocrates, Theophraſtus, and Dioſcorides, &c. and the Latin names in Pliny, the writers on huſbandry, and the poets.

Of the former ſort Linnæus has given us about 362, and of the latter 427. I ſhall give a few examples of each; as *acanthus*, *bromus*, *cannabis*, *Daphne*, *elymus*, *gentiana*, *Helenium*, *iſatis*, *lathyrus*, *mentha*, *Narciſſus*, *ononis*, *panax*, *rhamnus*, *Smyrnium*, *vella*, *xanthium*, *zea*.—*Acer*, *bellis*, *caltha*, *dactylos*, *ervum*, *ficus*, *geniſta*, *hedera*, *ilex*, *lilium*, *malva*, *nepeta*, *ophrys*, *panicum*, *quercus*, *rubia*, *ſalix*, *tilia*, *vaccinium*, *ulva*, *zoſter*.

SECT. CCXLII.

An antient generic name agrees beſt to an antient *genus*. This Linnæus has done, when the generic name conſiſted of two Latin words, by changing the name into one Greek word of the ſame import; as

Dens

Dens leonis into *leontodon*, *ferrum equinum* into *hippocrepis*; or by changing two words into one thus, *gramen parnaſſi* into *parnaſſia*, *lilium convallium* into *convallaria*; or by ſhortening the name when too long thus, inſtead of *calophyllodendron*, *calophyllum*, for *ſtaphylodendron*, *ſtaphylæa*, for *tetragonocarpus*, *tetragonia*, for *hydroceratophyllum*, he has put *ceratophyllum*, &c.

SECT. CCXLIII.

A generic name, that is worthy to be retained, ought not to be changed for any other, though more fit and proper. Thus *menyanthes*, on account of its woolly flower, might more properly be called *erianthus*, woolly flower, or *laſianthus*, hairy flower. But ſuch innovations ought by no means to take place, becauſe new names more fit might be every day invented without end.

SECT. CCXLIV.

New generic names ought not to be made, ſo long as there are any of the ſynonymous names that deſerve to be retained. When new *genera* are diſcovered, new names ought to be given them; but if an antient *genus* muſt be divided into two or more, it is proper not to coin new generic names, ſo long as there are any of the ſynonymous names belonging to any of the

ſpecies

ſpecies of that *genus*, worthy to be retained.

SECT. CCXLV.

The generic name of one *genus*, unleſs it be ſuperfluous, ought not to be tranſferred or given to another *genus*, though it would ſuit it better. For who at this time would change the names which have been long in uſe among the moderns, for thoſe of the antients, ſuppoſing we certainly knew what plants they gave ſuch names to, which is often not the caſe? Thus the *hyacinthus* of the antients is the *delphinium* of the moderns, and the *tribulus* of the antients is the *fagonia*, and the *opulus* of the antients is the *humulus*, of the moderns, &c.

SECT. CCXLVI.

If any *genus*, received according to the rules of nature and art, ought to be divided into two or more *genera*, then the original name ſhall be given to the moſt common and officinal plant. Thus, ſuppoſing the *genus cornus* were to be divided into three *genera*, viz. the *cornus mas* for one *genus*, the *cornus meſomora* for the ſecond, and the *cornus oſſea* for the third; the original generic name of *cornus* ſhould be given to the moſt common, which is the *cornus mas*.

SECT. CCXLVII.

Generic names are to be written in Roman and not Greek characters; as androſæmum not ΑΝΔΡΟΣΑΙΜΟΝ, &c.

SECT. CCXLVIII.

The termination and ſound of generic names ought to be made as eaſy as poſſible. There are ſome unuſual terminations, as *tetrahit*, *hedypnois*, *&c.* and ſome ill-ſounding words, as *caraxeron*, *&c.* which ſhould be wholly rejected.

SECT. CCXLIX.

Generic names that are too long, very difficult to pronounce, or diſagreeable in ſound, are to be rejected. Too long, as *kalophyllodendron* of Vaillant, which is the *calophyllum* of Linnæus; the *hydrophyllocarpodendron* of Boerhaave, which is the *protea* of Linnæus. Difficult to pronounce, as *acrochordodendros* of Plumier, *i. e. cephalanthus* of Linnæus; the *ſtachyarpogophora* of Vaillant, *i. e. achyranthes* of Linnæus. Diſagreeable ſound, as *galeobdolon* of Dillenius, *i. e. leonurus* of Linnæus, &c.

SECT. CCL.

To make uſe of terms of art in the room of generic names is very wrong, and highly improper, as *tuberoſa H.* for *polianthes*, *graminifolia*

minifolia R. for *ſubularia*, *ſpica H.* for *lavendula*, *&c.*

SECT. CCLI.

What has been ſaid of generic names holds true alſo of the names of claſſes and orders; each of which ought to have a name proper to itſelf, one and the ſame name always, not a primitive, foreign, mongrel, barbarous, nor equivocal word, not contrary to the claſs or order, not derived from any man's name, not too long a word, not difficult to pronounce, &c.

SECT. CCLII.

Names of claſſes and orders, taken from the virtues, root, herb, and habit, are bad, and very improper; as *cordialis*, *capillaris*, *bulboſæ*, *tuberoſæ*, *aſperifoliæ*, *ſucculentæ*, *verticillatæ*, *ſtellatæ*, *dorſiferæ*, *arbores*, *frutices*, *&c.*

SECT. CCLIII.

Names of claſſes and orders ſhould include the eſſential and characteriſtic mark of each reſpective claſs and order; as *papilionaceæ*, *T.* *cruciformes*, *T.* *ſyngeniſtæ*, *L.* *&c.*

SECT. CCLIV.

Names of claſſes and orders taken from the name of any plant, by which the antients meant a whole tribe, are excluded from the *genera*, and ought only to be uſed in the natural orders; as *palma*, *filix*, *&c.*

SECT. CCLV.

The names of claſſes and orders ſhould conſiſt of a ſingle word; as *campaniformes*, *monopetali*, *monandria*, *perſonati*, *tripetali*, *triandria*, &c.

CHAP. VIII.

Of Specific Differences.

SECT. CCLVI.

A Plant is ſaid to be compleatly named when it has got both the generic and ſpecific name. A young botaniſt ſhould know all the claſſes; a candidate ſhould be acquainted with all the *genera*; and a maſter in the ſcience ſhould know the greateſt part of the ſpecies: for the greater number of ſpecies he knows, ſo much the better botaniſt he is. And it is a certain truth, that all ſolid erudition and true natural knowledge depends upon knowing the ſpecies. Now the knowledge of a ſpecies conſiſts in ſome eſſential mark or character, by which alone it may be diſtinguiſhed from all other ſpecies of the ſame *genus*. Without the knowledge of the *genus* there is no certainty of the ſpecies. The ſpecific difference contains the marks wherein

wherein one ſpecies differs from others of the ſame *genus*. But the ſpecific name contains only the eſſential marks of the difference.

SECT. CCLVII.

The true or legitimate ſpecific name ought to diſtinguiſh a plant from all its congeners, *i. e.* from all the other ſpecies of the ſame *genus*; but for the trivial name there are not hitherto any fixed rules. This rule is the foundation of the ſpecific names; and if this foundation is neglected, all will be full of uncertainty. For all ſpecific names, which do not diſtinguiſh a plant from its congeners, are falſe; and all ſpecific names, which diſtinguiſh a plant from others beſides its congeners, are alſo falſe. It follows, therefore, that the ſpecific name is the eſſential difference. Trivial names, conſiſting of a ſingle word, taken from any remarkable circumſtance whatever, may, and ought, to be uſed, being very convenient on account of their brevity. Thus *pyrola*, with aſcending *ſtamina*, and a declining pointal, is the *pyrola irregularis*; *pyrola*, with the flowers in ſcattered cluſters, and the *ſtamina* and *piſtilla* upright, is the *pyrola halleriana*; *pyrola*, with cluſters on one ſide of the flowering ſtem only, is the *pyrola ſecunda*; *pyrola*, with

with flowers growing in an umbel, is the *pyrola umbellata*; *pyrola*, with a naked ſtem bearing only one flower, is the *pyrola uniflora*. But the conſideration of trivial names is no part of our intention here, being at preſent only to treat concerning ſpecific differences.

SECT. CCLVIII.

The ſpecific name ought to diſcover the plant to which it belongs at firſt ſight, ſince it contains the ſpecific difference inſcribed upon the plant itſelf. The names of the old botaniſts, and eſpecially of the moſt antient, were trivial, or rather trifling and inſignificant. The natural character of a ſpecies is the deſcription; but the eſſential character of a ſpecies is the difference. Linnæus was the firſt who began to form the eſſential ſpecific names, there being no ſpecific diſtinctions formed before his time worthy of notice. Many of the moſt excellent modern botaniſts have followed the ſame method, as Royen, Gronovius, Guettard, Dalibard, Haller, Gmelin, Burman, &c. Linnæus's ſpecific names have extracted the differences out of the deſcription, and out of the differences have inveſtigated the moſt ſelect eſſential character peculiar to each. All accidental marks, which do not exiſt in the plant itſelf, or

are

are not obvious to our ſenſes, ſuch as time, place, duration, uſe, ought to be wholly excluded from the ſpecific name. All ſpecific names alſo are erroneous, which are derived from the order of our ideas, or from ſuppoſition; as *tinus prior*, *tinus alter*, *tinus tertius*, *meum ſpurium*, *acorus verus*.

SECT. CCLIX.

The ſpecific name ought to be taken from ſuch parts of plants as are not ſubject to variation. Among former botaniſts the ſpecies were multiplied by reckoning up all the varieties as real ſpecies. This proceeded either from the fear of confounding different ſpecies, or from the want of eſſential differences or diſtinctions, or from the ignorance of the continued generation of the ſpecies (ſee ſect. 79. 132.), or from the obſcure knowledge of a diſtinct ſpecies, or from the contagious folly of floriſts, and a ſtudy of minute diſtinctions, &c. The colour, ſmell, taſte, roughneſs, criſpation, impletion, and monſtrous ſtructure of plants are very variable, ſeldom permanent. The patrons of varieties, who have adopted them in the room of real ſpecies, were principally ſome very late botaniſts, viz. Barrelier, Tournefort, Boerhaave, Pontedera, and Micheli. There is not any one thing which has done more diſcredit to botany than the introduction of the varieties, and thereby confounding the ſynonyms. Micheli has reckoned up no leſs than 16 varieties of the common Dutch clover, and deſcribed them as ſo many ſpecies.

SECT. CCLX.

Magnitude or largeneſs doth not properly diſtinguiſh the ſpecies one from another; for it varies according to the place, ſoil, climate, and quantity of nouriſhment, in the ſame manner as in animals. And if the magnitude is variable, and yet does not change the ſpecies, it cannot give to the ſpecific name any eſſential difference. Therefore all ſpecific names, taken from the largeneſs of the plant, leaves, or fructification, are erroneous; as *alſine altiſſima*, *nicotiana latifolia*, *magnolia flore ingenti*, &c.

SECT. CCLXI.

Comparative marks with other ſpecies of a different *genus*, are falſe diſtinctions. Former botaniſts pre-ſuppoſed beginners to have an empirical knowledge of moſt European plants, and therefore their writings were rather proper for the peruſal of expert botaniſts; but Linnæus's whole endeavours are to teach the principles of the

art

art ſcientifically to the ignorant. According to the rules of art, a plant ſhould be mutually known from its ſpecific name, and the name from the plant, and both from their proper character, written in the former, and delineated in the latter; any other character beſides cannot be admitted. For names pre-ſuppoſing the knowledge of other plants have led men round in a circle; as for example, *Jacobæa hieracii folio, hieracium blattariæ folio, blattaria verbaſci folio, verbaſcum conyzæ folio, conyza ſalviæ folio, ſalvia hormini folio, horminum betonicæ folio, betonica ſcrophulariæ folio, ſcrophularia meliſſæ folio, meliſſa plantaginis folio, plantago coronopi folio, coronopus ſenecionis folio, ſenecio Jacobææ folio.* All ſpecific names, which include a ſimilitude or likeneſs to the leaf, flower, or habit of any other plant, Linnæus pronounces falſe and erroneous; as for inſtance, *Jacobæa betonicæ folio, adonis buphthalmi flore, clinopodium origani facie, adonis helleboroides, braſſica aſparagoides, cirſium hellebori nigri radice.*

SECT. CCLXII.

Comparative marks with other ſpecies of the ſame *genus* are not good, or proper diſtinctive marks. A ſpecific name cannot be made true and permanent, unleſs all the ſpecies of the ſame *genus* are preſent, ſince it muſt contain that mark or character which is not to be found in any other of the ſpecies of the ſame *genus*; it therefore belongs to a maſter in the ſcience to make a ſpecific name, and to the learner to know a plant from ſuch a name. Now a learner cannot collect the ſpecies; but ſhould endeavour to know one after another, ſince they neither grow together, nor exiſt together. Therefore all ſpecific names are erroneous, which ſuppoſe another ſpecies of the ſame *genus* known; as *orchis flore candidiſſimo*, *campanula anguſtifolia*, *magno flore*, *minor*. *Campanula*, *flore minore*, *ramoſior*.

SECT. CCLXIII.

The name of the firſt finder or diſcoverer, or of any other perſon whatſoever, ſhould never be admitted into the ſpecific difference. Names are, as it were, the hands of plants, of which the generic is the right, and the ſpecific name the left hand; they may be compared to thoſe who will give no credit nor truſt to any thing but what they ſee; let *thoſe* therefore be preſented to a botaniſt, which are incapable of deceiving him. For we hold all ſuch ſpecific names to be erroneous, which are formed from the name of the firſt diſcoverer or deſcriber, or from ſomething in the hiſtory of the plant, or given

given as a memorial of any one; *e. g. trifolium Gaſtonium, conyza tertia Dioſcoridis, conyza media Matthioli, campanula a Carolo Toſſano miſſa, amanita divi Georgii.*

SECT. CCLXIV.

The place of growth does not diſtinguiſh the ſpecies. The place of growth ought not to make a part of the ſpecific name, for the following reaſons. 1. No one would readily go to Japan, the Cape of Good Hope, or Peru, in order to know a plant. 2. The place of growth is often changed; and all the Alpine plants, and thoſe that grow on very high mountains, out of the Alps become marſhy plants. 3. The ſame ſpecies has not one place of growth only; for Lapland, Siberia, Canada, Aſia, America, often produce the ſame ſpecies. 4. A botanic garden, well furniſhed, often contains plants from all parts of the globe. 5. Who would not endeavour to know or find out a plant that was given him, without knowing the place of growth? 6. Botaniſts love to know the ſpecies in a *hortus ſiccus*; phyſicians and apothecaries, in the ſhops. 7. The place of growth is only relative to us, and our knowledge here in Europe. So that a place of growth (which every plant muſt have) is accidental, and very changeable; and therefore ought not to make a part of the ſpecific name. For all ſuch names are falſe and erroneous diſtinctions, whether taken from the ſoil, country, frequency or ſcarcity of plants; as *valeriana ſylveſtris, paluſtris, campana, montana, Alpina, cochlearia Anglica, pulmonaria Gallica, aſter Atticus, œnanthe rara, hydrocotyle vulgaris, muſcus vulgatiſſimus.*

SECT. CCLXV.

The time of flowering of plants, and their ſpringing out of the ground, are moſt fallacious diſtinctions. Time is accidental with reſpect to a plant, for it exiſteth not in a plant, but rather a plant exiſteth in time; the times of plants are no conſtituent parts, and are very liable to change. Pluquenet and his cotemporaries introduced from both the Indies an amazing number of plants, which were not properly defined either as to the *genera* or ſpecies, for which reaſon I cannot ſay whether this tended more to the advantage or diſadvantage of botany. A houſe built upon a bad foundation ſhould be pulled down, and rebuilt on a ſure and ſolid one; whatever is ſerviceable of the old materials ſhould be uſed, and the reſt rejected; though the work ſhould be ſlow in coming to a concluſion: ſo alſo ſhould it be with regard to ſpecific names, that botany may at laſt be eſta-

bliſhed

bliſhed upon a firm foundation. All ſpecific names therefore, taken from the time, whether the year, month, day, or hour, are falſe and erroneous; as *tulipa præcox, tulipa ſerotina, crocus vernus, geranium æſtivale, crocus autumnalis, aconitum hyemale, roſa omnium calendarum, viola Martia, roſa Maialis, boletus Julii menſis, boletus Auguſti menſis, lychnis noctiflora, althæa horaria.*

SECT. CCLXVI.

The colour, which varies amazingly in the ſame ſpecies, can be of no ſervice in ſpecific diſtinctions. The inconſtancy of colour may be plainly ſeen in our domeſtic animals. Nothing is more mutable and inconſtant than the colour in flowers; the red and blue flowers, of all others, moſt readily and frequently change into white. The flowers of Marvel of Peru and ſweet Williams, have the *corolla* of different colours even in the ſame plant. The colour wonderfully attracts and delights the eye; the moſt noble and penetrating of our ſenſes. Botaniſts therefore, through great careleſsneſs and indolence, were eaſily attracted by colours, but there is no dependance on them. Hence the labours of floriſts took their riſe, to the great diſgrace and diſcredit of botany. For none ever ran to ſuch extravagant lengths as they have done; witneſs

witneſs in the tulip, *anemone*, *ranunculus*, *hyacinth*, *polyanthus*, &c. Tournefort, who joined the floriſts, ſaw, as it were, through a multiplying glaſs 63 ſpecies of *hyacinth* in one, and 93 ſpecies of tulip in one, more than there really were. All ſpecific names therefore, taken from the colour of the flower, fruit, ſeeds, root, plant, leaves, or any imaginary quality, are falſe and erroneous. Leaves are ſaid to be coloured when they aſſume any other colour than green. Theſe vary exceedingly, and often loſe that ſtrange colour, which in ſome is variegated with white ſpots; as in the ſow-bread, creeping *ranunculus*, Dutch clover; in others, with black ſpots, as in the cuckow-pint, ivy-leafed *ranunculus*, and ſome *orchiſes*; in ſome, with red ſpots, as the *amaranthus tricolor*; in ſome, chequered, as in Venus's ſlipper, and ſome of the *ſatyriums*; in ſome, dotted on the underſide of the leaf, as in *pimpernel*, and ſea plantain; in ſome, with a white line, as in the ſtriped Canary graſs, and *empetrum* on the underſide of the leaf; in ſome, with a white margin, as in the holly and box, &c. But to return: we will now give a few examples of ſuch erroneous ſpecific names as are taken from the colour, 1. of the flower; as *primula veris flore luteo*, *rubro*, *albo*, *ferrugineo*; *auricula urſi flore coccineo*, *purpureo*, *violaceo*, *variegato*.

gato. 2. Of the fruit, as *melo fructu luteo, cucumis fructu albo, pepo fructu variegato; prunus fructu atro-cæruleo, flavo, cerei coloris*. 3. Of the feeds, as *papaver femine albo, nigro, finapi femine rufo, luteo*. 4. Of the root, as *daucus radice atro-rubente, aurantii coloris, lutea*. 5. Of the plant, as *braffica viridis, rubra, alba; marubium album, nigrum, hyofcyamus niger, martagon cruentum*. 6. Of the leaves, as *agriiolium foliis ex luteo variegatis, &c. ocymum maculatum*. 7. Or from any imaginary quality, as *alypum f. frutex terribilis, campanula pulchra, filix faxatilis elegantiffima*.

SECT. CCLXVII.

The fmell can never clearly diftinguifh the fpecies. The fmell is, of all other qualities, the moft variable; different in different fubjects. As many individuals, fo many different fmells, even in the fame fpecies fometimes. This appears from dogs finding out their mafters in a croud. Smells admit of no determined limits, nor can they be defined; and therefore all fpecific names are defervedly exploded as erroneous, which admit of fmell as a mark of diftinction; *e. g. hypericum hircinum, melo mofchatus, hefperis noctu olens, caryophillus inodorus, ocymum citri, anifi, fœniculi, meliffæ, cinnamomi, rutæ odore, &c.*

SECT. CCLXVIII.

The taſte, which often varies in reſpect of the perſon who taſtes, ſhould wholly be excluded from ſpecific diſtinctions. At different times of life people judge differently of taſtes, which we alſo know are much altered by diverſity of ſoil and climate; and many plants, by nature ſour, auſtere, harſh, bitter, and diſagreeable, are rendered mild, ſweet, pleaſant, and wholſome by culture; witneſs the *cichoreum ſylveſtre*, *endive*, which is very bitter; *lactuca ſylveſtris*, narcotic and poiſonous garlick, which in Greece has not that ſtrong ſmell as with us; *apium paluſtre*, very diſagreeable, wild crab apple, extremely ſour: but culture has multiplied that and the pear into ſuch a number of varieties, that Boerhaave reckons 172 of the latter, and 200 of the former; each of which, on account of ſomething peculiar in their taſte, hath got a diſtinct proper name. All ſpecific names then, derived from the taſte, are ridiculous, and ought to be excluded from ſpecific diſtinctions; as *apium ingratius*, *dulce*, *lactuca opii ſucco viroſo*, *lactuca mitis*, *piſum cortice eduli*, *pyrus fructu ſaccharato ore deliqueſcente*.

SECT. CCLXIX.

The medicinal virtues and other uſes of plants afford vain and erroneous diſtinctions

tions to a botaniſt. For by this method of diſtinguiſhing the ſpecies, experiments muſt be tried in order to aſcertain their virtues, ſo that, in taſting the mancheneel, *e. g.* one would try the moſt dangerous experiment, and the ſlighteſt taſte of one ſpecies of *arum*, mentioned by Sir H. Sloane, inſtantly takes away the uſe of ſpeech. The medicinal plants, and their names, ſhould be placed among the ſynonyms. And phyſicians have no right to preſcribe names to botaniſts, ſeeing they themſelves do not recede from the uſe of their own officinal names. Are we, on their account, to make of the *turbith*, *ſcammony*, *mechoacan*, *cneorum*, *ſoldanella*, *&c.* ſo many diſtinct *genera*, contrary to the laws of nature, which has comprehended them all under one, viz. the *convolvulus*; or of one and the ſame *genus Punica* are we to make ſeveral *genera* of plants, viz. of the flowers one, under the name of *balauſtium*; another of the fruit, by the name of *granatum*; and a third of the peel, under the name of *malacorium?* Wherefore we pronounce all ſuch ſpecific names as the following to be falſe and erroneous, viz. *agrimonia officinarum*, *ſolanum lethale*, *aconitum ſalutiferum*, *geniſta ſcoparia*, *rubia tinctoria*, *dipſacus fullonum*, *menyanthes antiſcorbutica*, *rhamnus catharticus*, *ſolanum ſomniferum*, *piſum cortice eduli*, *Punica quæ malum granatum fert.*

SECT.

SECT. CCLXX.

The ſex can never in any caſe conſtitute different ſpecies. Here we underſtand males and females in the *diæcia* claſs, or in diſtinct individuals of the ſame ſpecies. Many authors have conſtituted diſtinct ſpecies of males and females, which differed in nothing but the ſex, and therefore ought not to be diſtinguiſhed into two ſeparate ſpecies; *e. g. urtica mas*, and *femina*, *humulus mas*, and *femina*, *cannabis mas*, and *femina*. Nay, the more antient botaniſts diſtinguiſhed many plants into males and females, where there were not diſtinct ſexes, but very different plants; as the male and female *anagallis*, *ariſtolochia*, *abrotanum*, *abies*, *amaranthus*, *balſamina*, *caltha*, *ciſtus*, *cornus*, *criſta galli*, *ferula*, *filix*, *mandragora*, *nicotiana*, *orchis*, *pæonia*, *pulegium*, *quercus*, *ſymphytum*, *tilia*, *veronica*.

SECT. CCLXXI.

Monſtrous flowers and plants all have their origin from ſimple and natural ones, and are therefore never to be taken for diſtinct ſpecies. Of multiplied, full, and proliferous flowers, all which are monſtrous productions, we have ſpoken under ſect. 119, 120, 121, 122, and alſo in ſect. 150. Theſe monſtrous productions are frequently owing to culture, and too much nouriſhment.

nouriſhment. No one ever reckoned monſters in the animal kingdom for diſtinct ſpecies; and for the ſame reaſon monſtrous plants ought not to be taken for diſtinct ſpecies. Let your large, multiplied, full, and proliferous flowers be baniſhed from botany, and an amazing number will thereby be cut off, which has long been a burden to the ſcience.

SECT. CCLXXII.

Pubeſcence, or the armature of plants, is a ridiculous diſtinction, ſince plants often loſe it by culture or change of place. The moſt fierce animals by culture are made ſurprizingly tame; and we alſo ſee the ſame thing in plants very common. Trees cultivated in gardens often loſe their ſpines, and inſtead of a ſour and harſh fruit, produce mild and agreeable fruit; witneſs the pear, citron, lemon, orange, medlar, gooſeberry, artichoke. Wild ſuccory or endive has rough leaves, with large ſinuſes and teeth, of a very bitter diſagreeable taſte; but the cultivated ſort has its leaves more entire, very ſmooth, and of a pleaſant taſte. Plants alſo very often loſe their roughneſs by age or change of place. The beech at firſt ſpringing up out of the ground is very rough, and ſoon after becomes ſmooth; the young plants of the

the *heliocarpus* have hairy leaves, but the full-grown, ſmooth ones; the *triumfetta* when young is downy, the old plants quite rough; the woodroof in the woods is hairy, in open places rough; the perennial arſmart growing in wet places is very ſmooth, in dry places rough; mother of thyme in open fields is ſmooth, on the ſandy ſea-beach rough; the devil's-bit in open places is ſmooth, in woods a little rough; buckthorn plantain in a moiſt ſoil has ſmooth whole leaves, in dry ſoil rough leaves with teeth; the martagon lily in the woods is rough, in gardens exceedingly ſmooth; the palmated lady's-mantle in open dry ſunny places is ſmooth and yellowiſh, in ſpongy and ſhady ground its leaves are green and hairy. A mild climate often renders plants more mild; and on the contrary, a ſevere cold climate renders them more harſh. We are not therefore to have recourſe to the roughneſs or ſpines of plants for a ſpecific character, unleſs we are obliged thereto by the greateſt neceſſity.

SECT. CCLXXIII.

Duration often reſpects the place of growth more than the plant, and therefore ſhould not be admitted into ſpecific diſtinctions. Warm countries, which enjoy perpetual

petual ſummer, produce plants which ſcarcely ſuffer any decay the whole year round; hence it is, that very many plants in thoſe countries are perennial and ſhrubby, which with us become annual; as the *tropæolum*, or Indian creſs, the beet, marjoram, and tree mallow, &c. Cold countries make perennial plants become annual; as the marvel of Peru, *Ricinus* or *palma Chriſti*, &c. From the duration of plants therefore no ſpecific difference ſhould be taken, unleſs it is manifeſtly unchangeable.

SECT. CCLXXIV.

A multiplication, or great increaſe of the parts of plants, often varies according to the place of growth, and is therefore no proper diſtinctive mark of the ſpecies. A creeping ſtem, by putting out roots at every joint, generally multiplies exceedingly. Plants are multiplied either by the ſoil, or in the root, ſtem, leaves, or fructification. A plant is ſaid to be frequent and common, which in a proper ſoil grows ſpontaneous and plentiful. A plant is called *cæſpitoſa*, which has a number of ſtems coming from one and the ſame root. This circumſtance is not conſtant, for ſuch a plant in a poor thin ſoil can hardly produce one ſtem; and on the contrary, a ſtem lopped off near the root

root in a plant which commonly produces but one, ſhall in that caſe put forth many ſtems. A plant is called *faſciata*, when ſeveral ſtems grow cloſe together in a bundle or packet, ſo as to appear like one. The ſame may be done by art, if ſeveral ſtems are forced to penetrate through a narrow hole or ſpace. This is frequently done in the *ranunculus*, beet, *aſparagus*, dame's-violet, pine, *celoſia*, or cock's-comb, goat's-beard, ſtinking May-weed, *amaranthus*. A plant is called *plicata*, when a tree or arm of a tree grows up with very ſmall twigs, interwoven, plaited, or matted like a magpye's neſt, which the vulgar think is the work of ſome demon. It is common in the birch of Norland, and in the hornbeam of Scania, and is often ſeen alſo in the pine. Curled leaves (ſect. 63. 83.) are thoſe whoſe circumferences are increaſed, ſo that their edges flow like waves. Bliſtered leaves are when the diſk is increaſed, ſo that the ſubſtance of the leaf on the upper ſide riſes like cones, hollow below; as in the baſil, and many of the ſages. That multiplied, full, and proliferous flowers, have their origin from ſimple ones, has been already explained, 119. 122. 150. and 271. Several plants are no more than varieties multiplied in ſome of their parts inſtead of real ſpecies; as *ophioglоſſum lingua bifida, plantago ſpica bifida.*

SECT.

SECT. CCLXXV.

The root often affords a true and real diftinction, but we muft not have recourfe to it till every other method has been tried in vain. If there is any other diftinguifhing mark, which is conftant and permanent, we are not to have recourfe to the root, for we are not often at liberty in gardens to take up plants by the root; in a *hortus ficcus* the root is not eafily preferved; and in frefh fpecimens, or plants growing, we feldom fee the root. The more eafily and readily plants can be diftinguifhed, fo much the better; but neceffity has no law. It is very difficult to diftinguifh the different fpecies of *fcilla* by the herb or grafs, but very eafy by the root or bulb, which is either coated, or folid, or fcaly. The different forts of *orchis* cannot rightly be diftinguifhed without having recourfe to the roots, which are either fibrous, roundifh, or tefticulated.

SECT. CCLXXVI.

The beft diftinctive marks are oftentimes taken from the trunk or ftalk. The ftalk or ftem in many plants affords fuch effential diftinctions or differences, that without it there is no certainty of the fpecies. The angular ftem diftinguifhes many plants, which are otherwife fcarcely diftin-

 guifhable.

guishable. The *hypericum hirsutum*, tutsan, or hairy St. John's-wort, *hypericum perforatum*, common St. John's-wort, and *hypericum quadrangulum*, St. Peter's-wort, are distinguished by the first having a round, the second a two-edged, and the third a quadrangular stem. The *convallaria polygonatum*, sweet smelling Solomon's seal, and *convallaria multiflora*, common Solomon's seal, by the first having a two-edged, and the second a round stem. The *pyrola rotundifolia*, common winter-green, and *pyrola minor*, lesser winter green, are distinguished from all the other species of *pyrola* by their naked three-cornered stem.

SECT. CCLXXVII.

The leaves furnish the most elegant and most natural specific distinctions. Nature is no where more various than in the leaves, the different sorts of which are exceedingly numerous, and ought to be carefully learned by every student of botany. The leaves recommend themselves to our notice, because they are most beautiful and shewy, have the greatest diversity of species, and most easily afford specific distinctions; hence Linnæus has taken very many of his specific distinctions from the leaves, as may be seen in his Sp. Pl. and Fl. Suec. &c. There are some species of leaves, which rarely occur, besides those mentioned in ſect. 83. chap. III. Theſe are the, 1. *Cucullatum*, or cowl-ſhaped leaf, whoſe edges cloſely meet at the baſe, but are expanded at the extremity. 2. The *glanduloſum*, or glandular leaf, which has ſmall glands, either on the back of the leaf, or on the margin. 3. The *aceroſum*, or chaffy leaf, which is like a pin, as in the cone-bearing plants, firs, &c. 4. The *radicatum*, or rooting leaf, which ſtrikes root from the ſubſtance of the leaf itſelf. 5. The *coadunata*, or conjoined leaves, which grow together at the baſe. 6. The *decuſſata*, or leaves croſſing one another, which run four different ways. 7. The *aſſurgentia*, or leaves riſing with a curve, or bending at the bottom, and ſtrait at the top. 8. The *obverſa*, or leaves turned upſide down, whoſe baſe is narrower than the tip.

SECT. CCLXXVIII.

The *fulcra*, or props, (viz. the *ſtipulæ*, *bracteæ*, or floral leaves, ſpines, prickles, tendrils, glands, hairs), and the *hybernacula*, or winter quarters, (viz. the bulbs and buds) commonly leave the beſt ſpecific diſtinctions. Without the aſſiſtance of thoſe marks it is ſcarce poſſible to diſtinguiſh the ſpecies of ſome *genera*. The prickles in the *rubus*, the ſpines in *prunus*, and the *bracteæ* in *fumaria*, and ſome others, are very remarkable. *Coma*, or tuft, conſiſts of *bracteæ* remarkably large at the extremity of the ſtem, as in the crown imperial, lavender, ſage. The glands in the *padus*, *urena*, *mimoſa*, *caſſia*, afford eſſential marks of diſtinction. The glandular ſerratures at the baſe of leaves, in *heliocarpus*, *ſalix*, *amygdalus*; the back of the leaves full of glands, in *padus*, *urena*, *paſſiflora*; the glandular prickles which ſeparate a fluid from the ſubſtance of the leaves, in the *bauhinia aculeata*, are all ſo many examples of diſtinctive marks afforded by the glands, without the knowledge of which the ſpecies cannot rightly be diſtinguiſhed in many *genera*, particularly *mimoſa*, *caſſia*, and ſome others. The almond can only be diſtinguiſhed from the peach by the glands in the ſerratures of the leaves. The ſpecies of *urena* cannot be determined till we have examined the glands of the leaves. The *convolvulus*, with a tubercle on the *calyx*, would be divided into ſeveral ſpecies by reaſon of the different figure of the leaves, did not the glands join them into one. The *monarda*, with glands on the *corolla*, is thereby clearly diſtinguiſhed from the other ſpecies of that *genus*. The *ſtipulæ* are of great conſequence in ſome large *genera*, where there is a doubt about the ſpecies. One ſpecies of *melianthus* has ſingle, and another double, *ſtipulæ*.

The

The *caſſia*, with kidney ſhaped bearded *ſtipulæ*, is by that mark clearly diſtinguiſhed from all the other ſpecies of that *genus*. The buds in the ſame *genus* are often widely different, as appears in *rhamnus*, where the buckthorn, *alaternus*, *paliurus*, and *frangula*, have very different buds. The ſpecies of *ſalix*, which are very numerous and intricate, may moſt eaſily and certainly be diſtinguiſhed by the buds and foliation. The bulbs are the beſt and almoſt the only diſtinctive marks of the *genus ſcilla*. The bulbs in the boſom of the leaves on the tooth-wort, lily, ſtar of Bethlehem, ſaxifrage, and biſtort, afford a moſt ſingular mark to determine the ſpecies.

SECT. CCLXXIX.

The mode of flowering (whether verticillate, corymbiferous, ſpiked, panicled, or axillary,) is a moſt real, certain, and true diſtinctive mark of the ſpecies. Infloreſcence is the mode or manner in which the flower-ſtalk produces the fructification, either as to the ſtructure, or place, or ſituation. In many *genera* this mode of flowering affords the moſt beautiful diſtinctions. Some of the *ſpiræas* have flowers doubly cluſtered, others corymbiferous, and others umbelliferous, that without knowing the mode of flowering there is no certainty of the ſpecies. A peduncle produces the flowers in various ways. It is ſaid to be flaccid, when it is ſo weak as to hang drooping down only by the weight of the flower; nodding, when bent at top, and the flower hangs a little to one ſide; as in the *bidens radiata*, *carduus nutans*, *ſcabioſa Alpina*, *helianthus annua*, *cnicus Sibiricus*. Flowers are called faſtigiate, when the partial flower-ſtalks are all of an equal height, and bear the fructifications in a bundle, as in the *dianthus* and *ſilene*. When the flowers ſtand remote from one another, the flower-ſtalks are ſaid to be ſpreading; and cloſe, when the contrary; flowers are conglomorate, when the branched flower-ſtalk bears the flowers without any order, very cloſe and compact. The reverſe of this, is a ſpreading panicle; a jointed flower-ſtalk, which has one joint, as in *oxalis*, *ſida*, *hibiſcus*; ſometimes two, and ſometimes three flower-ſtalks come out together at the ſame place, as in *capraria*, and one ſpecies of the *impatiens*. The flower-ſtalks in the *aira flexuoſa* are waved or bent in ſerpentine turns; ſometimes the flower-ſtalks remain on the plant after the fruit is fallen off, as in the *jambolifera*, *ochna*, *juſticia*; ſometimes the flower-ſtalks are thicker towards the flower than at the other extremity, as in *cotula*, *tragopogon*, and moſt of the nodding flowers.

SECT.

SECT. CCLXXX.

The parts of fructification (viz. the *calyx*, *corolla*, *ſtamina*, *piſtilla*, ſeed veſſel, and ſeeds) often afford the moſt conſtant and invariable ſpecific diſtinctions. For there are in the fructification more parts than in the whole plant beſides, and therefore more marks of diſtinction may be derived from thence. The marks of fructification are to be diſtinguiſhed into eſſential, natural, and ſpecific; which laſt only belongs to the ſpecies, and the two former to the *genera*. If you take away the flower, the gentians are not to be diſtinguiſhed, as appears by the obſervations of Haller; but the *corollas* being in ſome of them bell-ſhaped, wheel-ſhaped, tunnel-ſhaped; in others cut into four, five, or eight ſegments, afford very eaſy diſtinctions. St. John's-wort with three *ſtyles* is eaſy to be diſtinguiſhed from that with five. The African *geraniums* are to be ſeparated from the European by an irregular flower and *ſtamina* connected together. Here Linnæus gives definitions and explanations of ſeveral technical terms, which frequently occur in ſpecific diſtinctions derived from the fructification, and which had not been before explained in his chapter of the fructification.

In the *lichens*, a tubercle is that ſort of fructification which confifts of rough points or dots, like duft thrown together. A fhield *(fcutellum)* is an orbicular concave fructification, with the margin elevated quite round. A target *(pelta)* is a flat fructification, for the moft part glued to the margin of the leaf.

In moffes, the little head *(capitulum)* is the *anthera*.

In fungufes, the hat *(pileus)* is the round horizontal top, which bears the fructification underneath.

In graffes, the *fpicula* is the partial fpike, which former botanifts called *locufta*. The beard is called *tortilis*, when bent and twifted in the middle, as in oats. *Articulus* is that part of the ftem between two knots *(genicula)*.

A compound radiated flower confifts of a *difk* and *radius*. The *radius* of the irregular petals in the circumference. The *difk* of the fmaller and generally regular petals in the middle. A flower *doubly compounded* contains within a common *calyx* leffer *calyces* common to many flowers, as in the *fphæranthus*.

A *corolla* is *equal* when its parts are equal in figure, magnitude, and proportion. *Unequal*, where the parts do not correfpond in magnitude, but in proportion, fo that the flower becomes regular, as in *butomus*. A regu-

A regular *corolla* is equal in figure, magnitude, and proportion of parts. Irregular, is different either in the parts, figure, magnitude, or proportion. *Rictus*, is the gaping between the two lips of a flower. *Faux*, is the aperture of the tube of the *corolla*. *Palatum*, the hump or prominence in the aperture. *Calcar*, or ſpur, is the *nectarium*, a part of the *corolla* ſtretched out into a conical ſhape behind the flower. An urceolate *corolla* is inflated or blown up, and convex all round like a little bottle or pitcher. *Cyathiformis* is a *corolla*, ſhaped like a wine glaſs. *Connivens* is that ſort of *corolla*, the extremity of whoſe lobes converge or approach each other. *Lacera*, a torn *corolla*, which is cut into very ſmall parts.

Anthera verſatilis and *incumbens*, is that which is fixed on the ſide to the filament. *Anthera erecta* is fixed by the baſe.

A ſeed veſſel is called inflated, when hollow like a bladder, and not diſtended with ſeeds, as in the *fumaria cirrhoſa*. It is termed *priſmaticum*, when it is narrow, and conſiſts of ſeveral angles and plain ſides. *Turbinatum*, when ſhaped like a top, as in the pear. *Contortum*, when twiſted like a ſcrew, as in *ulmaria*, *helicteres*, and *thalictrum*. *Acinaciforme*, when the fruit is compreſſed like a knife, with one longitudinal angle ſharp,

ſharp, and the other blunt, as in *meſembryanthemum.* It is ſaid to have its ſeeds neſtling *(ſeminibus nidulantibus)*, when they are diſperſed without any order in the pulp of a berry. It is called *echinatum*, when every where armed with prickles or ſpines, like a hedge-hog. *Toroſum*, when protuberant on both ſides, with little knobs or prominences, as in *lycoperſicon*, *phytolacca.*

SECT. CCLXXXI.

It is abſurd to make uſe of the generic marks of the natural characters in ſpecific diſtinctions; as *ranunculus calycibus pentaphyllis, floribus pentapetalis, petalorum unguibus nectariferis.* For they can never diſtinguiſh the ſpecies, becauſe in every *genus* they agree through all the ſpecies, and conſequently cannot be marks of any ſpecific difference.

SECT. CCLXXXII.

All ſpecific diſtinctions muſt neceſſarily be taken from the number, figure, proportion, ſituation, and connection, of the various parts of plants.

We have already laid down the fallacious and true, or conſtant diſtinctive marks of the ſpecies. They are fallacious, when not ſufficient; when merely accidental; when variable; when derived from the magnitude of the plant; or comparative with

with other ſpecies of a different *genus*; or comparative with other ſpecies of the ſame *genus*; or taken from the name of the firſt finder, or any other perſon; or from the place of growth; time of flowering or ſpringing; colour; ſmell; taſte; medicinal virtues, and other uſes; the ſex; monſtrous flowers and plants; pubeſcence; duration; and, laſtly, from a multiplication, or great increaſe, of the parts of plants. The true, conſtant, and faithful marks are taken from the parts of a plant, as the root, ſtem, leaves, *fulcra*, or props, the mode of flowering, and the different parts of fructification, according to the number, figure, ſituation, connection, and proportion, as in the *genera*. Theſe are every where conſtant, both in the freſh plants, dried plants, and figures.

SECT. CCLXXXIII.

We ought always to be careful not to ſubſtitute a variety in the room of a ſpecies. This is a difficult point, and requires the greateſt care. The cauſe of our running into ſo many errors in this particular, is owing to nature's appearing in ſo many different forms; to the different and ſingular nature of countries and climates; to the places of growth being ſometimes very remote; and laſtly, to the ſhortneſs of human life.

life. Now that which promiſes certainty in diſtinguiſhing the ſpecies from the varieties, is to cultivate them in the moſt different and various ſoils; to examine attentively all the parts of a plant; to examine the fructification in all its parts, even the moſt minute; to inſpect the other ſpecies of the ſame *genus*; to attend to the conſtant laws of nature, which proceeds by ſlow degrees; to obſerve the remote modes of varieties; and, laſtly, to place the ſpecies under the next different *genus*.

SECT. CCLXXXIV.

The name of the *genus* muſt be prefixed to every one of the ſpecies. After the ſpecies are reduced to their *genera*, every one of them ſhould have the name of the *genus* prefixed to which they belong.

SECT. CCLXXXV.

The ſpecific name ought always to follow the name of the *genus*. Since without knowing the *genus*, there is no certainty, it neceſſarily follows, that the name of the *genus* ſhould begin the ſentence or ſpecific diſtinction, and this laſt immediately follow the generic name.

SECT. CCLXXXVI.

The ſpecific name without the generic is like a bell without a clapper. A ſpecific difference is only a diſtinction of the *genus* into two or more ſpecies, and therefore without the *genus* no difference can be conceived. Names are made by art, that we may be enabled by them ſcientifically to determine plants. Differences without a generic name are like animals without heads; as for example, *myagro affinis herba, capſulis ſubrotundis. J. B.*

SECT. CCLXXXVII.

The ſpecific name ſhould not be a part of the generic, by adding a ſyllable or two to the end, and thereby making a diminutive word; as *gentianella* inſtead of *gentiana parva*, or little gentian.

SECT. CCLXXXVIII.

The genuine ſpecific name is either ſynoptical or eſſential. The ſpecific names ſhould diſtinguiſh the ſpecies readily, ſurely, and eaſily. Every poſſible diſtinction of a ſpecies ſhould be collected, and from them the beſt ſhould be taken, that we may at laſt know the ſpecies with certainty. The mode of ſpecific names is either ſynoptical or eſſential, or a mixture of both.

SECT. CCLXXXIX.

The ſynoptical ſpecific name gives to plants of the ſame *genus* diſtinctive marks, branched into diviſions and ſubdiviſions. When the eſſential marks of the ſpecies cannot be traced, the ſynoptical ſpecific name is often made uſe of to diſtinguiſh them, and is therefore a *ſuccedaneum* to the eſſential name. In *genera*, where the ſpecies are very numerous, we are often obliged to give the ſpecific diſtinctions in a *ſynopſis*; thus, *ſalix foliis ſerratis glabris ovatis acutis ſubſeſſilibus*. Now the eſſential ſpecific character of the ſame plant is, *ſalix floſculis pentandris*; ſweet willow.

SECT. CCXC.

The eſſential ſpecific name gives one ſtriking diſtinctive mark peculiar only to that ſpecies to which it is applied. The eſſential ſpecific name conſiſts generally of one or two words, or one idea. After the *genera* are eſtabliſhed, and the ſpecies determined by their eſſential differences, we are got to the *ne plus ultra* of botany. For if botaniſts had once arrived ſo far, that they could determine every ſpecies by an eſſential name, they could proceed no farther towards perfection in the art. The excellency of a name conſiſts in its brevity, facility, and certainty. After the eſſential name

name is diſcovered, a *ſynopſis* ſhould not be admitted into the ſpecific difference. Botaniſts ought therefore to endeavour to find out the eſſential ſpecific names of as many ſpecies as poſſible, becauſe they are on all accounts the moſt excellent.

SECT. CCXCI.

The ſhorter the ſpecific name or difference is, it is ſo much the better, providing it be ſufficient to diſtinguiſh the ſpecies in queſtion from all other of the ſame *genus*. For it is folly to uſe a great many where few words are quite ſufficient. And we ſee that nature herſelf alſo is very compendious in all her operations. The number of words in a ſpecific difference ought not to exceed twelve; and in like manner, a generic name for the moſt part ſhould not exceed twelve letters.

SECT. CCXCII.

The ſpecific name ſhould admit no more words than are abſolutely neceſſary to diſtinguiſh the ſpecies from all other of the *genus*. There ought not to be one ſuperfluous word in a ſpecific difference. And that ſpecific diſtinction, which is expreſſed in the ſhorteſt way, and feweſt words, is the beſt.

SECT. CCXCIII.

No ſpecific name can be given, or is wanted, to a ſpecies, which is the only one of the *genus*. Therefore where no ſpecific difference is expreſſed, we are to ſuppoſe there is no other but that one ſpecies of the *genus* hitherto diſcovered.

SECT. CCXCIV.

He who diſcovers a new ſpecies, ſhould give it a ſpecific name, unleſs it be the only one of the *genus*. He ſhould not only give its ſpecific difference, but alſo increaſe, diminiſh, or alter thoſe of the other ſpecies of that *genus*, that all of them may be ſufficiently diſtinguiſhed for the future.

SECT. CCXCV.

The words made uſe of in a ſpecific name or difference ſhould not be compound ones, like the names of the *genera*, nor Greek, but only Latin; for the more ſimple, clear, and evident, ſo much the better.

SECT. CCXCVI.

The ſpecific name muſt not contain figures of rhetoric, much leſs ſhould it be erroneous, but faithfully deſcribe things as nature exhibits them. We ſhall give a few examples of ſuch erroneous ſpecific names

as

as are here meant; as *ſalicaria purpurea*, inſtead of *corollis purpureis*; *lupinus flore luteo*, inſtead of *floribus luteis*; *limon incomparabilis*, inſtead of *maximus*; *narciſſus calyce luteo*, inſtead of *nectario luteo*.

SECT. CCXCVII.

The ſpecific name ſhould not be a word either of the comparative or ſuperlative degree; for ſuch ſuppoſe the knowledge of another plant. And all ſpecific names, which have a compariſon to any thing without the plant, are erroneous; as *equiſetum lævius*. But the ſuperlative degree, applied to a part within the plant, is very proper, frequently uſed, and an excellent ſpecific mark; as *lobelia pedunculis breviſſimis, tubo corolla longiſſima*.

SECT. CCXCVIII.

The ſpecific name ſhould always be in poſitive, not negative, terms. For negatives expreſs nothing, or only inform us what is not, but not what is. When we have poſitive, we ſhould never make uſe of negative, terms; and thus proper words will be always ready at hand to expreſs oppoſite meanings; as *rotundatum* and *angulatum*, *obtuſum* and *acutum*, *ſerratum* and *integerrimum*, *tomentoſum* and *glabrum*, *petiolatum* and *ſeſſile*, *ariſtatus* and *muticus*, *re-*

moti and *conferti*, *herbaceus* and *fruticoſus*. The moſt tedious deſcription of a plant in negative terms conveys not the leaſt idea of it to any one; therefore all ſuch ſpecific names are erroneous; as *lyſimachia non papposa*, inſtead of *ſeminibus nudis*; *hippuris non aſpera*, inſtead of *glabra*; *bidens folio non diſſecto, i. e. integro*; *phalangium non ramoſum*, inſtead of *caule ſimplici*, *lychnis petalis non bifidis*, inſtead of *integris*.

SECT. CCXCIX.

Every ſimilitude uſed in a ſpecific name ſhould be common and obvious to all, though even theſe ſhould be uſed but ſparingly. Similitude expreſſes that in one word, which otherwiſe would require a long deſcription to demonſtrate it; but we are to obſerve, that every ſimilitude is lame, and therefore it is diſgracing of botany to uſe any obſcure ſimilitude, or which is not clear and obvious to the loweſt capacity. And indeed no other ſimilitudes ſhould be uſed but ſuch as are taken from the external parts of the human body; as the head, the ear, the hand, foot, &c. Many obſcure ſimilitudes have been introduced by botaniſts; as *agaricus tubæ fallopianæ inſtar*, *orchis ſimiam referens*, *orchis cercopithecum referens*, *hemionitis foliis ſecuris Romanæ figura*, *&c.*

SECT.

SECT. CCC.

A ſpecific name ſhould admit no adjective without its correſponding ſubſtantive. And all ſpecific names are erroneous which admit adjectives without their correſponding ſubſtantives; as *milleſolium cornutum*, *i. e. foliis cornutis*; *nigella cornuta*, *i. e. capſula cornuta*; *lyſimachia corniculata*, *i. e. capſula corniculata*; *viola tricolor*, *i. e. corolla tricolore*; *myrtus criſtata*, viz. *foliis criſtatis*; *amaranthus criſtatus*, viz. *ſpica criſtata*; *gramen criſtatum*, *i. e. bracteis criſtatis.*

SECT. CCCI.

Every adjective in a ſpecific name ſhould follow its own ſubſtantive. As in the generic character, the part to be deſcribed is always firſt mentioned; ſo alſo in a ſpecific difference, the ſubſtantive, to which the adjective agrees or belongs, ſhould always be firſt mentioned, that the meaning may be very diſtinct; and leſt, by an error of the preſs in placing the points wrong, a quite different ſenſe ſhould be given to the words; as *corona ſolis parvo flore*, *tuberoſa radice*, inſtead of *corona ſolis flore parvo*, *radice tuberoſa.*

SECT. CCCII.

Adjectives uſed in a ſpecific name are to be taken from the ſelect terms of art (80—86), providing thoſe are ſufficient to exprefs the meaning. If botanifts could agree in the terms of art, and conftantly ufe the fame terms, the fcience would become very eafy. A paraphrafe fhould never be ufed, fo long as there are terms of art properly defined; *e. g. conyza humidis locis proveniens*, inftead of *paluftris*. Synonymous terms fhould be excluded, and one felect term conftantly ufed to exprefs the fame thing; as, *e. g.* inftead of *caryophyllus fupinus, caryophyllus procumbens, liguftrum foliis pictis, liguftrum foliis variegatis, hieracium radice fuccifa, hieracium radice præmorfa.*

SECT. CCCIII.

Conjunctive or disjunctive particles fhould never be ufed in a fpecific name. Conjunctive and disjunctive particles, fuch as, *et, atque, fimul, vel, five, feu,* fhould be excluded; and all fpecific diftinctions expreffed in the ablative cafe, without any prepofition. When any of the conjunctive or disjunctive particles are wanted, they fhould be added in the end of the following word, as *carduus foliis lanceolatis ciliatis integris laciniatifque.*

SECT. CCCIV.

Diftinctive points fhould be placed after the parts of plants in a fpecific name, and not after the adjectives. Thefe points are

(,) (;)

(,) (;) (:) (.) by which, properly placed, a ſpecific difference becomes very clear. Linnæus uſes the *comma* to diſtinguiſh the parts, and the *colon* where there is a ſubdiviſion of a part, and the *punctum*, or full ſtop, at the end of the ſentence; thus, *bauhinia inermis, foliis cordatis ſemibifidis: laciniis acuminato-ovatis erecto-dehiſcentibus.*

SECT. CCCV.

A *parentheſis* ought never to be admitted into a ſpecific name. For a *parentheſis*, either expreſſed or underſtood, argues either an exception or want of order; thus, *ſinapiſtrum pentaphyllum, flore carneo, minus*; *androſemum maximum (quaſi fruteſcens) bacciferum*; *dens leonis qui piloſella folio minus villoſo.*

CHAP. IX.

VARIETIES.

SECT. CCCVI.

TO the generic and ſpecific names ſhould be added thoſe of the varieties, if there be any. Varieties are plants of the ſame ſpecies, which are changed by ſome accidental cauſe. The great uſefulneſs of many varieties in domeſtic œconomy, diet, and medicine, has made the knowledge of them neceſſary in common life; otherwiſe varieties belong not to botaniſts as ſuch, but ſo far as they ſhould take care that the ſpecies be not unneceſſarily multiplied or confounded. A botaniſt ſhould inſert, when it is neceſſary, ſuch varieties as are clear and evident, at the end of each ſpecific diſtinction to which they belong, on account of their common utility.

SECT. CCCVII.

The names of the *genera*, ſpecies, and varieties, ſhould be written in different characters, the firſt in Roman capitals, the next in the common Roman letters, and the laſt in Italics. The generic name ſhould always be in great letters or Roman capitals, the ſpecific in common or ſmall Roman letters, and the varieties in Italics; as CONVALLARIA ſcapo nudo; *corolla plena.*—CONVALLARIA ſcapo nudo; *corolla rubra.*

SECT. CCCVIII.

The ſexes of plants conſtitute the natural varieties; all other varieties beſide theſe are monſtrous. Plants of the *diœcia* claſs conſtitute one mode of varieties truly natural, diſtinguiſhed into males and females; to know which, and to add them to botanic differences, is very neceſſary. But we ſhould take care not to be miſled by the antient botaniſts; who, being ignorant of the fecundation of plants, took the males for females, and the females for males; as for example, their *mercurialis mas*, *cannabis mas*, and *lupulus mas*, are the female plants.

SECT. CCCIX.

The monſtrous varieties are the mutilate, multiplied, full, and proliferous flowers; as alſo luxuriant ſtems bundled, plaited or twiſted, and mutilate; luxuriant leaves curled, bladdery or bliſtered, in number, figure, proportion, ſituation, and connection of all the parts; and laſtly, theſe varieties often conſiſt in the difference of colour, ſmell, taſte, magnitude, time, and duration. The primary modes of varieties are here enumerated, viz. 1. The *corolla* is either mutilate, that is, wanting where it ought naturally to be. This often happens in *ipomæa*, *campanula*, *ruellia*, *viola*, *tuſſilago*, *cucubalus*. 2. The *corolla* multiplied, as in *campanula foliis urticæ*, *flore duplici* and *triplici*, *&c.* 3. The *corolla* full, as in *aquilegia flore roſeo*, *C. B.* where the impletion is by the petals multiplied, and all the *nectaria* excluded; *aquilegia flore multiplici*, *C. B.* where the impletion is by the *nectaria* being multiplied, and all the petals excluded. 4. The *corolla* proliferous, as in *ranunculus radice tuberoſa*, *flore pleno* and *prolifero*, *T.* where the proliSfication is from the center of the flower; *bellis hortenſis prolifera*, *C. B.* where the prolification is from the ſides of the flower. 5. Luxuriant ſtems are either bundled, that is, when ſeveral ſtems grow cloſe together in a bundle or packet, ſo as to appear like one. This is frequently effected by art, as in *ranunculus*, *aſparagus*, *&c.* See ſect. 274. Or, 6. Luxuriant ſtems are plaited or twiſted, as in birch and hornbeam, &c. See ſect. 274. Or, 7. Stems are mutilate or wanting in ſome plants, which ought naturally to have them. Of this Linnæus gives

gives no example. 8. Luxuriant leaves are either curled, as in *malva crifpa, J. B. lactuca crifpa, C. B. &c.* 9. Luxuriant leaves are ftudded or emboffed, as in *ocymum foliis bullatis, C. B.* 10. Varieties often confift in the difference of colour, 266. 11. Smell, 267. 12. Tafte, 268. 13. Magnitude, 260. 14. Time, 265. And, 15. Duration, 273. Of all which, various examples have been given in chap. VIII. from fect. 260 to 273.

SECT. CCCX.

The flighteft varieties are not worth the care of a true fyftematic botanift. The florifts, by an over-great ftudy and affiduous infpection, have difcovered fuch amazing wonders in flowers, as no man, the moft clear-fighted in the world, could ever difcern, but thofe who are verfed in this ftudy. The grand objects of their attention are the moft beautiful flowers, fuch as tulips, hyacinths, anemonies, ranunculufes, pinks, carnations, auriculas, and polyanthufes. To the hidden varieties of thefe flowers they have given fuch names as excite wonder and aftonifhment. Thefe men cultivate a fcience peculiar to themfelves, the myfteries of which are only known to the adepts; wherefore let no found botanift ever enter into their focieties. Their pompous

pous names are ſuch as the following: Phœbus, Apollo, Dædalus, Cupido, the Triumph of Flora, the Glory of Flora, the Splendor of Aſia, the Crown of Europe, the Pearl of Holland, Alexander the Great, Charles the XIIth, Julius Cæſar, Emperor Auguſtus, the Cham of Tartary, the Grand Signior, the Great Mogul, Scipio Africanus, Milton, Tullius Cicero, with 1000 other ridiculous appellations. The common gardeners alſo have given names, which are neither explained by them, nor capable of explanation, to their almoſt endleſs variety of fruits, apples, pears, and ſtone-fruit, &c. But the order of *fungi*, to the diſgrace of the art, remains to this day a heap of confuſion, botaniſts not knowing in them which is a ſpecies, or which is a variety.

SECT. CCCXI.

The luxuriance of leaves in oppoſition and compoſition very eaſily happens. The curled and bliſtered leaves are all monſtrous. Oppoſite leaves in pairs often become ſtarry or whorled, conſiſting of three or four leaves ſurrounding the ſtem in rings, and in that caſe a quadrangular ſtem becomes a many-angled one; as *lyſimachia lutea major foliis ternis, quaternis, quinis, T.*; *anagallis cærulea foliis binis terniſve ex adverſo naſcentibus,*

naſcentibus, R.; *anagallis Phœnicia fol. amplioribus ex adverſo quaternis, T.*; *ſalicaria trifolia caule hexagono, T.* Fingered leaves often add one or two ſegments to their uſual number, as *trifolium quadrifolium hortenſe album, C. B.* Plants with curled leaves are all monſtrous varieties, in the ſame manner as multiplied *corollæ* in flowers; and therefore no plants furniſhed with ſuch leaves are natural, but have their origin from waved leaves preternaturally extended, as *apium ſ. petroſelinum criſpum, C. B. naſturtium hortenſe criſpum, C. B. malva criſpa, J. B. lactuca criſpa, C. B. cichorium criſpum, T. lapſana folio ampliſſimo criſpo, B. tanacetum foliis criſpis, B. matricaria criſpa, mentha criſpa danica,* Park. The ſmell in tanſy, mint, baſil, and feverfew, is increaſed with the curled leaves, which is a ſingular circumſtance. Bladdery or bliſtered leaves take their riſe moſtly from wrinkled ones, having the ſubſtance of the leaves increaſed and multiplied, and conſequently greatly elevated on the upper ſide, as *ocymum foliis bullatis, C. B. lactuca capitata foliis magis rugoſis, B.* The *ſaponaria concava anglica* has a ſingular emboſſed leaf without the wrinkles, for the margins are contracted, and the leaves become hollow like a ſpoon. Small cut leaves ſometimes take their riſe from broad ones,

ones, but this ſort of variety is not very common; as *braſſica anguſto apii folio, B. ſambucus laciniato folio, ſonchus aſper laciniatus, valeriana ſylveſtris foliis tenuiſſimè diviſis.*

SECT. CCCXII.

It is generally ſuperfluous to reckon morbid plants, or even the ages of plants, among the varieties. There are different morbid plants mentioned by botaniſts, according to their different diſeaſes. *Eripylle* of Theophraſtus is a white mould, with ſmall brown ſeſſile heads, which is ſpread over the leaves of plants. This is common in the hops, *lamium purpureum, galeopſis retrahit, lithoſpermum arvenſe, acer platanoïdes. Rubigo* is a powder like the ruſt of iron on the under ſide of leaves. It is to be ſeen in *alchemilla vulgaris, rubus ſaxatilis, ſenecio ſylvaticus*, and ſome others. *Clavus* is that diſeaſe where the ſeeds are prolonged into a black horny appearance; as in rye, ſome of the graſſes, and *carexes. Uſtilago* is that diſeaſe by which the flowers and ſeeds of ſeveral plants are reduced into a black powder. Examples of this may be ſeen in wheat, barley, rye, oats, marſh *ſcorzonera*, goats-beard, &c. Inſects laying their eggs on ſeveral plants give riſe to various excreſcences; as the galls of oak, thoſe of *ciſtus*, aſpen tree, ſeveral of the willows,

willows, elm, lime, ground-ivy, and *hieracium myophorum*; thoſe of the *ſalvia baccifera*, called ſage apples, the pulp of which is of a ſweet and very agreeable taſte; and laſtly, thoſe of the ſcarlet oak, called *kermes*, or ſcarlet paſte. Of the ſame nature are thoſe ſubſtances on the briar called *bedeguar*, covered with green, red, or yellow fibres; and likewiſe the ſmall bladders on the ſurface of elm leaves and black poplar; the contorſions of ſome of the *veronicas*, *ceraſtiums*, and *lotus*; the ſcaly appearance of the fir and roſe willow. Inſects often cauſe an impletion and prolification of flowers, as we ſee the corn feverfew becomes proliferous by means of certain ſmall inſects; and the *carduus criſpus*, or thiſtle upon thiſtle, by the ſame means bears large full florets, or rather proliferous and leafy, the *piſtilla* or pointals growing up into leaves.

SECT. CCCXIII.

The colour is very ſubject to vary, eſpecially from blue or red to white. The principal colours enumerated by botaniſts are the following: water colour, *hyalinus, aqueus, vitreus*; white, *albus, lacteus, niveus*; lead colour, *cinereus, incanus, lividus, plumbeus*; black, *niger, pullus*; brown, *fuſcus*, jet black, *ater*; yellow, *luteus*; ſtraw coloured,

loured, *flavus*, *ſulphureus*; flame coloured, *fulvus*, *croceus*, *flammeus*; iron coloured, *gilvus*, *teſtaceus*, *ferrugineus*; red, *ruber*, *ſanguineus*; fleſh coloured, *incarnatus*; ſcarlet, *coccineus*, *puniceus*; purple, *purpureus*, *Phœniceus*; violet coloured, *cæruleo-purpureus*, *violaceus*; blue, *cæruleus*; green, *viridis*, *praſinus*. The various colours of plants are moſtly appropriated to particular parts; thus, black is common in the roots and ſeeds, rarely in the ſeed veſſel, ſcarce ever in the *corolla*; green, in the leaves and *calyx*, very rarely in the *corolla*; water colour common in the filaments and ſtyles; yellow in the *antheræ*, and alſo in the petals of autumnal flowers, and the ſemifloſculous flowers of Tournefort; white is common in the petals of ſpring flowers, ſweet berries and roots; red, in the petals of ſummer flowers, and in acid fruits; blue and violet, common in the petals. The colours of flowers are often changed; red into white, in the flowers of ling, mother of thyme, betony, pink, viſcous campion, cockle, trefoil, *orchis*, fox-glove, *carduus*, ſaw-wort, cudweed, roſe, poppy, fumitory, and *geranium*; blue into white, in *campanula*, Greek valerian, *convolvulus*, *hepatica*, colombines, violet, vetch, goats-rue, milk-wort, viper's-bugloſs, alkanet, comfrey, borrage, hyſſop, ſcabious, blue bottle,

tle, fuccory; yellow is changeable into white in melilot, agrimony, mullein, tulip, moth mullein, *alcea*, *cyanus Turcicus*, and corn marygold; white is changed into purple in wood forrel, thorn apple, peafe, and daify; blue into yellow in *commelina* and *crocus*; red into blue in pimpernel. Several different changes of colours happen in the petals of fome plants; as in colombines the blue is liable to change into red, and alfo into white; in milk-wort, *hepatica*, and blue bottle, the fame; in marvel of Peru, and primrofe, red into yellow and white; in touch-me-not, tulip, and lady's-finger, yellow into red and white; in wall-flower, yellow into blue and white. The fame mutability is obfervable in other parts of plants. Berries change from green to red, and from red to white; and in ripe fruit, whether red, white, or blue, the colour is fubject to vary, efpecially in apple, pear, plumb, and cherry trees. Seeds, though rarely, are fubject to vary; and fuch variations in colour are often feen in the feeds of poppies, oats, peafe, beans, and kidney beans. The root, though not very fubject to change, is found to vary in the common carrot and radifh. The leaves frequently become fpotted, as in arfmart, fome orchifes, ivy-leafed *ranunculus*, Alpine hawk-weed and lettuce; and thofe of *amaranthus*, or flower-gentle, change their green altogether, and aſſume another beautiful colour. The whole plant often aſſumes a colour which is unnatural or foreign to it, as may be ſeen in ſome ſpecies of *eryngo*, mug-wort, *orrach*, *amaranthus*, purſlane, and lettuce.

SECT. CCCXIV.

Aquatic plants commonly have their lower or bottom leaves; and mountain plants, on the contrary, their upper leaves, much cut or divided. Leaves of a different ſhape or figure are rarely ſeen on the ſame plant, yet it happens ſometimes, as in *euphorbia heterophylla*, *rudbeckia triloba*, *lepidium perfoliatum*, and *hibiſcus virginius*. Water plants have their lower leaves, which are under water, finely cut; as in water crowfoot, and ſome ſpecies of *ſiſymbrium*, *cicuta*, *ſium*, *phellandrium*, *œnanthe*. Mountainous plants, on the contrary, have their lower leaves moſtly entire, and the upper ones more cut; as in ſome ſpecies of ſaxifrage, parſley, aniſe, and coriander.

SECT. CCCXV.

A natural plant or ſpecies ſhould not be marked or diſtinguiſhed by a name oppoſed to the varieties. Since varieties are ſuperfluous in botany, this rule is ſtrictly to be obſerved,

obſerved, leſt diſtinctive marks ſhould be increaſed without end; for there is ſurely no occaſion to diſtinguiſh a natural plant from monſters.

SECT. CCCXVI.

Culture, from whence ſo many varieties have their origin, is alſo the beſt examiner of varieties. The ſuperabundance of nouriſhment occaſioned by culture, has produced your full flowers, ſweet, cooling, and agreeable ſummer fruits, delicate ſhoots, large and luxuriant herbs, and tender ſallads and pot herbs; all which, left to themſelves in a poor and meagre ſoil, do again aſſume their wild and natural habit. Thus the ſweeteſt grapes become ſour, the moſt agreeable apples become harſh and crabbed, the moſt grateful pear auſtere, the mildeſt and ſofteſt almonds bitter, the juicy and ſucculent peach hard and dry, the ſmootheſt lettuce prickly, the tender pulpy aſparagus woody, the moſt delightful and beſt taſted cherries exceedingly ſour and diſagreeable; in fine, corn, and all farinaceous grain, herbage, and fruit of every kind, dwindle and become of no value without culture. The ſoil changes plants, and from thence varieties ariſe; and the ſoil being changed, they return to their original form. This is examplified in the *buxus* *arborefcens*, box-tree, and *buxus humilis*, dwarf-box, which, however different in appearance, yet are of the fame fpecies; as are alfo the *acanthus mollis* and *acanthus aculeatus*, the foft and prickly bear's-breech; the *cynara aculeata* and *cynara non aculeata*, the artichoke with and without fpines, &c.

SECT. CCCXVII.

To collect the different varieties under their refpective fpecies, is a tafk of no lefs merit, than to place all the fpecies under their refpective *genera*. The ftrenuous endeavours of the moderns, about the end of the laft century, to increafe the number of plants, far exceeded the conftancy of the antients in diftinctly laying down the fpecies; and, like a contagion, infected the fcience, by the introduction of varieties in the room of fpecies; while on account of the flighteft difference a new fpecies was made, to the great detriment of botany; and fo far did this method prevail, that varieties were turned into fpecies, and fpecies into *genera*. This erroneous method of proceeding was firft oppofed by Vaillant, then by Linnæus, afterwards by Juffieu, Haller, Royen, Gronovius, and feveral others; and their oppofition prevented the ruin of the fcience. Several varieties are eafily explained and reduced, by comparing the variable

riable marks of the variety with the natural plant; yet there are many varieties that require both knowledge and experience, *e. g.* that the *fumaria bulbofa radice cava* and *non cava*, *major* and *minor*, are of the fame fpecies, appears by their exceedingly minute *calyx*, by being of the fame *genus*, by the fcale of the bud, the ftructure of the leaves, the fituation of the branches, the place of the *bractea*, the *corolla*, the pod, the feeds, and *ftigma*; but the variation is in the *bractea* being divided, and the root more or lefs hollow. There are nine or ten varieties of the *valeriana locufta*, or lamb's lettuce, all which are very different in the fruit, and leaves, which are more or lefs cut; yet that they are all of the fame fpecies appears by the forked ftalk, the annual root, the ftructure of the leaves, *corolla*, and feed. There are fifteen or fixteen varieties of the *medicago polymorpha*, being fo many different forms of the fruit in diftinct varieties, yet the fame fpecies. To conclude, we may truly fay that a botanift, who will exercife himfelf in finding out the varieties, fhall never be able to come to the end of the various forms of fporting nature.

CHAP. X.

SYNONYMS.

SECT. CCCXVIII.

SYNONYMS are the different names given to the ſame plant by different botaniſts; and theſe are either of the *genera*, or ſpecies, or varieties. The moſt antient and original writers among the Greeks and Romans generally agreed in the names of plants, being content with generic names only. The commentators, on account of lame or no deſcriptions, and a want of figures, in the writings of the antient botaniſts, have applied their names, I mean the ſame identical names, to various plants. Thoſe who have given deſcriptions of plants, when a far greater number were diſcovered, have given them names alſo, according to every one's own particular fancy. C. Bauhine, in his *Pinax* publiſhed in 1622, a work which coſt him 40 years labour, has collected and joined together all the names of his predeceſſors, reducing them to 6000 ſpecies. Since his time, many curious botaniſts, by diligent ſearching, have diſcovered new plants in every part

part of the world, and have thereby augmented them to double their former number. The ſyſtematic botaniſts, at firſt diſagreeing greatly in the conſtruction of the *genera*, eſtabliſhed many falſe ones; which occaſioned very falſe names to be given to plants. While as yet there were no rules laid down for ſpecific diſtinctions, botaniſts gave ſuch differences or diſtinctions to the ſpecies, as were partly trivial, partly variable, and all of them fallacious. William Sherard, Eſq; a great botaniſt, laboured in the continuation of Bauhine's *Pinax*; and dying in the year 1728, left the work to Dillenius, who continued this work of Sherard to the year 1747, in which he died. Dr. Sibthorp, ſucceſſor of Dillenius, is now in poſſeſſion of this work in manuſcript, and continues to augment the ſame. Haller, in ſeveral works of his, has endeavoured to give a compleat liſt of all the ſynonymous names of the Swiſs plants. Such a compleat liſt of the ſynonyms is very neceſſary and uſeful to botaniſts; for, having found the author's name only for the plant in queſtion, we have along with it the names which all other botaniſts have given to the ſame plant, and by the references may turn to all the figures and deſcriptions of the ſame; and may from thence learn every particular hitherto known concerning the plant; and laſtly, the plurality of names given to one and the ſame will no longer give us the idea of different plants. The ſynonyms of the ſpecies chiefly belong to botaniſts; but thoſe of the varieties, which are often ſuperfluous, any one may add them who pleaſes, that the number of falſe ſpecies may be leſſened.

SECT. CCCXIX.

Among ſynonymous names the beſt ſhould take the lead, whether it be the ſelect name given by any other botaniſt, or the writer's own name for the plant. Among ſynonyms the author's ſhall ſtand firſt, whether it be properly his own, or borrowed from any other. The firſt then ſhall be the ſelect name of the ſpecies, and the beſt among all the ſynonyms. Therefore I think it is wrong for any author to place his own ſelect name of a plant the laſt among the ſynonyms, and alſo the true ſpecific differences after the falſe and fallacious ones; inſtances of which may be ſeen in Haller.

SECT. CCCXX.

The ſynonyms of the ſame ſpecies are to be joined all together. Botaniſts lay down their ſynonyms either by beginning with the moſt antient, and bringing them down

in

in the order of time, to the modern ones; or, by beginning with the modern generic names, and ending with the moſt antient, which Linnæus ſays is his moſt uſual way.

SECT. CCCXXI.

Each of the ſynonyms ſhould begin a new paragraph.

The ſynonyms are recited in the following different ways by different authors.

1. According to the *genera*, thus,

Parthenium foliis ovatis crenatis, Hort. Cliff. 442. *Gron. Virg.* 115. *Roy. Lugd.* 86.

Ptarmica Virginiana, foliis helenii, Moriſ. Blæſ. 297.

Ptarmica Virginiana, ſcabioſæ auſtriacæ foliis diſſectis, Pluk. Alm. 308. tab. 53. fig. 5. and tab. 219. fig. 1. &c.

2. By blanks beginning the line.

Parthenium foliis ovatis crenatis, &c.

Ptarmica Virginiana, foliis helenii, &c.

Scabioſæ auſtriacæ foliis diſſectis, Pluk. Alm. 308, *&c.*

3. In a continued ſeries without paragraphs.

Parthenium foliis ovatis crenatis, baſtard feverfew of Virg. *Hort. Cliff.* 442. *Gron. Virg.* 115. *Roy. Lugd.* 86. *Ptarmica Virginiana, foliis helenii, Moriſ. Blæſ.* 297. *Ptarmica Virginiana, ſcabioſæ auſtriacæ foliis diſſectis, Pl. Alm.* 308. t. 53. f. 5. &c.

4. By not repeating the generic name.

Parthenium foliis ovatis crenatis, Hort. Cliff. 442. *Gron. Virg.* 115. *Roy. Lugd.* 86. *Ptarmica Virginiana, foliis helenii, Morif. Blæf.* 297. *Virginiana, fcabiofæ auftriacæ foliis diffectis, Pluk. Alm.* 308. t. 53. f. 5. &c.

5. By an abbreviation with a *parenthefis.*

Parthenium foliis ovatis crenatis, Hort. Cliff. 442. *Gron. Virg.* 115. *Roy. Lugd.* 86. *Dracunculus latifolius (f. Ptarmica Virginiana (fcabiofæ auftriacæ foliis diffectis, Pluk. Alm.* 308. t. 53. f. 5. and t. 219. f. 1.) *folio helenii, Morif. Blæf.* 297.) hift. 3. p. 41, &c.

The firft method is the beft, and that which is always ufed by Linnæus.

SECT. CCCXXII.

After each fynonym the author, book, and page, are to be quoted. It will not be fufficient only to quote the author's name, fince one and the fame man has often been author of feveral different works; and there have been often two or more of the fame name, as *e.g.* two Gefners, two Bauhines, two Millers, &c. Neither is it fufficient to quote the work only without mentioning the author, fince many have been publifhed under the fame title by different authors; as, *e. g. Hort. Lugd.* by Vorftius, Pavius,

Pavius, Herman, Boerhaave, Royen; *Hort. Patavin.* by Cortusus, Guilandinus, Schenkius, Veslingius, Marcellus; *Flor. Parisian.* by Cornutus, Tournefort, Vaillant, Dalibardus, &c. Authors in quoting their own works commonly omit their own name, and only mention the name of the book, or sometimes only the initial letters of the same; as (Dill.) *Catal. Giss.* or *C. G. Hort. Eltham.* or *H. E. Histor. Musc.* or *H. M.* The name of the work should be comprehended in one word, and written with a small initial letter, the name of the author beginning with a capital letter. The page should be added in the last place, that the plant may be readily found.

SECT. CCCXXIII.

In a compleat enumeration of the synonyms, it is proper to mark the name of the first discoverer, if known, with an asterism.

SECT. CCCXXIV.

The vernacular names of different countries are either wholly to be excluded, or placed together at the end of the synonyms.

CHAP.

CHAP. XI.

HISTORY OF PLANTS.

SECT. CCCXXV.

THE hiſtory of plants ſhould contain their names, etymologies, claſſes, generic characters, ſpecific differences, varieties, ſynonyms, deſcriptions, figures, places, and culture; times, virtues, uſes, when, where, and by whom diſcovered, &c. From this aphoriſm we learn, that the hiſtory of plants ſhould contain every thing pertaining to them, ſuch as their names, ſigns, outward appearance, nature, and uſe. In a word, the hiſtory of plants ſhould comprehend,

1. The ſelect or choſen name of the *genus* to be treated of or deſcribed.

2. The etymology or derivation of the generic name, with the proper and literal ſenſe of the original.

3. The claſs and order to which this *genus* does belong, according to one or more ſelect ſyſtems. The *genera* to which this particular one has been referred by the different ſyſtematical writers.

4. The

4. The natural character of the *genus*, giving all the poſſible characteriſtics or diſtinguiſhing marks. The eſſential character, laying down the moſt peculiar mark of that *genus*. The artificial character, diſtinguiſhing the *genera* which are conjoined in that ſyſtem. The miſtakes of authors in their referring this to other *genera*, to be deduced from the natural character. The *genus* to which it naturally belongs. A confirmation of the ſelect name of the *genus*, and why the others are rejected.

5. Next ſhould follow the ſpecific differences or diſtinctions of each ſpecies in their order from others of the ſame *genus*.

6. Then all the principal varieties of each ſpecies that are to be found in authors, reduced to their proper place; that is, to the reſpective ſpecies to which they do belong.

7. Then all the ſynonymous names of the chief ſyſtematic writers, and all other authors antient or modern, under each plant. The Latin, Greek, Engliſh, French, Spaniſh, Italian, and German names, &c. with their meanings and derivations.

SECT. CCCXXVI.

8. Next ſhould follow a deſcription, which is the natural character of the whole plant, and ſhould deſcribe all its external parts;

parts; and that not in the common way, by barely defcribing the root, ftem, leaves, and fructification, but alfo particularly noticing the leaf and flower-ftalks, the *ftipulæ*, *bracteæ*, glands, hairs, buds, foliation, and the whole habit of the plant.

SECT. CCCXXVII.

And fuch a defcription fhould be delivered in the moft compendious, yet perfect, and compleat manner, couched only in terms of art, if thefe are fufficient, according to the number, figure, proportion, fituation, and connection of all the parts.

SECT. CCCXXVIII.

Again, a defcription of a plant fhould follow the order of its growth, beginning at the root, and fo proceeding to the ftem, footftalks, leaves, flowers, &c.

SECT. CCCXXIX.

A defcription fhould delineate the diftinct parts of plants in feparate paragraphs; the parts of the plant fhould be printed in Roman characters, and the defcription in Italics.

SECT. CCCXXX.

A defcription fhould not be too long, tedious, and prolix, nor too fhort and imperfect;

perfect; for the firſt includes many vain, ſuperfluous, and variable circumſtances; and the other excludes ſome ſingular marks, and eſſential, though ſmall, parts of a plant; as the *ſtipulæ*, *bracteæ*, glands, hairs, and ſuch like.

SECT. CCCXXXI.

In the deſcription of plants the meaſure of magnitude is moſt conveniently taken from the parts of the human body. In deſcribing the parts of plants, Tournefort introduced a meaſure laid down according to an accurate geometrical ſcale, which many of his followers have retained; ſo that the eſſence of the deſcription conſiſted in an accurate menſuration of the whole. But as every one converſant in botany very well knows that the parts of plants vary in nothing ſo much as in that of dimenſion, Linnæus very rarely admits any other meaſure than that ariſing from the reſpective length and breadth of the parts compared together. In caſes that require actual menſuration, he recommends, inſtead of Tournefort's artificial ſcale, the following natural ſcale of the human body, which is much more convenient, and not leſs accurate. This ſcale conſiſts of the following degrees. 1. A hair's breadth (*capillus*), which is the twelfth part of a line. 2. A line

line is the length of the crescent at the root of the nail of the finger (not thumb), measured from the skin towards the body of the nail, and is equal to the twelfth part of a Paris inch. 3. A nail *(unguis)* is the length of a finger nail, and equal to six lines, or half a Paris inch. 4. A thumb *(pollex)* is the diameter of the first joint of the thumb, and equal to an inch, Paris measure. 5. A palm *(palmus)* is the diameter or transverse breadth of four fingers extended, or the palm exclusive of the thumb, and equal to three Paris inches. 6. A span *(spithama)* is the distance between the extremity of the thumb and that of the fore finger, when extended, and equal to seven Paris inches. 7. A great span *(dodrans)* is the distance between the extremity of the thumb, and that of the little finger, when extended, and equal to nine Paris inches. 8. A foot *(pes)* is the measure from the bending of the elbow to the base of the thumb, and equal to twelve Paris inches. 9. A cubit *(cubitus)* measured from the bending of the elbow to the extremity of the middle finger, and is equal to seventeen inches. 10. An arm-length *(brachium)* from the arm-pit to the extremity of the middle finger, and is equal to twenty-four Paris inches, or two feet. 11. A fathom *(orgya)* the measure of the human

human ſtature; the diſtance between the extremities of the two middle fingers, when the arms are extended, equal, where greateſt, to ſix feet.

SECT. CCCXXXII.

9. Figures of plants ſhould be drawn of the natural ſize and ſituation. There ſhould be annexed accurate figures of all the plants, which ſhould repreſent them in their natural ſituation and magnitude The figures of the old botaniſts often repreſent the largeſt trees and ſmalleſt herbs of the ſame bigneſs; procumbent and creeping plants for the moſt part erect; which faults ought carefully to be avoided. In large plants, when their true magnitude cannot be repreſented in the figures, it is proper to exhibit a ſmall branch, and the whole plant in miniature adjoining thereto. Figures conſiſting only of the outlines, ſuch as thoſe of Fuſchius and Plumier, are moſt eaſily executed, and repreſent the plants exceedingly well. The wooden cuts, formerly ſo much in uſe, ſuch as thoſe of Rudbeckius, Matthiolus, Gerard, and others, were as good as copper-plates, and of much eaſier purchaſe; but are now entirely out of uſe, to the great detriment of botany. The knowledge of drawing, engraving, and botany, are neceſſary and requi-

requiſite in finiſhing good figures of plants; and as any of theſe accompliſhments are more or leſs wanting, ſo the figures will be more or leſs perfect. Hence it is, that botaniſts, who were well ſkilled in drawing and engraving, have left the moſt excellent figures, as Dillenius.

SECT. CCCXXXIII.

The beſt figures ſhould exhibit all the external parts of plants, even the ſmalleſt alſo of the fructification. For in the ſmalleſt parts, eſpecially thoſe of the fructification, there are the moſt numerous and excellent diſtinctions, by which to characterize the ſpecies. The hairs, glands, *ſtipulæ*, floral leaves, *ſtamina*, and pointals, which were neglected in the figures of the old botaniſts, ſhould never be omitted in a good figure.

SECT. CCCXXXIV.

10. The native places or ſtations of plants reſpect the country, climate, ſoil, and ſituation, nature of the ground, earth, and mould. The only true foundation of gardening, and the right cultivation of plants, depends on the knowledge of the native places of their production, from whence the rules and principles of the art ought to be derived. Miller's Gardener's

Dictionary lays down the particular culture of every plant; but this method of gardening through all the known ſpecies of plants would be too tedious, diffuſe, and burdenſome. From the natural place of their growth we know where to find the different ſpecies of plants for gardens, herbals of dried plants, medicinal and œconomic uſes. The country reſpects the kingdom, provinces, diſtricts; and, when the plants are very rare and ſcarce, the places of their growth ought to be moſt particularly mentioned. The climate reſpects the latitude, longitude, and altitude of the place, which laſt is its perpendicular height above the level of the ſea. Vaillant was the firſt who introduced the climates in deſcribing the native places of plants, and this he did with regard to the latitude only. But that the latitude alone is not ſufficient, and much leſs the longitude, appears from this; that places very remote from each other, but under the ſame latitude, produce plants very different. Rome in Italy, Pekin in China, and New York in America, are ſituated nearly under the ſame degree of North latitude; Rome being 41 : 51. Pekin 39 : 55. and New York 41 : 0. In like manner Paleſtine and Florida on the North, and the Cape of Good Hope and Chili on the South, are nearly under the ſame latitudes; but thoſe countries produce

 plants

plants very different from one another. It is much more proper to obſerve the altitude of the place in deſcribing the habitations of plants; thus the aquatic plants of India often agree with thoſe of Europe, as the hooded milfoil, the ſun-dew, the water-lily, the arrow-head, and *aldrovanda*. The Alpine plants of Lapland, Greenland, Siberia, Switzerland, Wales, Scotland, the Pyrenean mountains, Olympus, Ararat, and Brazil, are often the ſame, though growing in places ſo remote from each other. Suppoſe a meadow a little higher than the ſea, and full of ſuch plants as commonly grow in meadows, and the adjacent ground a little higher ſtill, and further from the ſea; this laſt will produce other plants very different from the meadow: examples of which may be ſeen every where. In deſcribing the habitations of plants, we ought always particularly to mention the ſoil, ſituation, nature of the ground, earth, mould, &c. in which they grow. This is very various, being either in the ſea, on the ſea ſhore, about fountains or ſprings, in rivers, or on the banks of rivers, in lakes, ditches, water-pits, ponds, pools, fens, marſhes, bogs; on the tops of very high mountains, and in thick foreſts on their ſides; on little hills, declivities, cliffs, rocks, ſtones, caverns, old high walls; groves, woods, hedges, and ſhady places; heaths, commons, fields, fallows, clofes, plowed lands, gardens, dunghills, rubbifh, meadows, paftures, loam, fand, gravel, clay, chalk or marl; or laftly, on the roots, trunks, and branches of trees or other plants. In this refpect plants may be arranged into fix general divifions, according to their places of growth above recited, viz. aquatic, Alpine, hilly, fhady, campaign, and parafitic plants, each of which contains feveral fubdivifions. We fhall give examples of each in their order.

1. In the fea, many of the *confervas*, fome *charas*, *ulvas* or lavers, all the *fucufes*, *zoftera marina*, grafs wrack; *potamageton marinum*, fea pondweed; *ruppia marina*, fea grafs. On the fea fhores, *hippophae rhamnoides*, fea buckthorn; *atriplex portulacoïdes*, fea purflane; *atriplex laciniata*, *haftata*, *ferrata*, *littoralis*, *pedunculata*, jagged fea *orrache*, wild *orrache*, indented fea *orrache*, grafs-leafed *orrache*, ftalked fea *orrache*; *fcirpus maritimus*, round-rooted baftard *cyperus*; *rumex maritimus*, golden dock; *after tripolium*, fea ftar-wort; *glaux maritima*, fea milk-wort, or black falt-wort; *eryngium maritimum*, fea holly; *arenaria peploïdes*, fea chickweed; *ftatice limonium*, fea lavender; *artemifia maritima*, fea wormwood; *plantago maritima*, fea plantain; *plantago coronopus*, buckfhorn plantain; *triglochin maritimus*, fea fpiked grafs; *crambe maritima*, fea colewort; *lotus*

maritimus, ſea lotus; *piſum marinum*, ſea peaſe; *liguſticum Scoticum*, Scottiſh ſea parſley; *ſalicornea Europæa*, marſh ſamphire; *ſalſola kali*, prickly glaſs-wort; *chenopodium maritimum & fruticoſum*, ſea blite and ſhrub ſtonecrop; *bunias cakile*, ſea rocket; *arenaria rubra marina*, ſea ſpurrey; *cochlearia Anglica & Danica*, Engliſh and Daniſh ſcurvy-graſs; with many others. In lakes, &c. *iſoëtes lacuſtris*, quill-wort; *ſparganium natans*, leaſt bur-reed; *nymphæa lutea & alba*, yellow and white water lily; *potamogeton natans*, *perfoliatum & lucens*, broad-leafed, perfoliate and long-leafed pondweed; *myriophyllum ſpicatum & verticillatum*, ſpiked and verticillated water milfoil; *ceratophyllum demerſum*, horned-leafed pondweed; *ſcirpus acicularis & lacuſtris*, leaſt upright club-ruſh and bull-ruſh; *typha latifolia & anguſtifolia*, great cats-tail, and narrow-leafed cats-tail; *arundo phragmites*, common reed graſs; *equiſetum fluviatile*, river horſe-tail; *lobelia dortmanna*, Cluſius's water gladiole; *ſubularia aquatica*, awl-wort; *limoſella aquatica*, baſtard plantain; *plantago uniflora*, graſs-leafed plantain, &c. In more ſhallow waters; *potamogeton criſpum & compreſſum*, greater water caltrops, ſmall branched pondweed with a flat ſtalk; *potamogeton pectinatum*, *gramineum*, *puſillum*, fennel-leafed, graſs-leafed, and ſmall graſs-leafed pondweed; *zanichellia paluſtris*, horned fruited

fruited pondweed; *callitriche verna & autumnalis*, vernal and autumnal ſtar-wort; *utricularia vulgaris & minor*, greater and leſſer hooded milfoil; *ſtratiotes aloïdes*, water ſoldier; *hydrocharis morſus*, frogs-bit; *ranunculus aquatilis*, various leafed water crowfoot; *ſagittaria ſagittifolia*, arrow-head; *butomus umbellatus*, flowering ruſh; *aliſma plantago aquatica & ranunculoïdes*, greater and leſſer water plantain; *hottonia paluſtris*, water violet; *hippuris vulgaris*, mare's-tail; *phellandrium aquaticum*, water hemlock; *œnanthe fiſtuloſa & crocata*, water and hemlock drop-wort; *cicuta viroſa*, long-leafed water hemlock; *ſium latifolium & nodiflorum*, great and creeping water parſnip; *ſiſon inundatum*, leaſt water-parſnip; *iris pſeudacorus*, yellow water flower-de-luce; *polygonum amphibium*, perennial arſmart; *fontinalis antipyretica*, greater water moſs; *acorus calamus*, ſweet flag; *menyanthes trifoliata*, water trefoil; *ranunculus lingua*, great ſpear-wort; *aira aquatica*, water hair-graſs; *poa aquatica*, reed meadow-graſs; *feſtuca fluitans*, flote feſcue graſs; *montia fontana*, water chickweed; *veronica beccabunga*, brooklime; *naſturtium aquaticum*, water creſſes; *pilularia globulifera*, pepper-graſs; *rumex aquaticus*, water dock; *phalaris arundinacea*, reed canary-graſs; *ſcirpus paluſtris*, club-ruſh; *othonna paluſtris*, marſh fleabane; *oſmunda regalis*, oſmund royal;

 lythrum

lythrum ſalicaria, purple ſpiked looſe-ſtrife; *lycopus Europæus*, water horehound; *ſenecio paludoſus*, bird's-tongue; *arundo calamagroſtis*, branched reed-graſs; *lyſimachia thyrſiflora & vulgaris*, tufted and yellow looſe-ſtrife; *eupatorium cannabinum*, hemp agrimony; *ſcutellaria galericulata*, hooded willow herb; *mentha aquatica*, water mint; *hydrocotyle vulgaris*, marſh penny-wort; *teucrium ſcordium*, water germander; *carex pſeudo-cyperus*, baſtard carex; *ſparganium erectum*, great bur-reed; *acroſticum thelypteris*, marſh fern; *ſiſymbrium amphibium*, water radiſh. In places that are overflown in the winter, ſuch plants as the following; *betula alnus*, the alder; *ſalix pentandra*, *fragilis*, *aurita*, *repens*, ſweet, crack, round-leafed, and creeping willow; *juncus articulatus & bulboſus*, jointed leafed and bulboſe ruſh; *triglochin paluſtre*, arrow-headed graſs; *ſanguiſorba officinalis*, burnet; *cornus Suecica*, dwarf honeyſuckle; *epilobium paluſtre*, marſh willow-herb; *veronica ſcutellata*, narrow-leafed water ſpeedwell; *alopecurus geniculatus*, flote fox-tail; *carex cæſpitoſa*, *acuta*, *&c.* turfy and brown carex; *caltha paluſtris*, marſh marygold; *ranunculus auricomus*, ſweet wood crowfoot; *gentiana pneumonanthe*, calathian violet; *equiſetum paluſtre*, marſh horſe-tail; *trifolium fragiferum*, ſtrawberry trefoil; *lathyrus paluſtris*, marſh chickling-vetch; *inula*

pulicaria,

pulicaria, ſmall fleabane; *linum rhodiola*, all ſeed, &c. In ſpungy and ſpouty ground; *viburnum opulus*, marſh elder; *myrica gale*, gale, or Dutch ſweet willow; *geum rivale*, water avens; *Parnaſſia paluſtris*, graſs of Parnaſſus; *ſpiræa ulmaria*, meadow ſweet; *comarum paluſtre*, purple marſh cinquefoil; *carex flava*, yellow carex, &c.; *angelica ſylveſtris*, wild *angelica*; *gallium paluſtre*, white lady's-bedſtraw; *nardus ſtricta*, mat-graſs; *pedicularis paluſtris*, marſh louſe-wort. In bogs and turfy ground; *ſphagnum paluſtre*, common bog-moſs; *ſplachnum ampullaceum*, common *ſplachnum*; *ſcirpus cæſpitoſus*, dwarf club-ruſh; *eriophorum polyſtachion*, cotton graſs; *carex pulicaris*, flea carex; *juncus effuſus*, common ſoft-ruſh; *erica tetralix*, croſs-leafed heath; *vaccinium oxycoccos*, cranberries, ſun-dew, butter-wort; *equiſetum limoſum*, ſmooth horſe-tail; *ophrys paludoſa*, the leaſt *orchis*. 2. On or near the tops of very high mountains, or growing in foreſts on the ſides of ſuch high mountains. Theſe are called Alpine plants; *betula nana*, dwarf birch; *ſalix herbacea*, herbaceous willow; *arbutus Alpina*, mountain ſtrawberry tree; *dryas octopetala*, mountain avens; *ſibbaldia procumbens*, baſtard cinquefoil; *alchemilla Alpina*, cinquefoil lady's-mantle; *rhodiola roſea*, roſe-wort; *ſaxifraga nivalis*, *oppoſitifolia*, *aizoïdes*, *cæſpitoſa*, mountain, mountain heath-

 like

like, yellow mountain, ſmall mountain ſengreen; *trollius Europæus*, globe flower; *rumex digynus*, round-leafed mountain ſorrel; *draba incana*, wreathen podded whitlow-graſs; *viola biflora & montana*, Welſh and yellow violet; *anthericum calyculatum*, Scottiſh aſphodel; *tuſſilago frigida*, mountain colts-foot; *ſonchus Alpinus*, mountain ſow-thiſtle. 3. In groves and woods grow the ſhady plants; as *fagus ſylveſtris*, beech tree; *fraxinus excelſior*, aſh tree; *corylus avellana*, hazle nut; *tilia Europæa*, lime tree; *acer platanoïdes*, greater maple; *rhamnus catharticus*, buckthorn; *prunus padus*, cluſter cherry; *euonymus Europæus*, ſpindle tree; *ribes Alpinum*, mountain currants; *daphne mezereon*, ſpurge olive; *rhamnus frangula*, blackberry-bearing alder; *roſa eglanteria*, ſweet briar; *rubus fruticoſus*, bramble; *milium effuſum*, millet-graſs; *circæa Alpina*, *lutetiana*, mountain and common enchanter's nightſhade; *ſanicula Europæa*, ſanicle; *galeopſis galeobdolon*, yellow nettle-hemp; *convallaria majalis*, May-lily; *ornithogalum luteum*, yellow ſtar of Bethlehem; *fumaria bulboſa*, bulboſe fumitory; *lathyrus latifolius*, broad-leafed peaſe everlaſting; *primula veris*, cowſlips; *paris quadrifolia*, herb paris; *campanula trachelium*, great throat-wort; *aſperula odorata*, wood-ro f, hart's-tongue; *melampyrum nemorum*, creſted cow-wheat; *pinus ſylveſtris & abies*, Scotch

Scotch and common fir; *taxus baccata*, yew tree; *juniperus*, common juniper; *berberis vulgaris*, barberry; *populus tremula*, trembling poplar; *betula alba*, birch tree; *vaccinium myrtillus*, black whorts; *pyrola*, winter-green, all the ſorts; *anemone nemoroſa*, wood *anemone*; *juncus piloſus*, common hairy wood-ruſh; *lycopodium clavatum*, common club-moſs; *annotinum*, Welſh club-moſs; *equiſetum ſylveſtre*, wood horſe-tail; *hyemale*, ſhave-graſs; *melampyrum ſylvaticum*, yellow cow-wheat; *gnaphalium ſylveſtre*, upright cudweed. 4. On heaths, commons, fields, fallows, &c. ſuch plants as *rubus cæſius*, dewberry buſh; *ononis ſpinoſa*, prickly reſt-harrow; *convolvulus arvenſis*, ſmall bindweed; *mentha arvenſis*, corn-mint; *papaver dubium*, long ſmooth-headed poppy; *piſum arvenſe*, common peaſe; *myagrum ſativum*, gold of pleaſure; *eryſimum cherianthoïdes*, treacle worm-ſeed; *lapſana communis*, nipple-wort; *ervum tetraſpermum*, ſmooth tare; *euphorbia helioſcopia*, wart-wort; *panicum crus galli*, looſe panic-graſs; *dianthus armeria*, Deptford pink; *avena fatua*, bearded wild oats; *lolium annuum*, annual darnel; *agreſtis ſpica venti*, ſilky bent-graſs; *bromus ſecalinus & arvenſis*, field and corn brome-graſs. In cloſes, plowed lands, gardens, dunghills, rubbiſh, &c.; *ægopodium podagraria*, herb-gerard; *leontodon taraxacum*, dandelion;

gallium

gallium aparine, goofe-grafs; *æthufa cynapium*, fool's-parfley; *fonchus oleraceus*, fowthiftle; *chenopodium polyfpermum, vulvaria, viride, hybridum*, round-leafed blite, ftinking *orrache*, green blite, maple-leafed blite; *thlafpi burfa paftoris*, fhepherd's purfe; *lamium purpureum*, red dead-nettle; *veronica agreftis*, germander fpeedwell; *geranium cicutaria*, hemlock-leafed cranefbill, and feveral others; *urtica urens*, common nettle; *euphorbia peplus*, petty fpurge; *amaranthus blitum*, leaft blite; *ulmus campeftris*, common elm; *fambucus nigra & ebulus*, common and dwarf elder; *marubium album*, white horehound; *nepeta cataria*, cat-mint; *artemifia abfynthium*, common wormwood; *plantago major*, great broad-leafed plantain; *bryonia alba*, white briony; *cynogloffum officinale*, hound's-tongue; *leonurus cardiaca*, mother-wort; *datura ftramonium*, thorn-apple; *hyofcyamus albus & niger*, black and white henbane; *hordeum murinum*, wall barley; *verbena officinalis*, vervain; *lamium album*, white dead-nettle; *veronica chamædrys*, wild germander; *refeda luteola*, weld; *malva fylveftris*, common mallow; *polygonum aviculare*, knot-grafs; *fenecio vulgaris*, common rag-wort; with many more. In meadows and paftures, &c. fuch plants as the following; *pyrus malus & communis*, apple and pear tree; *lolium perenne*, perennial darnel; *campanula rotundifolia & patula*, leffer leſſer round-leafed and field bell-flower; *hypericum quadrangulare*, St. Peter's-wort; *trifolium pratenſe*, meadow trefoil; *ſpiræa filipendula*, drop-wort; *lotus corniculata*, bird's-foot trefoil; *aira cæſpitoſa & caryophyllæa*, turfy and ſilver hair graſs; *cynoſurus criſtatus*, creſted hair-graſs; *poa pratenſis*, great meadow-graſs; *avena flaveſcens*, yellow oat-graſs; *carex panicea*, pink *carex*; *lychnis dioïca*, white and red campion; *phleum pratenſe*, meadow cats-tail; *alopecurus pratenſis*, meadow foxtail-graſs; *leontodon autumnale*, yellow devil's-bit; *linum catharticum*, purging flax; *tragapogon pratenſe*, yellow goat's-beard; *melampyrum pratenſe*, meadow cow-wheat. In ſandy ground; *ſalix arenaria*, ſand willow; *ſpartium ſcoparium*, common broom; *geniſta tinctoria*, dyer's weed; *liguſtrum vulgare*, privet; *elymus arenarius*, ſea lyme-graſs; *arundo arenaria*, ſea reed-graſs; *carex arenaria*, ſea *carex*; *dianthus arenaria*, ſtone-pink; *ſcleranthus perennis*, perennial knawel; *thymus ſerpillum*, mother of thyme; *antirrhinum linaria*, toadflax; *ſtatice armeria*, thrift; *aſtragulus arenarius*, purple mountain milk-wort; *feſtuca ovina*, ſheep's feſcue-graſs; *ceraſtium ſemidecandrum*, leaſt mouſe-ear chickweed; *filago montana*, leaſt cudweed; *arenaria purpurea*, purple-flowered ſpurrey; *bromus tectorum*, wall brome; *valeriana locuſta*, lamb's-lettuce; *myoſurus minimus*,

nimus, moufe-tail; *phleum arenarium*, fea canary-grafs; *aira canefcens & præcox*, grey and early hair-grafs. In clayey ground; *tuffilago farfara*, common coltsfoot; *anthyllis vulneraria*, lady's-finger; *potentilla reptans*, common cinquefoil; *plantago media*, hoary plantain; *cichoreum intybus*, wild fuccory; *inula dyfenterica*, middle fleabane. In chalky ground; *hippocrepis comofa*, tufted horfefhoe-vetch; *hedyfarum onobrychis*, faintfoin; *trifolium fcabrum*, oval-headed trefoil; *verbena officinalis*, vervain; *campanula glomerata*, leffer throat-wort; *refeda lutea*, bafe rocket; *cheiranthus luteus*, wall-flower. 5. On dry, fandy, and gravelly hills, fcorched with the fun, grow, *falix caprea*, common fallow; *prunus fpinofa*, floe tree; *crategus oxyacantha*, hawthorn; *rofa canina*, red flowered dog's-rofe; *medicago falcata*, yellow medick; *trifolium repens*, creeping trefoil; *alchemilla vulgaris*, lady's-mantle; *cucubalus behen*, white corn campion; *ranunculus bulbofus*, bulbofe crowfoot; *plantago lanceolata*, rib-wort plantain; *avena pratenfis*, meadow oat-grafs; *daucus carota*, bird's-neft; *gentiana campeftris*, vernal dwarf gentian; *trifolium agrarium*, hop trefoil; *holcus lanatus*, meadow foft-grafs. On the declivities, or dry floping fides, of little hills; *quercus robur*, oak; *crategus aria*, white beam tree; *forbus aucuparia*, mountain afh; *prunus domefticus*, garden plum;

plum; *lonicera periclymenum*, honeyſuckle; *roſa ſpinoſiſſima*, burnet roſe; *carpinus betulus*, hornbeam; *acer campeſtre*, common maple; *trifolium montanum*, mountain trefoil; *hypericum perforatum*, perforate St. John's-wort; *geranium ſanguineum*, bloody craneſbill; *anemone pulſatilla*, paſque flower; *ſaxifraga granulata*, white ſaxifrage; *polygala vulgaris*, milk-wort; *achillæa millefolium*, yarrow; *ophigloſſum vulgare*, adder's-tongue; *melampyrum criſtatum*, creſted cow-wheat. In rocky and ſtony places; *rubus idæus*, raſpberry buſh; *ſedum telephium, rupeſtre, reflexum, album & acre*, orpine, St. Vincent's rock ſtone-crop, yellow ſtone-crop, white flowered and wall ſtone-crop; *ſempervivum tectorium*, houſeleek; *polypodium vulgare*, common polypody; *aſplenium ruta muraria*, wall-rue; *acroſticum ſeptentrionale & ilvenſe*, forked and hairy fern; *convallaria polygonatum & multiflora*, ſweet ſmelling and common Solomon's ſeal; *geranium Robertianum*, herb Robert; *potentilla rupeſtris*, baſtard upright cinquefoil; *hypericum montanum*, mountain St. John's-wort; *rubus ſaxatilis*, ſtone bramble; *melica nutans*, melick-graſs; *poa compreſſa*, creeping *poa*; *ſilene nutans*, Nottingham catchfly; *aira flexuoſa*, mountain hair-graſs, 6. On the trunks, branches, and roots of trees and other plants; *viſcum album*, miſſeltoe; *cuſcuta Europæa*, dodder; *monotropa*

tropa hypopytis, bird's-neſt ſmelling like primroſe roots; *lathræa ſquamaria*, tooth-wort; *orobanche major*, broom-rape; beſides various moſſes, *lichens*, and *funguſes*. In loam, and the common black vegetable earth or mould (which is the principal food of plants), moſt plants will grow, as appears by gardens in which plants from various ſoils do thrive. From what has been ſaid it appears, that the nature of any ground or ſoil may be readily known from the bare inſpection of the plants that grow in the ſame. Thus, the *potentilla argentea*, tormentil cinquefoil, indicates clay under the ſurface; *melampyrum criſtatum*, creſted cow-wheat, grows only in hilly ground; *melampyrum arvenſe*, purple cow-wheat, in plowed land; *melampyrum nemorum*, wood cow-wheat, in groves or ſhady places; *melampyrum pratenſe*, meadow cow-wheat, in meadow or paſture ground; *melampyrum ſylvaticum*, yellow cow-wheat, in woods; *pedicularis ſylvatica*, common louſe-wort, in ſpungy or ſpouty ground; *aira cærulæa*, purple hair-graſs, in turfy ground.

SECT. CCCXXXV.

The time of the whole duration of plants, or the years of their age, the time of their germination, that is, their ſprouting or ſpringing out of the ground after ſowing, the time of their foliation, or leaf-

ing

ing, flowering, ſleeping, watching, fruiting, and ſhedding their leaves, plainly indicates the climate, or points out to us how one climate differs from another. And firſt of germination, which is the time that ſeeds require to ſpring out of the ground, or to put forth their ſeminal leaves after ſowing. And in this reſpect the ſeeds of plants differ amazingly, from one or two days to as many years. Thus, *e. g.* the millet and wheat come up in one or two days; the navew, rocket, blite, muſtard, turnip, ſpinache, and kidney-bean, in three or four days; the dill, lettuce, cucumber, gourd, and creſſes, in four or five days; the beet and radiſh in ſix days; barley in ſeven days; orrach in eight days; cabbage in ten; beans require from fifteen to twenty; the onion comes up in nineteen or twenty days; the hyſſop in thirty days; parſley ſeed in forty days; ſmallage in forty or fifty days; the peach, almond, walnut, cheſnut, and piony, in one year; the cornel and hazle-nut in two years after ſowing. The foliation or leafing of plants is the time of the ſpring or ſummer they unfold, expand, or put out their firſt leaves. The order of the leafing of trees at Upſal in Sweden, 1755, is as follows:

1. Red elder,
2. Honeyſuckle,
3. Gooſeberry,

4. Red

4. Red currant,		
5. *Spiræa frutex*,		
6. Bird cherry,	May	9.
7. Spindle tree,		14.
8. Shrub cinquefoil,		
9. Common elder,		
10. Privet,		14.
11. Quicken tree,		
12. The ofier,		13.
13. Alder,		14.
14. Sea buckthorn,	May	14.
15. Apple tree,		15.
16. Cherry tree,		15.
17. Water elder,		14.
18. Birch,		13.
19. Hazle,		9.
20. Elm,		15.
21. Dog rofe,		
22. Pear tree,		
23. Plum tree,		
24. Buckthorn,		15.
25. Berry-bearing alder,		21.
26. Lime tree,		21.
27. Beech,		16.
28. *Aria Theophrafti*,		
29. Afp,		20.
30. Maple,		
31. Oak,		21.
32. Afh.		21.

The order of the leafing of fome trees and fhrubs in Norfolk, in the year 1755, as as obſerved by Mr. Stillingfleet, is as follows:

1.	Honeyſuckle,	Jan.	15.
2.	Gooſeberry,	Mar.	11.
3.	Currant,		11.
4.	Elder,		11.
5.	Birch,	Apr.	1.
6.	Weeping willow,		1.
7.	Raſpberry,		3.
8.	Bramble,		3.
9.	Briar,	Apr.	4.
10.	Plum,		6.
11.	Apricot,		6.
12.	Peach,		6.
13.	Filberd,		7.
14.	Sallow,		7.
15.	Alder,		7.
16.	Sycamore,		9.
17.	Elm,		10.
18.	Quince,		10.
19.	Marſh elder,		11.
20.	Wych elm,		12.
21.	Quicken tree,		13.
22.	Hornbeam,		13.
23.	Apple tree,		14.
24.	*Abele*,		16.
25.	Cheſnut,		16.
26.	Willow,		17.
27.	Oak,		18.
28.	Lime,		18.
29.	Maple,		19.
30.	Walnut,		21.

31. Plane,	Apr.	21.
32. Black poplar,		21.
33. Beech,		21.
34. *Acacia robinia*,		21.
35. Aſh,		22.
36. Carolina poplar,		22.

Flowering is the time that each ſpecies of plants puts forth their firſt flowers. Thus at Upſal in 1755;

Common coltsfoot,	Apr.	12.
Spring *crocus*,		13.
Snow-drops,		13.
Pile-wort,		15.
Yellow ſtar of Bethlehem,		15.
Mezereon,		15.
Perfoliate honeyſuckle,		15.
Noble liver-wort,		16.
Yellow water lily,		17.
White poplar,		19.
Wild black hellebore,		21.
Black poplar,		30.
Butter-bur,		30.
Garden *polyanthus*,	May	1.
Wood *anemone*,		3.
Sweet violet,		3.
Oſier,		7.
Tuberous moſchatel,		8.
Wood-ſorrel,		13.
Bear's-ear,		14.
Wild Engliſh daffodil,		15.
Marſh marygold,		21.
Tulip,		25.

Ground-ivy,

Ground-ivy,	May 26.
Globe flower,	27.
Lily of the valley,	30.
Apple tree,	2.
Buckbean,	3.
Gooſeberry buſh,	June 7.
Dame's-violet,	7.
Barberry,	8.
Yellow water flag,	10.
White campion,	14.
Water elder,	14.
Graſs of Parnaſſus,	16.
Ox-eye daiſy,	17.
Eye-bright,	17.
Bulboſe lily,	18.
Deadly nightſhade,	18.
Wall pepper,	20.
Yellow day-lily,	20.
Blue bottle,	22.
Yellow looſe-ſtrife,	22.
Roſe-bay willow herb,	23.
Golden rod,	23.
Mock orange,	23.
Tway blade,	26.
Yellow medic,	27.
White briony,	28.
Corn marygold,	29.
Feverfew,	29.
Maiden pink,	29.
Field ſcabious,	29.
Common elder,	29.
Small bindweed,	July 1.

Giant throat-wort,	July	2.
Meadow rue,		2.
Purple fox-glove,		4.
Meadow ſweet,		4.
Six o'clock primroſe,		4.
Common yarrow,		6.
Yellow lady's-bedſtraw,		6.
St. John's-wort,		6.
Common briar,		7.
Mother-wort,		7.
Deptford pink,		8.
Burdock,		9.
Mug-wort,		10.
Water betony,		10.
Tree ſow-thiſtle,		11.
Wild ſuccory,		12.
White ſtone-crop,		14.
Red-day lily,		16.
Dwarf elder,		17.
White lily,		20.
Calathian violet,		26.
Orpine,	Aug.	1.
Devil's-bit,		4.
Meadow ſaffron,		28.

The times of flowering of ſome plants at Stratton in Norfolk, as obſerved by Mr. Stillingfleet in 1755.

Red dead-nettle,	Jan.	23.
Lauruſtinus,		23.
Snow-drops,		26.
Common daiſy,		26.

Haſel

Hafel tree,	Feb.	22.
Sallow,	Mar.	11.
Scurvy-grafs,		21.
Afp,		21.
Alder,		26.
Sweet violet,		28.
Pile-wort,		28.
Primrofe,		29.
Yew tree,		29.
Elm tree,	Apr.	1.
Apricot,		1.
Wild Englifh daffodil,		1.
Red currants,		3.
Peach,		6.
Dandelion,		10.
Wood *anemone*,		10.
Dog's-mercury,		12.
Strawberry,		13.
Goofeberry,		13.
Turnips,		15.
Ground-ivy,		16.
Plum tree,		16.
Wood-forrel,		16.
Marfh marygold,		16.
White willow,		17.
Oak,		18.
Cherry tree,		18.
Wall-flower,		21.
Afh,		22.
Buckbean,		22.
Sycamore,		25.
Hornbeam,		25.

 Wild

Wild cicely,	Apr.	25.
Wild germander,		26.
Lilac,		27.
Birch tree,		27.
Sweet wood crowfoot,		28.
Bugle,		29.
Avens,	May	1.
Water violet,		3.
Lamb's-lettuce,		4.
Cowſlips,		4.
Wild valerian,		4.
White ſaxifrage,		6.
Woodroof,		8.
Solomon's ſeal,		10.
Horſe-cheſnut,		12.
Bulboſe crowfoot,		14.
Hedge-muſtard,		16.
Earth-nut,		20.
Columbines,		25.
Clover,		27.
Cuckow flower,		30.
Water elder,	June	2.
Bramble,		5.
Sanicle,		8.
Field ſcabious,		12.
Common mallow,		15.
Yarrow,		18.
Wheat and rye,		21.
Corn marygold,		23.
Wild ſuccory,		28.
Blue bottles,		28.
Calathian violet,	July	2.

Maiden

Maiden pinks,	July	7.
Kidney-beans,		10.
White lily,		11.
Mug-wort,		16.
Water hemp agrimony,		18.
Penny-royal,		22.
Great bindweed,		27.
Tree fow-thiftle,		28.
Devil's-bit,		28.
Rue,	Aug.	1.
Tanfey,		5.
Common wormwood,		9.
Burdock,		12.
Vervain mallow,		15.
Yellow devil's-bit,		21.
Smallage,		29.
Teafel.		29.

From the blow of the fnow-drops to that of the meadow faffron, at Upfal, is about 135 days, at Norwich about 190 days. The grafs of Parnaffus is the forerunner of hay-harveft; and the meadow faffron of fowing wheat.

The watching or vigils of plants are the precife times of the day that their flowers open and fhut. Such flowers as obferve a determinate time of opening and fhutting are called folar; and are of three forts, viz.

1. Meteorical, which obferve the hour of expanding with lefs accuracy, but open fooner or later according to the degree of

 fhade,

ſhade, moiſture, dryneſs, greater or leſſer preſſure of the atmoſphere.

2. Tropical, are thoſe which open in the morning and ſhut up before night, but the time of their opening is ſooner or later as the days increaſe or decreaſe; therefore they obſerve the Turkiſh or unequal hours.

3. The third ſort of ſolar flowers is called the Equinoctial. Theſe open preciſely at a certain hour of the day, and generally ſhut up every day at a determinate hour, and therefore obſerve European or equal hours.

Here follow the moſt common ſolar flowers, with their times of opening and ſhutting.

	Opens.	Shuts.
1. *Leontodon taraxacum*, dandelion,	5 6	8 9
2. *Leontodon hiſpidum*, rough dandelion,	4	3
3. *Leontodon autumnale*, yellow devil's-bit,	7	3
4. *Hypochæris maculata*, ſpotted hawkweed,	6	4 5
5. *Hypochæris radicata*, long-rooted hawkweed,	7 8	2

6. *Hypo-*

	Opens.		Shuts.
6. *Hypochæris glabra*, ſmooth hawkweed,	9	12	1
7. *Hieracium auricula*, narrow-leafed hawkweed,	8		2
8. *Hieracium murorum*, French or golden lung-wort,	6 7		2
9. *Hieracium umbellatum*, narrow-leafed buſhy hawkweed,	6		5
10. *Hieracium ſabaudum*, broad-leafed buſhy hawkweed,	7		1 2
11. *Hieracium aurantiacum*, golden mouſe-ear,	6 7		3 4
12. *Crepis tectorum*, ſmooth ſuccory hawkweed,	4 5	10 12	
13. *Crepis Alpina*, Alpine baſtard hawkweed,	5 6	11	
14. *Crepis rubra*, red flowered Apulian hawkweed,	6 7		1 2
15. *Picris echioïdes*, ox's-tongue,	4 5	12	9

16. *Sonchus*

	Opens.				Shuts.
16. *Sonchus arvensis*, tree sow-thistle,	6	7	10	12	
17. *Sonchus oleraceus*, common sow-thistle,	5		11	12	
18. *Sonchus Alpinus*, blue flower Alpine sow-thistle,	7			12	
19. *Sonchus palustris*, marsh sow-thistle,	6	7			2
20. *Lactuca sativa*, garden lettuce,	7			10	
21. *Scorzonera Tingitana*, Tangier viper's-grass,	4	6		10	
22. *Tragapogon pratense*, yellow goat's-beard,	3	5	9	10	
23. *Tragapogon Columnæ*, Columna's goat's-beard,	5	6		11	
24. *Tragapogon Dalechampii*, Dalechampius's great hawkweed,	6	7		12	4
25. *Lapsana rhagadiolus*, rhagadiolus,	5	6		10	1
26. *Lapsana stellata*, starry hawkweed,	7	8			2

27. *Lapsana*

	Opens.	Shuts.
27. *Lapſana glutinoſa*, glutinous nipple-wort,	5 6	10
28. *Cichoreum intybus*, wild ſuccory,	4 5	
29. *Nymphæa alba*, white water lily,	7	5
30. *Calendula arvenſis*, field marygold,	9	3
31. *Calendula pluvialis*, violet and white African marygold,	7	3 4
32. *Papaver nudicaule*, yellow flower wild poppy, with a naked ſtem,	5	7
33. *Hemerocalis fulva*, red day lily,	5	7 8
34. *Convolvulus tricolor*, convolvulus minor,	5 6	
35. *Malva Caroliniana*, Carolina mallow,	9 10	1
36. *Alyſſum ſinuatum*, mad-wort, with indented leaves,	6 8	4
37. *Anthericum ramoſum*, branched ſpider-wort,	7	3 4

38. *Arenaria*

	Opens.	Shuts.
38. *Arenaria rubra*, purple flowered ſpurrey,	9 10	2 3
39. *Anagalis arvenſis*, pimpernel,	8	
40. *Anagalis Monelli*, Monellus's narrow-leafed pimpernel,	7 8	
41. *Portulaca oleracea*, garden purſlane,	9 10 11 12	
42. *Dianthus prolifer.* proliferous pink,	8	1
43. *Meſembryanthemum barbatum*, ſtar-pointed ficoïdes,	7 8	2
44. *Meſembryanthemum cryſtallinum*, diamond ficoïdes,	9 10	3 4
45. *Meſembryanthemum nodiflorum*, fig marygold of Naples,	10 11	3
46. *Meſembryanthemum linguiforme*, tongue-leafed ficoïdes,	7 8	3
47. *Oenothera biennis*, night primroſe, opens at		6

From the above-mentioned flowers an hour-index may be formed, or a method of of difcovering the true time of the day, after having excluded the meteorical and tropical flowers, thus:

At 3. *Tragapogon pratenfe*, N° 22. of the lift.
4. *Leontodon hifpidum*, 2.
5. *Sonchus oleraceus*, 17.
6. *Hypochæris maculata*, 4.
6. *Hieracium umbellatum*, 9.
7. *Hieracium fabaudum*, 10.
8. *Hieracium auricula*, 7.
9. *Hypochæris glabra*, 6.
9, 10. *Malva Caroliniana*, 35.
10. *Lactuca fativa*, 20.
11. *Crepis Alpina*, 13.
12. *Sonchus Alpinus*, 18.
1. *Dianthus prolifer*. 42.
2. *Sonchus paluftris*, 19.
3. *Leontodon hifpidum*, 2.
4. *Tragapogon Dalechampii*, 24.
5. *Nymphæa alba*, 29.
6. *Oenothera biennis*, 47, opens.
7. *Papaver nudicaule*, 32.
8. *Hemerocalis fulva*, 33, &c.

The *calendula pluvialis*, 31, opens between fix and feven in the morning, and fhuts at four in the afternoon, if the weather is dry; but if it opens not its flowers at feven in the morning, you are fure to have rain that day. There is but one exception from this rule, and that is, if there comes

comes rain with thunder, the prognoftic from this flower is then not to be depended on. If the *fonchus Sibiricus*, or Siberian fow-thiftle, fhuts up its flowers in the night-time, the following day is generally fine; but if its flowers keep open all night, the following day is generally rainy.

Of the fleep of plants (as we may call it) in the night, we have fpoken fomewhat in chapter V. fect. 133. This fleep of plants is a certain pofition or fituation of their leaves very different from that they have by day, and takes place almoft in every fpecies of plants. In thofe with fimple leaves it is in the four following ways. 1. By conniving, when two oppofite leaves are fo clofely applied to one another by their upper furface, as if they were but one leaf, by which means the tender buds of the future leaves and fructification are preferved as under a cover from the injuries of the night air; as in garden *orache*, and common chickweed. 2. By including, when alternate leaves during the night lie clofe to the ftem, and thereby include and guard the tender buds, boughs, or flowers; as in *œnothera mollis*, or hairy tree primrofe. 3. By furrounding, when the leaves, which by day have a horizontal pofition, are raifed upwards in the night, and furround both the ftem and tops of the young fhoots, ſhoots, in form of a tunnel, under which the tender flowers and young leaves are covered and preſerved from being hurt or injured; as in mandrake and thorn-apple. 4. By guarding, when the uppermoſt leaves with their long footſtalks, which ſtood before in a horizontal poſition, now hang down quite round, and form as it were a vault, to preſerve the flowers and tender leaves from the wind, dew, rain, and other external injuries; as in *impatiens noli tangere*, or quick-in-hand. In the plants that have compound leaves this night poſition of their leaves is in the ſix following ways. 1. By folding together, when the partial leaves are laid cloſe to one another, like the leaves of a book, thereby covering their upper ſurfaces; as in ſweet pea, or painted lady, and common bean. 2. By involving, when the partial leaves only connive, or come cloſe together at top, and all of them together form a cavity to include and guard the tender flower; as in bladder trefoil, and heart trefoil. 3. By diverging, when the partial leaves approach one another at the baſe, but ſpread open at their extremities or tips; as in common melilot. 4. By hanging down of the partial leaves, that the young ſhoots be not too much loaded by the dew or rain, or ſhaken by the wind; as in white lupine. 5. and 6. By inverting and imbricating, or lying over one

one another like tiles, that the upper and more tender ſurface of the partial leaves may be covered, and the common footſtalks defended from wind, rain, and ſtorms; as in almoſt all the ſpecies of *caſſia*, tamarind tree, logwood, moſt ſpecies of the *mimoſa* or ſenſitive plant, and triple-thorned *acacia*.

Now this nocturnal change in the poſition of the leaves of plants, which we call ſleep, may be aſcribed by ſome, partly to the darkneſs, and partly to the cool air, of the night. But that theſe are not the ſole cauſe of this phænomenon appears from hence, that the ſame plants, though placed in a ſtove, where the degree of heat is the ſame both day and night, do notwithſtanding at their uſual hours in the evening contract their leaves, and go to ſleep, and open or expand them again very early in the morning; and, which is very remarkable, that they obſerve the ſame viciſſitudes of contracting and expanding their leaves, whether the window ſhutters of the ſtove are ſhut or open. Let it be obſerved, that as animals while young and tender ſleep moſt, ſo alſo do plants in their young ſtate, but when grown up they indulge leſs in this reſpect.

The next thing to be obſerved, is the time that plants ripen their fruits and ſeeds. Common barley ſown in Lapland May 31, 1732, was cut July 28, conſequently ripened in 58 days. The ſame ſort of barley ſown at Upſal Mar. 6, 1750, was cut Aug. 4, and ripened in 151 days. And we find that at Upſal the medium is 110 days, in Scania 90 days, and in Lapland 60 days. For as eggs require a fixed time for the excluſion of the young, ſo the barley does in different provinces to ripen the ſeed, as appears by the above examples. And thus ſhould obſervations be made on other plants as to the time of ripening their ſeeds.

Defoliation is the time of autumn, when trees ſhed their leaves, and thereby point out the progreſs of autumn, and the approach of the enſuing winter. The aſh is among the firſt that ſheds, and the laſt that puts out its leaves. The firſt fall of the leaves of trees with us is about the autumnal equinox. We ought carefully to obſerve alſo the firſt blowing of the meadow ſaffron.

The time of the duration of plants comprehends the years of their age; which in many are eaſily reckoned from the internal concentric circles or roſiny rings in the trunk when felled. Here Linnæus gives an example, from his journey through Oeland, of an oak, which had 260 of thoſe internal concentric circles, by which it appeared to have been ſown in the year 1481. And another example is produced, from his journey through Weſtrogothia, of a pine ſown in the year 1337, and 409 years old when felled. The ages of the pine, cedar, apple tree, pear tree, &c. may be known alſo from their annual boughs or branches. The time when the moſt ſevere or moſt mild winters happened, may alſo be made out from the internal rings of many trees, particularly the oak.

Botaniſts, having been hitherto taken up in acquiring the knowledge of plants, and confounded, or as it were overwhelmed, with the prodigious number and vaſt variety which nature every where preſented to their view, have not been at leiſure to make a regular courſe of obſervations in the manner of aſtronomers, although, in my opinion, ſuch obſervations would have been of far greater utility to the public. Calendars of *Flora* ſhould be made out in every province yearly, according to the time of plants coming into leaf, flower, fruit, and ſhedding their leaves; obſerving alſo the climate, that the difference of one country from another might from thence appear. The time alſo of ſolar flowers opening and ſhutting ſhould be made out in every climate, that any one, without the help of a clock, or ſeeing the ſun, might know the time of the day. Maps of the plants alſo ſhould be formed,

 which

which would point out every where the country, climate, and ſoil. Such obſervations would be highly uſeful in diſcovering more clearly the nature of the earth in general. The progreſs of the year from the putting out to the fall of the leaves of trees would ſhew the climate, and alſo the greateſt heat and cold of the place. In our botanic thermometer the freezing point is 0, and that of boiling water 100. The autumnal plants are thoſe of Virginia, which flower kindly with us in Sept. and Oct. but rarely produce ripe ſeeds. The winter plants are thoſe of the Cape of Good Hope, that flower with a gentle heat in the middle of winter, which is Midſummer time in their native places. The ſpring or vernal plants are all thoſe called the Alpine, which produce their flowers and fruit very early. The plants which flower twice a year, to wit, in ſpring and autumn, are all the Indian ones between the Tropics. The cold plants, ſuch as the Alpine, &c. will ſcarcely bear the heat of 30 degrees on our thermometer. The temperate plants, ſuch as thoſe of Spain, Italy, &c. will ſcarce bear the cold of 8 degrees. The warm plants will bear the heat of 40 degrees, but the cold of 10 degrees will kill them. The cold plants placed in a ſtove, at firſt grow very luxuriant, but in a

 ſhort

ſhort time grow weak and die. The warm plants in a cold ſituation do firſt ceaſe to grow, then loſe their leaves, and produce neither flowers nor fruit.

CHAP. XII.

Of the VIRTUES and USES of PLANTS.

SECT. CCCXXXVI.

THE virtues of plants ought, by the true ſyſtematic botaniſt, to be derived from the fructification, obſerving at the ſame time the taſte, ſmell, colour, and place of growth. The different ſects of phyſicians have been in every age ſolicitous to trace and diſcover the virtues of plants. The empirics were the firſt: they built their rules and maxims on experience alone. Of this number were Dioſcorides, and all the antient phyſicians and botaniſts who lived before the revival of learning. After which period, phyſicians attempted by ſome different and ſhorter ways to diſcover the virtues of plants, all which proved falſe and deluſive theories (except the method

thod here propoſed), as we ſhall ſee in the ſequel. And firſt of aſtrologers, who ſuppoſed that the ſtars had a certain influence upon every plant, by which each produced its effect upon that part of the human body over which ſuch ſtars preſided like tutelar deities. Thus they ſuppoſed certain ſtars preſided over the heart, and that the plant, which was ſubject to their influence as well as the heart, was an uſeful and proper medicine for diſorders of the heart, &c. 2. The next were thoſe who from ſome external ſigns or marks on plants endeavoured to aſcertain their virtues. They knew that certain medicines of a yellow colour, ſuch as ſaffron, turmerick, rhubarb, celandine, were given with ſucceſs in that yellow diſeaſe called the jaundice. They found alſo that medicines of a red colour, ſuch as dragon's-blood, Japan earth, tormentil, bloody-dock, were uſed in the cure of the bloody flux; hence they were perſuaded there was a great myſtery in the colour. Moreover, they thought proper to conſult the figure alſo. Thus they imagined they ſaw in the flowers of the *orchiſes* the figures of the male and female parts of generation, and hence concluded that thoſe plants muſt be provocatives to venery. So the oriental *anacardium* from its figure muſt ſtrengthen the

 heart;

heart; and the occidental, for the ſame reaſon, the kidneys. The large round-headed common white cabbage muſt be good for diſorders of the head, &c. 3. The chemiſts thought proper to examine plants according to the principles of their art. They ſaw that they could ſeparate all the principles of minerals and foſſils, and that they could alſo by the help of fire ſeparate certain parts of bodies, which being exhibited in ſmall quantities, would produce wonderful effects, ſuch as the oil, ſpirit, water, ſalt, and earth; and thus they gave us all the conſtituent parts of plants ſeparately, and hence concluded in what way plants compounded of thoſe parts would produce their effect. The members of the royal academy of ſciences at Paris thought proper to make a farther enquiry into this ſubject, about the end of the laſt century, as Geofroy and Tournefort inform us. The members of this illuſtrious ſociety, after long and laborious reſearches on this ſubject, were at laſt obliged to own, that although in many plants the end ſeemed to be attained pretty clearly, yet in many others they were far from the end propoſed. For they obſerved, for example, that the *ginſeng* produced the ſame chemical principles as the common *hepatica*. Hence they were led to conclude, as Chomel

Chomel tells us, who was himſelf a member of the ſociety, that though they had chemically analyſed almoſt 2000 plants, no other certain diſcovery was made, but that from all thoſe they could commonly extract a ſmall quantity of an acid liquor like vinegar, a greater or leſſer quantity of eſſential or fetid oil, a certain quantity of fixed or volatile ſalt, inſipid phlegm and earth; and very often that all theſe were contained in the ſame quantity and proportion in plants which had the moſt different effects. Thus they found that their labour was vain and uſeleſs: yet it had this good effect, to take off people's prejudices concerning the uſefulneſs of chemiſtry in aſcertaining the virtues and powers of medicines. We grant that chemiſtry, which furniſhes us with very efficacious and compendious medicines, is of the greateſt uſe to phyſic; but we deny that the virtues of plants can be demonſtrated *à priori* by means of chemiſtry. Nor is it indeed clear, that the chemiſts by their art alone ever diſcovered any virtues of plants which were unknown before. Theſe methods therefore here mentioned of determining the virtues of plants proving ineffectual, let us next examine the method here propoſed from the fructification,

SECT. CCCXXXVII.

Plants which are of the ſame *genus*, agree in their medicinal virtues; thoſe of the ſame order in the natural method, are nearly of the ſame virtues; and thoſe which are of the ſame natural claſs, have in ſome meaſure the ſame virtues. And here we ſhall firſt obſerve, that ſuch plants as agree exactly in fructification, or, in other words, are of the ſame *genus*, have very ſeldom hitherto been found to differ in medicinal virtues; *e. g.* all the ſpecies of *convolvulus*, viz. the ſcammony, turpeth, jallap, mechoacan, *ſoldonella*, &c. have the ſame virtues. The ſame may be ſaid of the ſpecies of *allium*, viz. garlick, onion, leeks, moly, cives, eſchalots, rockambole, &c. And alſo of the ſpecies of *laurus*, viz. cinnamon, camphire, ſaſſafras, benzoin, &c. And alſo of the ſpecies of *euphorbia*, viz. the pine ſpurge, broad-leafed or garden ſpurge, German ſpurge, the *euphorbium* of the ſhops, &c. And alſo of the ſpecies of *artemiſia*, viz. lavender cotton, worm-ſeed, common wormwood, ſea wormwood, Roman wormwood, ſea wormwood with a lavender leaf, &c. The ſyſtematic botaniſts endeavoured long ſince to determine the virtues of plants according to the claſſes and orders of their ſeveral ſyſtems; but ſeeing there was no natural ſyſtem then con-

ſtructed,

ſtructed, and botaniſts were obliged to take the foundation of their ſyſtems, which were partly natural and partly artificial, from ſome part or other of the fructification, and by that means either to break the natural claſſes, or tranſgreſs the rules of their ſyſtems, and by ſo doing fruſtrate the deſign of them, which was, according to certain principles, to lead to the knowledge of any *genus*; this being the caſe, I ſay, it was no wonder the virtues of plants in ſome claſſes ſeemed to differ widely from one another. That there are natural claſſes or aſſemblages of plants truly natural we have already ſeen in the firſt chapter; for although botaniſts have not hitherto found out any ſyſtem which could comprehend all the natural claſſes entire, nevertheleſs the fragments of a natural method, as far as hitherto diſcovered, have been laid down in the chapter above quoted. As all plants were found to have a fructification, botaniſts juſtly concluded that this was the only eſſential part of all vegetables. They had indeed long endeavoured to find out a ſyſtematic arrangement of plants, and to this end had attempted to form ſuch an arrangement from the various parts of plants, viz. the root, the ſtem, the leaves, but in vain. At laſt they betook themſelves to the fructification, and in this they could not

not agree in opinion, ſome taking the ſeeds, others the fruit, and others the flower, as the foundation of their ſyſtem, not conſidering that all the parts of fructification ought to coincide, to conſtitute one certain ſyſtematic *genus*. Theſe difficulties being now got over, we ſhall lay it down as a rule, that plants which agree in flower and fruit are of the ſame *genus*; and that thoſe which agree in *genus* have an affinity one to another, and agree alſo in their medicinal virtues, in ſuch a manner that we may in a great meaſure *à priori* determine the effects of any plant in this way. For in the fructification the internal eſſence of a plant is ſet before us, by viewing of which we may read its characters; and in them the All-wiſe Creator has clearly pointed out its nature, manner of growth, and medicinal virtues. We ſee then that there are natural *genera* throughout the whole vegetable kingdom; and we ſee alſo, that while we collect the natural *genera* into one natural claſs, their limits approach ſo near to one another, that it is difficult to diſtinguiſh the *genera* one from another, ſo great is their affinity; as may be ſeen in the umbelliſerous, compound, papilionaceous plants, and ſeveral others. We contend therefore, that the virtues of plants are beſt and moſt ſafely determined according to the natural claſſes, providing we are acquainted before hand with the virtues of one or two plants of the ſame claſs; for if this is wanting, in vain ſhall we alſo expect any aſſiſtance even from theſe means. And beſide this way, there is no other by which we can arrive at the ſure knowledge of the virtues of plants, but only by experience. Let us then try this botanical method according to the natural orders, and ſee how far the plants contained in them agree in virtues and uſes.

SECT. CCCXXXVIII.

The leaves of the graſſes afford nouriſhment and ſupport to our flocks, herds, and beaſts of burden; the ſmaller ſeeds of graſſes ſerve for food to birds; and the larger, called eſculent ſeeds, to man. The graſſes are all thoſe plants which in the ſexual ſyſtem are comprehended under the *triandria digynia*, with a few others, and conſtitute the fourth order of the natural method. All theſe are eaten by ſuch animals as we mentioned, and are indeed the principal part of their food, though ſome are more fond of one graſs than another. The ſeeds of many graſſes, as the millet, canary, feſcue, panic, and others, are greedily devoured by turkies, geeſe, chickens, and ſmall birds. The larger ſeeds or grain, as rice,

rice, wheat, rye, barley, oats, millet, panic, mayz, &c. do all make part of man's daily food; but the annual darnel, which is a large grain almoſt like wheat, intoxicates in beer, though it even loſes this quality when made into bread; and has been uſed in time of ſcarcity. And among all this numerous tribe there is not to be found one poiſonous ſpecies.

SECT. CCCXXXIX.

The ſtarry plants are chiefly diuretic. They are of the *tetrandria monogynia*, and 47 order of the natural method. Of theſe, the madder and woodroof are officinals, well known for their diuretic virtues. Akin to them are the gooſe-graſs, lady's-bedſtraw, &c. which alſo promote urine pretty powerfully.

SECT. CCCXL.

The rough-leafed plants are more or leſs of the oleraceous kind, and alſo mucilaginous and glutinous. They are of the *pentandria monogynia*, and 41 order of the natural method. Of the oleraceous kind, are the alkanet, borrage, &c. Of the mucilaginous and glutinous, the principal is the comfrey root.

SECT. CCCXLI.

The lurid plants, *i. e.* of an ugly, difagreeable, or forbidding afpect, tafte, and fmell, are of a fufpected nature. They are of the *pentandria monogynia*, moftly berry-bearing plants, and conftitute the 28 order of the natural method. The *capficum*, or Guinea pepper, is highly corrofive. All the nightfhades more or lefs poifonous, not excepting the potatoes, though in a very fmall degree. The winter cherry a moft violent diuretic, and unfafe. The mandrake, mad apples, deadly nightfhade, henbane, and thorn apple, bring on madnefs, and even death. Tobacco highly narcotic, emetic, and purgative. The mullein kills fifhes, and intoxicates them fo, that one may take them with their hands; hence phyficians, though they apply it often outwardly as an emollient, never ufe it inwardly.

SECT. CCCXLII.

The umbelliferous plants which grow in dry foils are aromatic, heating, and driving; but thofe that grow in watry places are often poifonous. The virtues of umbelliferous plants refide in their roots and feeds; they are of the *pentandria digynia*, and 45 order of the natural method. Thofe efpecially which are officinal plants do grow in dry ſoils, as the ſpignel, laſer-wort, wild carrot, hog's-fennel, *opoponax*, *galbanum*, *aſa fetida*, *angelica*, lovage, cumin, maſter-wort, dill, fennel, carraway, aniſe, parſley, &c. All theſe have an aromatic ſmell, are hot to the taſte, reſolvent and carminative, diaphoretic and diuretic. On the other hand, thoſe which grow in watry places are poiſonous, as the long-leafed water hemlock, hemlock drop-wort, common water hemlock, *phellandrium aquaticum*, wild ſmallage, *apium paluſtre*, leaſt water parſnip.

SECT. CCCXLIII.

Plants of the *hexandria* claſs have roots according as their ſmell and taſte are either eſculent or noxious. They are of the 9 and 10 orders of the natural method. So we find the root of *narciſſus*, ſnow-drops, fritillary, crown imperial, ſquill, lily of the valley, hyacinth, aloes, autumnal ſnow-drop, lily *narciſſus*, *Jacobea* lily, ſuperb lily, aſphodel lily, ſpider-wort, to be all poiſonous or hurtful, having a ſtrong diſagreeable ſmell; eſpecially the crown imperial, hyacinth, and *narciſſus*. Garlick, onion, leek, &c. contain a great deal of volatile *alcali*, are acrimonious, and often corroſive, if taken in too great quantity; but roaſted or boiled, they loſe their acri-

mony,

mony, and become eſculent and agreeable. The roots of martagon, tulip, and ſtar of Bethlehem, are eatable, having no ſmell. The tulip root is eaten in ſome places of Italy; and the martagon lily makes part of their daily food in Siberia.

SECT. CCCXLIV.

The plants with horned *antheræ* (Bicornes, Cl. 8. and 10. Ord. Nat. 18.) are aſtringent, and their acid berries are eſculent. Marſh *ciſtus*, winter-green, ling, whorts, bearberry, are all aſtringent; among which the moſt remarkable are the ling, whorts, and bearberries, the leaf of this laſt being uſed in Sweden for tanning of leather. The acid and eſculent berries of this tribe are the black and red whorts, cranberries, bearberry, ſtrawberry tree, American gooſeberry, &c.

SECT. CCCXLV.

All the pulpy fruits of the *icoſandria* claſs (Ord. Nat. 19. 35, 36.) are eſculent and wholſome. The pulpy fruits of this are the apple, pear, pomegranate, wild ſervice, medlar, true ſorb, hips, bramble, raſpberry, ſtrawberry, almond, peach, plum, apricot, cherry, prickly pear, *guava*, &c. all which are eſculent. Nor is there any plant in this claſs whoſe fruit or any other

other part is poiſonous. For it is much to be doubted, whether the laurel or cherry-bay has ſuch a noxious quality as has been aſcribed to it.

SECT. CCCXLVI.

Plants of the *polyandria* claſs (Ord. N. 26 & 27.) are chiefly poiſonous. The wolf-bane or monk's-hood, colombines, ſtaveſacre, larkſpur, hellebore, paſque-flower, piony, virgin's-bower, water lily, *nigella*, *ranunculus*, marſh marygold, poppy, celandine, herb Chriſtopher, prickly poppy, gamboge, wild Syrian rue and ſpurge, &c. are all more or leſs hurtful or unfriendly to nature. And even tea is not to be uſed when freſh cured. The *anthora*, or wholſome helmet-flower, has been by many reckoned an alexipharmic, and even its root an antidote for the poiſonous wolf's-bane, which is of the ſame *genus*; but this is much doubted by Cluſius Bauhine and Lobel; and Solerius affirms, that the bigneſs of a kidney-bean of this root, taken inwardly, purges both upwards and downwards. It is certain, this ſpecies is leſs hurtful than the other aconites; and may be given in a ſmall doſe, and be ſerviceable in eruptive fevers. For all medicines of the vegetable kingdom, which we are acquainted with, and which kill worms

and

and promote eruptions, have ſomething in them noxious, as appears by the ſeeds of colombines. There is beſides a remarkable bitterneſs and acrimony in the root of *anthora*, from which one would readily gueſs it to be hurtful and corroſive.

SECT. CCCXLVII.

The verticillate plants (*didynamia gymnoſpermia*, Ord. Nat. 42.) are fragrant, nervine, reſolvent, and deobſtruent; their virtues are chiefly in the leaves. For the root of none of them is uſed in medicine; the ſtem has but little ſmell, is dry and woody; hence many of them were called underſhrubs by the old botaniſts; the *calyx* alſo, which conſtitutes the greateſt part of the flower, is dry and ſapleſs, and the ſeeds rarely uſed; but their virtue is chiefly in the leaves, as in the Syrian *marum*, whoſe leaves are ſo fragrant, that in the whole vegetable kingdom there is ſcarce any thing to parallel them, not even in the *dracocephalum Canarienſe*, or balm of Gilead. There is no poiſonous or hurtful plant of this order. The following plants are highly fragrant, and by their action on the nerves reſolvent, and expel wind, promote the *menſes*, &c. viz. *marum*, dittany, ſavory, thyme, *origanum*, marjoram, baſil, penny-royal, mint, baum, lavender, roſemary, ſage, clary.

SECT. CCCXLVIII.

The podded plants (*tetradynamia* claſs, Ord. Nat. 39.) which grow in moiſt or watry places, are acrid, inciding, abſtergent, and diuretic; but when dried are good for nothing. The principal plants of this claſs for theſe purpoſes are the pepper-wort, ſcurvy-graſs, horſe radiſh, lady's-ſmock, muſtard, water-creſſes, winter-creſſes. In all the others the taſte is much weaker, though of the ſame ſort. The virtues of theſe plants is loſt by drying. There is no noxious or hurtful plant in the whole claſs.

SECT. CCCXLIX.

The pillar-bearing plants (*columniferæ*, Ord. Nat. 39. *monadelphia polyandria*) are mucilaginous, lubricating, and obtund acrimony; externally applied to tumours, they are ripening. All theſe plants have an emollient or ſoftening quality; and he that is acquainted with the nature of mallows and marſh-mallows, knows the effects of them all. The ſame lubricating virtues are found in every part of theſe plants. They lubricate and obtund acrimony in coughs, ſtranguries, nephritic diſorders, colics, and excoriations, and by that means eaſe pain. They maturate or ripen tumours by their ſoftening quality. Nor is there any

any hurtful or poiſonous plant in this whole tribe or natural order.

SECT. CCCL.

The leaves of papilionaceous plants *(diadelphia decandria*, Ord. Nat. 32.) are eaten by cattle and other beaſts of burden; their ſeeds, which are farinaceous and flatulent, are the food of various animals. Every one knows that thoſe animals are fond of the trefoils and clovers, yellow medick, lucern, black noneſuch, bird's-foot trefoil, ſaintfoin, vetches, tares, fenugreek, &c. all which are cultivated for their uſe. Horſes are particularly fond of lentils, and ſoon grow fat by eating them. The ſeeds of the papilionaceous plants are eaten by various animals, eſpecially boiled; though chickens are not fond of the ſeeds of kidney-beans and lupines. It is well known that the ſeeds of peaſe, beans, vetches, kidney-beans, chiches, and lentils, are eſculent, farinaceous, and flatulent; and not proper for thoſe of weak ſtomachs, except they be exceedingly well boiled. Among all the leguminous or papilionaceous tribe there is no deleterious or hurtful plant to be found.

SECT. CCCLI.

Plants of the *ſyngeneſia* claſs, many of which are officinal, are commonly bitter.

This is the 49th order of the natural method. There are many plants of this claſs uſed in the ſhops; as burdock, carline thiſtle, colts-foot, butterbur, pellitory, *arnica montana*, leopard's-bane, Aſiatic centory or Behen, ſuccory, viper's-graſs, dandelion, ſeveral of which are reckoned deobſtruent. Among the bitters are the following, common wormwood, ſea wormwood, Roman wormwood, ſea wormwood with a lavender leaf, lavender cotton, ſouthern wood, coſtmary, tanſey, feverfew, chamomile, hemp agrimony, *verbeſina acmella*, or water hemp agrimony of Ceylon, cudweed, golden rod, daiſy, ſneez-wort, yarrow, *ſtœchas*, or French lavender, maudlin, May-weed, milky thiſtle, carline thiſtle, bleſſed thiſtle, mouſe-ear hawk-weed. And in the whole claſs there is not a poiſonous plant, except the wild lettuce with a milky juice, the leopard's-bane, *doronicum*, and the *carthamus*, or ſafflower.

SECT. CCCLII.

The tribe of *orchiſes (gynandria diandria*, Ord. Nat. 7.) are provocatives to venery. The roots of *orchis*, *ſatyrium*, *ſalep*, *ophrys*, baſtard hellebore, lady's-ſlipper, *vanilla*, and ſome others of this order, are univerſally acknowledged to have theſe virtues and properties. Theſe roots have alſo a ſtrong

ſtrong or rank ſmell when freſh; and the ſtronger they ſmell, the more efficacious they are reckoned.

SECT. CCCLIII.

The cone-bearing plants (Ord. Nat. 51.) are reſinous and diuretic; as the pines, firs, junipers, cypreſs, tree of life, turpentine tree, ſavin, *olibanum*, &c. all which are ever-green, reſinous, warm, ſtimulating, and diuretic, communicating to the urine the ſmell of ſweet violets.

SECT. CCCLIV.

The *cryptogamia* claſs (Ord. Nat. 55, 56, 57, 58.) contains moſtly ſuſpected or dangerous plants. Of the *filices*, there are ſcarce any eſculent, and but very few medicinal plants; the ſame may be ſaid of the moſſes and *algæ*, of which ſome are purgative; and as to the tribe of *funguſes*, they are at beſt but dangerous plants either for food or phyſic. Many plants of this claſs, particularly the ferns, moſſes, and *funguſes*, have a very diſagreeable flavour or bad ſmell.

SECT. CCCLV.

Plants which have a *nectarium* diſtinct from the petals are commonly poiſonous. Such are the barren-wort, *nigella*, colombines, aconite, dog's-bane, *ſtapelia*, *narciſſus*, honey-flower, graſs of Parnaſſus, hellebore, moſt of the ſwallow-worts, horned wild cumin, quick-in-hand, *monotropa*, or bird's-neſt ſmelling like primroſe roots, hyacinth, oleander, white dittany, *clutia*, *kiggleria*, marvel of Peru, *zygophyllum*, or bean caper, all which are of a poiſonous nature. But the white ſwallow-wort, or ſilken cicely, which is not milky, is the only officinal ſpecies of the *genus aſclepias*.

SECT. CCCLVI.

Milky plants are moſtly poiſonous, except the ſemifloſcular plants of Tournefort. Such are of order 30, in the natural method, as *rauwolfia*, *cerbera*, *plumieria*, or red jaſmine, *tabernæmontana*, *periploca*, or Virginian ſilk, *apocynum*, or dog's-bane, *cynanchum*, *ceropegia*, *aſclepias*, or ſwallow-wort, *ſtapelia*, *vinca*, the periwincle, *nerium*, the oleander, &c. And alſo order 27, as the *bocconia*, *argemone*, or prickly poppy, *chelidonium*, celandine, *papaver*, common poppy, *ſanguinaria*, the puccoon, *podophyllum*, May-apple. As alſo order 38, the ſpurges, gamboge, *dalechampia*, *jatropha*, the caſſava, &c. and ſome others of different orders, as *rhus*, ſumach, fig, maple, *melia*, the bead-tree, and many of the agarics. But the ſemifloſ-

ſemifloſcular plants of Tournefort are not dangerous or noxious, viz. *prenanthes*, ivy-leafed wild lettuce, *chondrilla*, gum ſuccory, *hieracium*, hawk-weed, *crepis*, ditto, *hypochæris*, ditto, *picris*, ox-tongue, *hyoſeris*, ſwine's ſuccory, *leontodon*, dandelion, *tragopogon*, goat's-beard, *lactuca*, garden lettuce. But there are ſome ſpecies of the wild lettuce very poiſonous. Of the *campanaceæ* order 29, there are ſome that can ſcarcely be ſaid to be noxious, as the *campanula*; and others are poiſonous, as the *lobelia*, cardinal-flower.

SECT. CCCLVII.

A dry ſoil renders plants more aromatic, a moiſt ſoil more inſipid, a watry ſoil generally corroſive.

The beſt aromatic plants grow in dry places; as cinnamon, cloves, roſemary, ſage, thyme, ſavory, baſil, *origanum*, lavender, hyſſop, baum, nep, &c. All aromatics have the beſt taſte when dried; and medicinal plants when green are more inſipid, but their taſte is improved by drying. Plants that grow in a moiſtiſh, ſucculent ſoil, and alſo in ſhady places, are more inſipid, as moſt of the oleraceous tribe; and thus the leaves of navew, turnip, endive, that grow in cellars, become white and watry. So all fruits growing in moiſt and ſhady places are harſh and crude; but in dry warm ſoils, expoſed to the ſun, are ſweet and agreeable to the taſte. Very many of the aquatic plants are acrid and corroſive, as *ranunculus*, water lily, long-leafed water hemlock, hemlock drop-wort, common water hemlock, ſmallage, arſmart, &c. And many of the vernal plants for the ſame reaſon are acrimonious, as the paſque flower, *anemone*, golden ſaxifrage, ſpurge olive, and ſpurge laurel. But all aquatic plants loſe their acrimony amazingly by being cultivated in a more dry place; *e. g.* ſkirrets, the only ſpecies of *ſium* which grows in dry places, is not only eſculent, but very ſweet and pleaſant. And the ſweet ſmallage, called *celleri* by the Italians, is a moſt agreeable eſculent plant; but when it grows ſpontaneouſly in watry places, it is acrid, nauſeous, and hurtful, being made mild and eſculent only by culture in a dryer ſoil.

SECT. CCCLVIII.

The qualities of plants, in which their medicinal virtues conſiſt, are diſcovered alſo by taſte, ſmell, and colour. The external ſenſes are the natural inſtruments by which animals are to explore the qualities of plants and other ſubſtances; and we ſee how by the help of ſmell and taſte, cattle and other animals for the moſt part browſe ſafely among noxious and ſalutary plants, cautiouſly avoiding the one, and chooſing the other. Of thoſe ſubſtances that are leſs volatile the taſte is the beſt examiner, as the ſmell is of thoſe that are more volatile. Horſes will carefully ſhun the *phellandrium aquaticum*, or common water hemlock, while it is yet green, it being a deadly poiſon to them; and this they are warned to by their ſmell and taſte: but oxen, enticed thereto by the ſame ſenſe of ſmell and taſte, will eat the plant in queſtion, it being to them both wholſome and agreeable. And it is highly worthy our obſervation, that the Author of Nature has appointed certain plants for the food of certain animals, leſt thoſe of different kinds ſhould deprive one another of ſubſiſtence; and hence ſome plants are poiſonous to certain animals, ſo that they are not to touch them but at their peril, of which they have ſufficient notice from their ſmell and taſte. Nor is it leſs worthy our attention, that the taſte is greatly changed or altered in certain circumſtances; *e. g.* in a putrid fever the patient cannot endure the ſmell or taſte of roaſt meat; but at ſuch a time acids are highly agreeable. In the green ſickneſs, and that diſorder of infants where their ſtomachs are oppreſſed with an acid, earthy and

and abſorbent ſubſtances, charcoal, chalk, tobacco pipe clay burnt, &c. are both agreeable and uſeful. Thoſe ſpecies of plants that have the moſt taſte and ſmell are the moſt efficacious of all others of the ſame *genus*, and poſſeſs the greateſt medicinal virtues; *e. g.* the true Turkey rhubarb far excels the Rhapontick, &c. And we find that plants deprived of taſte and ſmell, are alſo deprived of the virtues and qualities which they originally were poſſeſſed of, whether good or bad; as *caſſava, calla, arum, yucca,* when deprived of their ſucculent juice, wherein their pungent and acrimonious taſte conſiſts, either by drying or otherwiſe, become mere inert, farinaceous, and even eſculent ſubſtances.

SECT. CCCLIX.

Sapid and ſweet-ſmelling plants are good; nauſeous and ſtinking ones are often poiſonous or hurtful. All animals, as well as man, are guided and directed by their ſenſes of ſmell and taſte to the choice of proper food or aliment. In the ſame manner as any plant acts on the nerves of ſmell and taſte, ſo it alſo acts on the nerves of every part of the body. We ought however always to conſider the nature of other plants that have an affinity to the plant in queſtion; and if we find by experience that they

are

are innocent, we may ſafely truſt to our taſte and ſmell for the uſe of any ſuch plant. Sweet-ſmelling plants are the following, viz. *milium effuſum*, millet-graſs, *holcus odoratus*, ſweet-ſmelling ſoft-graſs, woodroof, melilot, mock orange, jaſmine, white lily, tuberoſe, citron, orange, lemon, bean, oleander, *crocus*, violet, lime, eſpecially the flowers of all theſe, which diffuſe a moſt agreeable odour. Plants that are diſagreeable to the ſmell are the following, viz. the *fungi*, ſtinking May-weed, dwarf elder, bane-berries, aconite, black hellebore, white hellebore, *aſarabacca*, roots of *narciſſus*, crown imperial, ſuperb lily, leaves of ſtinking bean trefoil, flowers of *ſtapelia*, ſome of the *chenopodiums*, nightſhade, thorn apple, tobacco, henbane, hedge hyſſop, ſtinking horehound, leopard's-bane, bitter apple, coriander, rue, box, hound's-tongue, *opium*, walnut, *convallaria*, aloe, African marygold, dill, valerian; all which are pernicious, emetic, or purgative, except the three laſt, which are anodyne.

SECT. CCCLX.

Contrary qualities produce contrary effects: *e. g.* binding and looſening medicines have contrary qualities, and produce contrary effects. Diſeaſes in the human body ariſe from the ſolids being too rigid or or too flaccid, or from the fluids being too thick or too thin. This contrariety ought to be well attended to, otherwiſe there can be no ſucceſs in the cure of diſeaſes. If, *e. g.* the fibres are too rigid, they ſhould be ſoftened: if the fluids are too much attenuated, they ſhould be thickened in order to bring about a cure. Hence diſeaſes are often cured by contrary diſeaſes. Thus an hæmorrhage, or flux of blood from the noſtrils, for example, cures inflammatory fevers; hence phlebotomy or bleeding is proper in ſuch fevers. A flux, or looſeneſs, is cured by coſtiveneſs, which laſt is brought on by aſtringents. Convulſive diſorders are cured by ſleep, which laſt is procured by *opium*. Sleepy diſorders, on the contrary, are cured by convulſions; *e. g.* by ſneezing, which is a violent convulſion; this is cauſed by medicines which ſtimulate the noſtrils, called *errhines:* and ſo of many others. Now all medicines act by bringing about ſome change in the body. Every change is a diſeaſe, and therefore there are as many diſeaſes as modes of change. Hence it appears, that by the uſe of medicines contrary diſeaſes are excited. We are alſo to obſerve, that the ſame plants have different qualities in their different parts, as the root, leaves, ſtem, flowers, ſeed, and fruit; *e. g.* the milky

milky juice of the fig tree is cauſtic and corroſive, but the fruit is emollient, ſweet, and agreeable. The fruit of the peach tree is pleaſant and agreeable; the ſeeds bitter, and will kill horſes and dogs in the ſame manner as bitter almonds. The ſeeds of the citron and lemon are bitter, the peel aromatic, and the pulp acid, &c. We are alſo to obſerve, that the ſelf-ſame medicines given in greater or leſſer quantities produce very different effects.

SECT. CCCLXI.

All plants act either by their *effluvia* on the nerves, or by their ſapid part on the muſcular fibres, or by both on the fluids. That medicines act not only in the firſt paſſages, but alſo on the moſt remote parts of the body, daily experience evinces: for we find that the moſt ſolid parts of animals have the ſmell and taſte of thoſe things they have fed on. The fleſh of ſome birds that feed on ſmall fiſhes, and cattle that feed on turnips, taſte of thoſe ſeveral ſubſtances. A remarkable ſmell is communicated to the urine from turpentine, nutmeg, mace, *aſparagus*, garlick, and *carduus*. Some *fungi* give a nauſeous taſte to cow's milk; and goat's milk is purgative, after thoſe animals have been eating ſcammony or ſpurge. The milk and butter in Gothland has

has the taſte of garlick, from the cattle's feeding on *ſcordium*, onions, and leeks. The milk of nurſes is bitter after their taking extract of wormwood, and purgative from hedge hyſſop. The fleſh of hares fed on cabbage has a very diſagreeable taſte. The mutton about Montpelier taſtes of roſemary; and the beef and mutton in England often taſte of turnips. The fleſh of thruſhes that have fed on buckthorn berries is purgative in autumn. The bones of hogs and chickens that have been fed with madder are of a red colour. The fruit of the prickly pear makes the urine red; rhubarb makes it yellow; and the ſeeds of lovage black. The powder of tobacco ſprinkled on ulcers or ſores will cauſe vomiting. Hence we ſee it is the more neceſſary to be well acquainted with the virtues of ſimples; as it appears certain that medicines often exert their power and efficacy not only in the firſt paſſages, but through the whole body, and penetrate its moſt minute canals and meanders.

SECT. CCCLXII.

Perfumes are analeptic or reviving; fragrant ſubſtances orgaſtic, or extremely agreeable; aromatic ſmells are rouzing; abominably ſtinking ſmells are ſtupifying; and nauſeous ones are corroſive. The organs of of ſmell, being ſituated ſo near to the brain or common ſenſory, are the ſooneſt of all affected; hence volatile medicines reſtore life and vigour as it were in a moment to hyſterical and fainting people. Every volatile ſmell is called by the chemiſts the governing ſpirit; this often is of ſo ſubtle a nature, that it cannot be collected or confined in any veſſels. It is different in different plants; thus lavender, baum, thyme, *marum*, *origanum*, baſil, ſavory, have all a ſweet and aromatic ſmell; yet lavender has not the ſmell of baum, nor baum of *marum*, but every one has its peculiar ſmell; and therefore affects the nerves differently, and produces a different effect on them. For in the ſame manner as they affect the organs of ſmell, ſo they do the nerves, after they are diffuſed through the whole maſs of blood; hence the wonderful operation of medicines on the human body, ſcarcely to be learned by any theory, but only by the knowledge of the ſimples themſelves. Thus, *e. g.* the flowers of the tuberoſe diffuſe ſuch a ſmell through a whole houſe or room, that an hyſterical woman on entering the ſame ſhall fall down like one dead. The ſmell of cinnamon excites the nerves moſt powerfully, inſomuch that a ſingle drop of its eſſential oil taken on ſugar diffuſes its volatile flavour

vour through the whole body, that every part ſmells of cinnamon. The flowers of oleander have a very ſtrong, pleaſant, and ſomewhat narcotic ſmell, which will affect one that ſleeps in the ſame chamber where theſe flowers are, with a *carus*. This is a ſpecies of apoplexy, attended with profound ſleep and a fever. The ſmell of muſk-mallows will often cauſe young girls to faint. Rue recovers thoſe that are overcome with ſweet ſmells. All the Europeans that firſt landed at Surinam died ſuddenly, without any one being able to aſſign the cauſe, till at laſt it appeared to be occaſioned by the ſmell of that poiſonous tree called the mancheneel. The ſhade of walnut, elder, &c. is prejudicial, often cauſing fevers in thoſe that ſit or ſleep under them. Groves of the ſtinking bean trefoil give people violent headachs. Cats are enchanted, as it were, with the ſmell of nep, *marum*, and valerian. The fumes of wine, during its fermentation, iſſuing from large veſſels or caſks, have proved fatal in a moment. And the ſmell of ſome *fungi* has alſo been known to be fatal. Bane-berries, ſtinking May-weed, and ſtinking horehound, allure toads by their ſmell. Many have been ſuffocated by the fumes of charcoal. A dog by the ſmell will trace his maſter's ſteps in the moſt populous city. The very ſmell of of *coloquintida* will both vomit and purge. Sweet-ſmelling plants, as woodroof, drive away moths and other deſtructive vermin; and when chewed preſerve people from infectious diſorders. Theſe, and many other inſtances that might be produced, ſhew the great and ſingular effects of ſmell in plants and other ſubſtances. Perfumes act like ambergreaſe, muſk, or civet, and are the following; woodroof, melilot, jagged-leafed vervain mallow, muſky craneſbill, muſk-mallows, millet-graſs, and *holcus odoratus*, ſweet-ſmelling ſoft-graſs. Fragrant plants are the flowers of ſaffron, wall-flower, tuberoſe, Arabian and common jaſmine, white lily, lime tree, violet; and alſo the following herbs, lavender, thyme, marjoram, baſil, *origanum*, ſavory, baum, *marum*. Aromatics (which generally agree both in ſmell and taſte) are cinnamon, ſweet-bay, ſaſſafras, camphire, cardamoms, ſpicey cloves, nutmeg, ſweet-flag, biſhop's-weed, *angelica*, citron, lemon. Bad ſmells are thoſe of garlick, onion, leek, ſauce-alone, *ſcordium*, *petiveria*, *aſſa fœtida*; all which have more or leſs of the garlick ſmell. There are beſides, the *orchis*, ſtinking *orrache*, ſtinking hawk-weed, herb Robert, which have a rank odour. Heavy, ſtinking, and narcotic ſmells, are thoſe of ſtinking horehound, ſtinking May-weed,

Ff *tagetes*

tagetes or African marygold, *opium*, hemp, dwarf elder, ftinking bean trefoil. Naufeous fmells, are thofe of black and white hellebore, *convallaria*, *afarabacca*, tobacco, *coloquintida*.

SECT. CCCLXIII.

Sapid fubftances act both on the fluids and folids. The qualities of medicines in regard to tafte are the ten following, viz. 1. Watery; as common water, tea, coffee, whey, fmall beer, gruel, &c. thefe cleanfe, moiften, and dilute. 2. Vifcous or gluey; as gum arabic, gum dragant, marfh mallows, quince feeds, linfeed, fleafeed, comfrey, and feveral farinaceous fubftances; they are mucilaginous, foften, fmooth, and refift acrimony, and thicken the fluids. 3. Oily; as various oils drawn from feeds; they are obtunding and emollient, or blunting and foftening. 4. Sweet; as fugar, honey, moft farinaceous fubftances, nuts, almonds, *piftachia* nuts, figs, dates, &c. they nourifh, fweeten the acrimonious fluids, and render them mild and foft. 5. Acid or four; as vinegar, wines, currants, lemons, tamarinds, ftrawberries, cherries, and other fruits, alfo garden forrel and wood forrel; they dilute, cool, quench thirft, refift putrefaction, ftrengthen the nerves, help digeftion. 6. Dry; as, in outward application, flour, powder of maftick,

maftick, &c. and inwardly, biftort, tormentil, and various aftringents; they leffen the fuperfluous humidity. 7. Acrid; as muftard, horfe-radifh, fcurvy-grafs, garlick, *arum*, onion, *iris*, rue, fquill, wall-pepper, &c. all which are poffeffed of a volatile acrimony, which goes off by drying; they cut and divide tough and tenacious fluids, and even corrode the folids. 8. Salt; as common falt, marfh famphire, falt-wort, common famphire, fea arrow-head, *chenopodium maritimum*; they ftimulate and irritate the nerves, promote all the evacuations, refift putrefaction, and in fmall quantities are cooling. 9. Bitter; as gentian, centory, *carduus benedictus*, wormwood, chamomile, &c. they are alcaline and ftomachic, cure fpontaneous acids in the ftomach and bowels, increafe the appetite, and fupply the place of bile. 10. Styptic, rough, or aftringent; as galls, floes, red rofes, bloody dock, tamarifk, medlar, quince, &c. they thicken the fluids, and ftrengthen the fibres. Thofe qualities that are of the fame nature are watery and vifcous, fweet and oily, acid and faline, acrid and bitter, dry and aftringent. The fame qualities contrafted run thus; watery and dry, oily and ftyptic, acid and bitter, fweet and acrid, faline and vifcous. The oppofite qualities that act on the fluids are, cleanſing and abſorbent, cooling and balſamic, ſweetening and cutting, blunting and thickening, mucilaginous and penetrating. The oppoſite qualities that act on the ſolids are, moiſtening and drying, attenuating and ſtrengthening, fattening and ſcouring, ſoftening and aſtringent, ſmoothing and corroding.

SECT. CCCLXIV.

A pale colour indicates an inſipid ſubſtance; green, a crude one; yellow, a bitter; red, an acid; white, a ſweet; and black, a diſagreeable one. Many of the bitters are of a yellow colour; as gentian, aloe, centory, rhubarb, celandine, turmerick, and ſeveral of the yellow flowers. A red colour often ſhews an acid taſte; as in cranberries, red whorts, barberries, raſpberries, red currants, cherries, plums, mulberries, ſea buckthorn; and alſo in ſome herbs which turn of a red colour towards autumn, as garden ſorrel, wood ſorrel, bloody dock, and ſome others of the dock tribe, red cabbage. Green indicates a crude taſte; as in all unripe fruits, and young leaves of plants. A pale colour indicates an inſipid ſubſtance; as in *aſparagus*, cabbage, young lettuce, and endive. White indicates ſweetneſs; as in white currants, white-

white-berried bramble, ſome ſweet apples, and white plums. Black often indicates a diſagreeable taſte, and poiſonous quality; as in the berries of deadly nightſhade, herb Chriſtopher, ſumach, common nightſhade, *lauruſtinus*, crowberries, cherry-bay, &c. The beſt examiners of an acid are blue or purple; ſuch as an infuſion of *tourneſol*, or violets, which, being mixed with an acid, turns red; and with an *alcali*, green. Tournefort made uſe of a deep blue paper, which, being moiſtened with the juice of the plant he would examine, ſhewed its acid or alcaline quality.

SECT. CCCLXV.

The œconomical uſes of plants in human life are very great and many. For, beſides furniſhing food and medicine for man and beaſt, the vegetable kingdom alſo ſupplies materials for building of houſes and ſhips, for furniture, for carriages of various ſorts, for inſtruments of agriculture and other arts and manufactures, for hedges and fences, for dying and tanning, for linens and cottons, for fire and candles, for articles of commerce, for pleaſure or ornament, as in painting, plants for pleaſure gardens, parterres, green-houſes, ſtoves, &c.

In every branch of natural knowledge, the firſt principles ſhould be eſtabliſhed on, and confirmed by, repeated obſervations and experience.

Ad utilitatem vitæ omnia conſilia factaque noſtra dirigenda ſunt.

TACIT.

F I N I S.

APPENDIX.

APPENDIX;

Containing descriptions of some plants lately discovered in Norfolk and Suffolk, never found before in England, or not described as English plants; illustrated with figures of the same, taken from the life, and curiously engraved on three additional copper-plates.

GERANIUM *Paluſtre?* Marſh crane's-bill.

Lin. Gen. Plant. 832. *Monadelphia decandria.*

GERANIUM *pedunculis biſloris longiſſimis declinatis, foliis quinquelobis inciſis, petalis integris. Lin. Sp. Plant.* Ed. 2. p. 954? *Amœn. Acad.* iv. p. 323? *Burm. ger.* 13? *Geranium* with very long declining biflorous flower-ſtalks, leaves conſiſting of five lobes cut on the margins, and entire petals.

Geranium ſanguineum majus. Beſl. eyſt. vern. 1. tab. 9. fig. 2? Greater *geranium*, with a blood-coloured flower.

Geranium batrachoïdes paluſtre flore ſanguineo. Dillen. Eltham. 160. tab. 134. fig. 161? *Dillen. App.* 55? *Haller. Opuſc.* 109? Marſh crowfoot crane's-bill, with a bloody flower.

The

The *root* of this plant is perennial, of a brown colour, pretty thick, and ſends out ſeveral large lateral fibres, which contain a ligneous pith.

From the root ſpring ſeveral *ſtems*, each as thick as a gooſe-quill at the bottom, jointed, roundiſh, or rather ſomewhat quadrangular, about two feet high, branched and much divaricated, each branch divided into three or four bifurcations, the uppermoſt terminating with the flowers. The ſtems are a little hairy, as is the whole plant.

At each joint come out two *leaves*, one on each ſide, oppoſite, rugged and wrinkled; the radical ones, and thoſe at the firſt joint, are long and broad, conſiſting of five lobes each, which are cut on the edges, the two exterior lobes being deeply divided; they are alſo ſupported on very long

Foot-ſtalks, which as well as the leaves diminiſh gradually to the top, the uppermoſt of the latter being ſeſſile, and cut into three diviſions.

Each foot-ſtalk has two thin ſmooth tapering *ſtipulæ*, one on each ſide.

The *flower-ſtalks* are long and biflorous: out of the center alſo of each bifurcation comes one long flower-ſtalk, which in like manner bears two flowers. The partial flower-ſtalks are recurved and pendulous before

before the flowers open; but during the time of flowering they only decline a little, and after the petals are fallen off they are erect. They are alſo furniſhed with very ſmall *ſtipulæ* of the ſame ſhape with thoſe at the baſe of the foot-ſtalks of the leaves.

The *calyx* conſiſts of five ſmall acute bearded leaves.

The *corolla* is of a deep purple or blood colour at the firſt blowing of the flower, but afterwards turns to a pale purple.

The *petals* are entire, marked with three brown lines, and wooly at the baſe.

The *geranium paluſtre* grows in Ruſſia, Germany, and England. It is perennial, and flowers in May and June. Found near Spixworth church about five miles from Norwich, in 1771, by Mr. Wm. Humphry. For the figure of this plant ſee Plate I. of the Appendix, in which letter *(a)* repreſents the front view of the flower, letter *(b)* the back view of the ſame, both of their natural ſize.

If the plant above deſcribed be not the *geranium paluſtre*, which I do not affirm it to be, I ſhould be glad to know what ſpecies it is. It differs from the *geranium ſylvaticum* in ſeveral particulars. For it is a much larger plant, the leaves are not ſo much divided, not ſo ſhining, but more rough and wrinkled; the flower-ſtalks longer,

ger, and more reflexed; the petals at the firſt blowing of the flower are of a blood colour, whereas thoſe of the *geranium ſylvaticum* are of a fine blue.

VERONICA *verna.* Spring *veronica*, or ſpeedwell.

Lin. Gen. Plant. 25. *Diandria monogynia.*

VERONICA *floribus ſolitariis, foliis digitato-partitis, pedunculo longioribus. Sp. Plant.* p. 19. *Flor. Suec.* Ed. 2. N. 23. Spring *veronica* with flowers coming out ſingle, leaves divided like fingers, and longer than the flower-ſtalk.

Veronica humilis erecta montana, flore parvo cæruleo. Dillen. App. 38. Low upright mountain *veronica* with a ſmall blue flower.

Alſine triphyllos cærulea (foliis minoribus). Bauh. Pin. 250. Trifid chickweed with a blue flower and leſſer leaves.

The *root* is ſmall and fibrous. The *ſtem* is very ſlender, ſingle, divided into two or three branches, upright, round, and about two or three inches high. The *leaves* are alternate, ſupported on very ſhort *foot-ſtalks:* the lower leaves are divided into five parts like fingers; the upper ones, and alſo the *bracteæ*, or floral leaves, are whole, acute,

acute, and lanceolate; all of them being ſmooth, ſucculent, and longer than the *flower-ſtalks*, which come out ſolitary, one from the boſom of each leaf, bearing a ſmall blue *flower*, which is ſucceeded by a heart-ſhaped *ſeed veſſel*, as in the other *veronicas*. This grows in Sweden, Germany, Spain, and England, in dry, open, barren ſoil, on houſes, old walls, and rocky places. It is an annual plant, and flowers in April and May. Found by Sir John Cullum near Bury in Suffolk. See Plate II. of the Appendix, fig. 1.

HOLOSTEUM *umbellatum*. Umbelliferous wild pink.

Lin. Gen. Plant. 104. *Triandria trigynia.*

HOLOSTEUM (*umbellatum*). *Sp. Plant.* 130.

Holoſteum floribus umbellatis. Læfl. It. 120.

Holoſteum ruellii ſ. gramen leucanthemum. Lib. i. c. 38.

Holoſteum caryophyllæum arvenſe. Tabernom. Icon. 233.

Caryophyllus arvenſis umbellatus. Park. theatr. 1338. Wild pinks in tufts.

Caryophyllus arvenſis holoſteus. Ger. Em. 595. Broad-leafed wild pink.

Caryophyllus arvenſis umbelliferus. J. B. R. Hiſt. Pl. 1028. Field chickweed bearing the flowers in an umbel.

Caryophyllus arvenſis umbellatus folio glabro. Caſp. B. Pin. 210.

Caryophyllus arvenſis. Caſp. Bauh. Hiſt. 3. p. 361.

Caryophyllus umbelliferus. Vaill. Bot. Paris.

Lychnis graminea hirſuta umbellifera. Moriſ. Hiſt. ii. p. 546. ſ. 5. tab. 22. fig. 46.

Spergula foliis oppoſitis, pedunculis umbellatis. Guett. Stamp. 298. *Dalib. Pariſ.* 134.

The *root* is annual, ſlender, a little branched, fibrous, and runs perpendicularly down.

The *ſtems* are numerous, filiform, jointed, round, perfoliate, upright, from two or three to ſix inches high, having moſtly three joints; the ſpace betwixt the two loweſt is ſmooth, the others for the moſt part viſcous and hairy.

The *leaves* are ſet on in pairs at each joint, very entire, oppoſite, ſeſſile, erect, cohering at the baſe, each pair croſſing thoſe above and below, ſmooth on the under ſide, the upper ſurface and margins a little hairy; concave at the baſe, keel-ſhaped, ovate, obtuſe and fleſhy. The radical

dical leaves are narrower and longer than the others.

The two external *bracteæ* are large, and of the form of the leaves; the internal (one to every flower-ſtalk) are lanceolate, and very ſmall.

The *flower-ſtalks* are numerous, all from one center, viz. the extremity of the ſtem, unequal in length, ſome hanging down, ſome declining a little, ſome erect, and ſome bent in different directions, filiform, uniflorous, and abiding.

The *ſeed-veſſel* is an egg-ſhaped capſule, of one cell, burſting at the top into ſix valves.

N. B. The filaments, ſtyles, and valves of the *pericarpium* do very often exceed the number allotted to this *genus*.

This ſpecies of *holoſteum* is a native of Spain, Italy, France, Germany, and England. Found in great plenty on the city walls of Norwich, and many other old walls of that city, and on ſome banks and walls in the neighbourhood. Firſt noticed and examined by Mr. John Pitchford in Spring 1765. It is an annual plant, and flowers in April and May. See Plate II. of the Appendix, fig. 4.

TILLÆA

TILLÆA *muſcoſa.* Moſſy *tillæa.*

Lin. Gen. Plant. 177. *Tetrandria tetragynia.*

TILLÆA *(muſcoſa) procumbens. Lin. Sp. Pl.* 186. *Hort. Upſal.* 24. *Sauv. Monſp.* 129. Procumbent moſſy *tillæa.*

Tillæa. Dalibard. Pariſ. 43.

Tillæa muſcoſa perfoliata annua. Mich. Gen. 22. tab. 20. Moſſy annual perfoliate *tillæa.*

Craſſula foliis ſeſſilibus connatis, floribus aggregatis in foliorum alis. Guettard. Stamp. I. p. 97. *Craſſula*, or leſſer orpine, with ſeſſile leaves cohering at the baſe, and aggregate flowers coming out from the boſom of the leaves.

Polygonum muſcoſum minimum. Boccon. Sicil. 56. tab. 29. Leaſt moſſy *polygonum*, or knot-graſs.

Sempervivum omnium minimum repens muſcoſum polygoni facie. Bocc. Muſ. ii. p. 36. tab. 22. Leaſt creeping moſſy houſeleek, with the appearance of a *polygonum.*

The *root* is annual, ſmall, and fibrous.

The *ſtems* are numerous, creeping, filiform, round, ſmooth, jointed, perfoliate, one or two inches high, at firſt nearly erect, at length procumbent, pellucid, ſometimes whitiſh, ſometimes of a red colour, as is the whole plant generally.

The

The *branches* come out ſolitary from the boſom of the leaves, and moſtly oppoſite.

The *leaves* are ſet on in pairs at each joint, very entire, oppoſite, ſeſſile, erect, cohering at the baſe, bent inwards, each pair croſſing thoſe above and below, ſmooth, ſhining; on the lower ſurface convex, gibboſe, broadeſt in the middle, and membranaceous at the baſe; on the upperſide concave, narrow at the tip, fleſhy, ſemicylindrical, and obtuſe; ſometimes as long, ſometimes half as long as the intermediate ſpace betwixt one joint and another.

The *flower-ſtalks*, which are very ſhort, filiform, and erect, come by two or three from the boſom of each leaf.

The *bracteæ* are like the leaves, about half the length, two to each flower-ſtalk.

The *calyx* conſiſts of three parts, ovate, acute, bearded, concave, conniving, and rough.

The *corolla* is made up of three petals, egg-ſhaped, acute, conniving, concave, pellucid, and leſs than the ſegments of the *calyx*.

The *ſtamina* are three capillary filaments, having roundiſh, incumbent *antheræ*, which open on the ſides.

The *piſtillum* conſiſts of three ovate *germina*, ſhorter than the *ſtamina*; and three tapering erect *ſtyles*, with ſimple *ſtigmata*.

The *ſeed-veſſel* conſiſts of three oblong capſules, which are acute, ſpreading, and longer than the petals, burſting longitudinally, and contain two very ſmall ovate *ſeeds* each.

Obſ. The parts of fructification in this ſpecies are trifid, ſeldom or never quadrifid, and, though by Linnæus it is placed in the 4th claſs, comes properly under the *triandria trigynia.*

This plant grows in Italy, Sicily, France, and England, in dry, barren, ſandy, and gravelly ſoil. Found on Drayton heath, and ſeveral other places near Norwich, in great plenty. It is an annual, and flowers from June to October. Firſt examined and aſcertained by the Rev. Mr. Bryant in 1766. See Plate II. of the Appendix. 2 *A.* The plant of its natural ſize. 2 *B.* a plant in its young ſtate magnified. *a.* The flower ſpringing from the boſom of the leaf. *b.* The flower expanded. *c.* The capſules of the ſeed both magnified.

OPHRYS *paludoſa.* The leaſt *orchis.*

Lin. Gen. Plant. 1011. *Gynandria diandria.*

OPHRYS *(paludoſa) bulbo ſubrotundo, ſcapo ſubnudo pentagono, foliorum apicibus ſcabris, nectarii labio integro. Spec. Plant.* 1341.

Flor.

Flor. Suec. 813. *Hudſ. Flor. Ang.* 339. Leaſt *orchis*, with a roundiſh bulb, five-cornered ſtalk almoſt naked, tips of the leaves rough; and lip of the *nectarium* whole.

Orchis minima bulboſa. *Ray Supp.* 587. *Ray Synop.* 378. Leaſt bulboſe *orchis*.

The *bulb* is egg-ſhaped, bent inwards, and terminates in a *root* below. The bulbs ſtick together downwards like a chain, having a ſmall branch for a line of diſtinction.

The *ſtalk* is five-cornered, and naked the greateſt part of its length, which is from three to ſix inches or more.

It is furniſhed with three or four radical *leaves*, which are alternate, ſhaped like a *ſpathula*, having their tips rough on the interior ſurface, and ſhorter on the exterior.

Several green yellowiſh *flowers* come out at the top of the ſtalk in a cluſter.

The two lateral *petals* are of an oblong egg-ſhape, reflexed and erect. The two interior lateral petals are linear and recurved; the uppermoſt petal is ſtreight, and forms a hollow vault for the *ſtamina*.

The lip of the *nectarium* is lanceolate and egg-ſhaped, reflexed and entire.

The leaſt *orchis* grows in Sweden, Scotland, and England, in turfy bogs. Found on Felthorp bogs by Mr. Charles Bryant, in 1769. It is a perennial plant, and flowers in June and July. See Plate II. of the Appendix, fig. 3.

This plant was ſent to Mr. Ray by Dr. Preſton, profeſſor of botany, at Edinburgh, and immediate predeceſſor in that department to the late Dr. Alſton.

The plant repreſented on Plate II. of the Appendix, at fig. 5. and 6. (the former being of the natural ſize, and the latter the plant magnified) has been found near Norwich for ſeveral ſeaſons ſucceſſively, and always in the ſame ſtate. I know it had been ſaid to be the *juncus bufonius* in a young ſtate, but being much in doubt about it, I had it examined carefully laſt ſummer by a friend, who took up a large clod full of theſe minute plants, and put it into a pot, which he ſet in a moiſt place by the ſide of his fiſh-pond. The event proved them not to be compleat plants of themſelves, but real ſeedlings of the *juncus bufonius*. Wherefore I thought proper to inſert this account to prevent others from being miſled for the future.

GENISTA *piloſa*. Hairy dyer's-broom. *Lin. Gen. Plant.* 859. *Diadelphia decandria.*

GENISTA

Genista *foliis lanceolatis obtuſis, caule tuberculato decumbente. Sp. Plant.* 999. *Hort. Cliff.* 355. *Flor. Suec.* 588, 635. *Roy. Lugb.* 371. *Geniſta* with lanceolate obtuſe leaves, and a knotty decumbent ſtem.

Geniſta ramoſa foliis hyperici. Bauh. Pin. 395. Branched *geniſta*, with a leaf like S. John's-wort.

Chamægeniſta foliis geniſtæ vulgaris. Bauh. Pin. 395. *R. Hiſt. Pl.* 1725. Dwarf *geniſta*, with leaves of common broom.

Chamægeniſta montana hiſpida. Bauh. Pin. 396. Hairy mountain dwarf *geniſta*.

Chamægeniſta prima. Cluſ. Hiſt. 1. p. 103. The firſt dwarf broom.

Geniſtella piloſa. J. Bauh. Hiſt. 1. p. 3. Hairy dwarf broom.

Chamægeniſta pannonica. Ger. Em. 1313. *Park. Theatr.* 229. Hungarian dwarf broom.

This ſhrubby plant grows about a foot high, or more, having a long *root*, which runs obliquely, and is furniſhed with many ſmall fibres.

The *twigs*, which for the moſt part ſpread on the ground, are pliant, ſlender, cylindrical, and ſubdivided into many ſmall, angular, ſtriated *branches*.

The *leaves* are very ſmall, coming out by two, three, or four, from the ſame point,

 white

white and hairy on the under ſide, ſmooth on the upper.

The *flowers*, which are numerous, come out on the ſides of the ſmall branches, of a yellow or ſaffron colour, having hairy flower-cups and petals.

The *pods* are ſmall, about an inch long, broadiſh, hairy, and contain many *ſeeds*.

Grows in Germany, Hungary, France, Sweden, and England, in dry and hilly places. Flowers in May and June. Found by Sir John Cullum about Lackford, four or five miles from St. Edmund's Bury, in July 1774. See Plate III. of the Appendix. Fig. 1. the plant in its natural ſize; letter *(a)* the flower magnified.

HYDNUM *auriſcalpium*. *Hydnum* like an ear-picker.

Lin. Gen. Plant. 1211. *Cryptogamia fungi.*

HYDNUM *ſtipitatum*, *pileo dimidiato. Flor. Lap.* 524. *Flor. Suec.* 1100, 1260. *Roy. Lugb.* 519. *Hydnum* with a ſtalk, and half a head.

Erinaceus parvus hirſutus ex fuſco fulvus, pileo ſemiorbiculari, pediculo tenuiore. Mich. Gen. 132. tab. 72. fig. 8. The ſmall rough prickly *fungus*, of a browniſh colour, having a ſemiorbicular head, and a ſlender pedicle or foot-ſtalk.

Fungus

Fungus erinaceus parvus in conis abietis naſcens. Buxb. Cent. i. tab. 57. fig. 1. Small prickly *fungus*, which grows on the cones of the fir-tree.

Fungus erinaceus parvus, pediculo longiore auriſcalpium referens buxei coloris. Buxb. Hall. 129. tab. 129. Small prickly *fungus* with a pretty long ſtalk, reſembling an ear-picker, of the colour of box.

This *fungus* has a thick upright *ſtalk* two inches high, covered all over with a fine ſoft down like velvet. It ſupports a ſmall ſemiorbicular *head*, which is ſomewhat convex on the upper, and concave on the lower ſide, the latter being full of ſmall prominences reſembling prickles, whence the name of *erinaceus*, or hedge-hog. The whole plant is of a browniſh colour, and in ſhape reſembles an ear-picker.

Grows in pine woods on the ground, and out of dead branches or cones. Found laſt autumn near Norwich, in a ſmall plantation of Scotch pines called Hardy's Grove. See Plate III. of the Appendix, where the plant is repreſented in its natural ſize at fig. 2. and the lower concave ſide of its ſemiorbicular head at letter *(b)*.

END OF THE APPENDIX.

EXPLANATION OF THE PLATES.

PLATE I.

Claſſes. See p. 39—43.

1. *Monandria,*
2. *Diandria,*
3. *Triandria,*
4. *Tetrandria,*
5. *Pentandria,*
6. *Hexandria,*
7. *Heptandria,*
8. *Octandria,*
9. *Enneandria,*
10. *Decandria,*
11. *Dodecandria,*
12. *Icoſandria,*
13. *Polyandria,*
14. *Didynamia,*
15. *Tetradynamia,*
16. *Monadelphia,*
17. *Diadelphia,*
18. *Polyadelphia,*
19. *Syngeneſia,*
20. *Gynandria,*
21. *Monœcia,*

22. *Diœcia,*
23. *Polygamia,*
24. *Cryptogamia.*

PLATE II. Leaves.

Simple Leaves. See Sect. 83.

Fig.
1. Round—*Folium orbiculatum.*
2. Roundish—*Folium subrotundum.*
3. Egg-shaped—*Folium ovatum.*
4. Oval—*Folium ovale, subrotundum, ellipticum.*
5. Oblong—*Folium oblongum.*
6. Lancet-shaped—*Folium lanceolatum.*
7. Linear—*Folium lineare.*
8. Awl-shaped—*Folium subulatum.*
9. Kidney-shaped—*Folium reniforme.*
10. Heart-shaped—*Folium cordatum.*
11. Moon-shaped—*Folium lunulatum.*
12. Triangular—*Folium triangulare.*
13. Arrow-shaped—*Folium sagittatum.*
14. Heart and arrow-shaped—*Folium cordato-sagittatum.*
15. Spear-shaped—*Folium hastatum.*
16. Parted half way down—*Folium fissum.*
17. Three lobed—*Folium trilobum.*
18. Bitten—*Folium præmorsum.*

Fig.

19. Lobed—*Folium lobatum.*
20. Quincangular, with five angles—*Folium quincangulare.*
21. Gnawed—*Erosum.*
22. Hand-shaped—*Palmatum.*
23. Pinnatifid—*Pinnatifidum.*
24. Jagged—*Laciniatum.*
25. Sinuated—*Sinuatum.*
26. Sinuated and indented—*Dentato-sinuatum.*
27. Sinuated backward—*Retrorsum sinuatum.*
28. Divided to the base—*Partitum.*
29. Serpentine edged—*Repandum.*
30. Toothed or indented—*Dentatum.*
31. Sawed—*Serratum.*
32. Doubly serrated or sawed—*Duplicato-serratum.*
33. Doubly notched—*Duplicato-crenatum.*
34. Cartilaginous or gristly—*Cartilagineum.*
35. Sharp-notched—*Acute crenatum.*
36. Blunt-notched—*Obtuse crenatum.*
37. Plaited—*Plicatum.*
38. Notched—*Crenatum.*
39. Curled—*Crispum.*
40. Obtuse or blunt—*Obtusum.*
41. Acute or sharp-pointed—*Acutum.*
42. Tapering to a point—*Acuminatum.*
43. Obtuse with a point—*Obtusum acumine.*

44. Notched

Fig.
44. Notched at the tip ſharp—*Emarginatum acute.*
45. Notched at the tip wedge-ſhaped—*Cuneiforme emarginatum.*
46. Blunted—*Retuſum.*
47. Hairy—*Piloſum.*
48. Cottony—*Tomentoſum.*
49. Briſtly—*Hiſpidum.*
50. Fringed—*Ciliatum.*
51. Wrinkled—*Rugoſum.*
52. Veined—*Venoſum.*
53. Ribbed—*Nervoſum.*
54. Bliſtered—*Papilloſum.*
55. Tongue-ſhaped—*Linguiforme.*
56. Shaped like a Perſian ſcymitar—*Acinaciforme.*
57. Hatchet-ſhaped—*Dolabriforme.*
58. Deltoid, ſhaped like the old Greek delta—*Deltoïdes.*
59. Three-cornered—*Triquetrum.*
60. Furrowed—*Sulcatum.*
61. Channeled—*Canaliculatum.*
62. Cylindrical—*Teres.*

PLATE III.

Compound Leaves, Sect. 83.

Fig.
63. Fingered, or compounded of two—*Binatum.*

64. Fingered,

Fig.

64. Fingered, or compounded of three ſeſſile leaves—*Ternatum foliolis ſeſſilibus.*

65. Fingered, or compounded of three pedunculate leaves—*Ternatum foliolis petiolatis.*

66. Fingered, or compounded of many ſeſſile leaves—*Digitatum.*

67. Foot-ſhaped—*Pedatum.*

68. Pinnated, and ending with an odd one—*Pinnatum cum impari.*

69. Pinnated, and ending abruptly—*Pinnatum abrupte.*

70. Pinnated, and alternately placed—*Pinnatum alternatim.*

71. Pinnated, with every other leaf ſmaller—*Pinnatum interrupte.*

72. Pinnated, and ending with a tendril—*Pinnatum cirrhoſum.*

73. Pinnated, and conjugate—*Pinnatum conjugatum.*

74. Pinnated, and decurrent—*Pinnatum decurſive.*

75. Pinnated, and jointed—*Pinnatum articulate.*

76. Shaped like a lyre—*Lyratum.*

77. Double three-leafed—*Biternatum v. duplicato-ternatum.*

78. Double winged—*Bipinnatum v. duplicato-pinnatum.*

79. Triple

Fig.

79. Triple three-leafed—*Triternatum v. triplicato-ternatum.*
80. Triple winged ending abruptly—*Tripinnatum ſine impari.*
81. Triple winged ending with an odd one—*Tripinnatum cum impari.*

PLATE IV.

Determinate Leaves, Sect. 83.

Fig.

82. Rolled back—*Revolutum.*
83. Reclined—*Reclinatum.*
84. Horizontal—*Horizontale.*
85. Spreading—*Patens.*
86. Upright—*Erectum.*
87. Bent inwards—*Inflexum.*
88. A flower leaf—*Florale.*
89. A branch leaf—*Rameum.*
90. A ſtem leaf—*Caulinum.*
91. A ſeed leaf—*Seminale.*
92. A glove-like leaf—*Vaginans.*
93. Two oppoſite leaves grown together —*Connatum.*
94. A perforated leaf—*Perfoliatum.*
95. Embracing the ſtem—*Amplexicaule.*
96. A running leaf—*Decurrens.*

97. A

Fig.

97. A leaf furniſhed with no footſtalk—*Seſſile.*

98. A leaf furniſhed with a footſtalk—*Pedunculatum.*

99. A target-ſhaped leaf—*Peltatum.*

100. Placed in bundles—*Faſciculata.*

101. Laid over each other like tiles—*Imbricata.*

102. Chaffy and evergreen—*Aceroſa.*

103. Alternate leaves—*Alterna.*

104. Oppoſite leaves—*Oppoſita.*

105. Starry, compoſed of four leaves—*Quaterna.*

106. Starry, or whorled leaves—*Stellata.*

107. A jointed leaf—*Articulatum.*

108. A *frons,* conſiſting of a branch and leaf.

109. Shaped like a *ſpatula*—*Spatulatum.*

110. Parabolic, or half oval—*Parabolicum,*

PLATE V.

Trunk, Sect. 82.

Fig.

111. A ſquamoſe, or ſcaly ſtraw or haulm—*Squamoſus culmus.*

112. A creeping ſtem—*Repens caulis.*

113. A

Fig.

113. A *ſcapus*, or ſtalk.

114. A jointed ſtraw or haulm.

115. A twining ſtem—*Volubilis caulis.*

116. A forked ſtem—*Dichotomus caulis.*

117. A brachiate ſtem, or a ſtem branching in pairs—*Brachiatus caulis.*

PLATE VI.

Fulcra, or Props, Sect. 84.

Fig.

118. *a.* A claſper or tendril—*cirrhus.* *b.* A *ſtipula*, which is a ſcale or ſmall leaf on each ſide of the baſe of the foot-ſtalks of the leaves. *c.* Glands on the foot-ſtalks of the leaves.

119. *a.* Glands ſupported on ſmall foot-ſtalks.

120. *a.* *Bracteæ*, or floral leaves. *b.* The leaves.

121. *a.* Simple ſpines or thorns. *b.* A triple ſpine.

122. *a.* Simple *aculei*, or prickles.

123. *b.* Triple *aculei*, or forked prickles.

124. *a.* Oppoſite leaves. *b.* The *axillæ*, or boſoms of the leaves.

PLATE VII.

Roots, Sect. 80. 85. 163.

Fig.

125. *A.* A ſcaly bulb, as in the white lily —*Bulbus ſquamoſus.*

125. *B.* A ſolid bulb, as in the tulip— *Bulbus ſolidus.*

126. *A.* A double bulb, as in chequered daffodil—*Bulbus duplicatus.*

126. *B.* A globular, or round root, as in earth-nut—*Radix globoſa.*

127. Tranſverſe ſection of a coated bulb— *Bulbus tunicatus.*

128. *A.* A tuberous handed root, as in the *orchis*—*Radix tuberoſa palmata.*

128. *B.* A bundled root—*Radix faſciculata.*

129. *A.* A granulous root, as in white ſaxifrage—*Radix granuloſa.*

129. *B.* A tuberous and pendulous root, as in dropwort—*Radix tuberoſa pendula.*

130. *A.* A ſimple tapering root, as in the carrot—*Radix fuſiformis.*

130. *B.* A jointed root, as in wood-ſorrel —*Radix articulatus.*

131. *A.* A branched root—*Radix ramoſa.*

131. *B.* A creeping root—*Radix repens.*

PLATE VIII.

Parts of the Flower. See Sect. 86.

Fig.

132. *A. a.* An *arillus* opened. *b.* The feed.

132. *B. a.* A *ſpatha* or ſheath, as in the *narciſſus.*

133. *a.* A chaffy huſk, *gluma.* *b.* The beard or awn, *ariſta.*

134. *a.* An univerſal umbel. *b.* A partial umbel. *c.* An univerſal *involucrum* or cover. *d.* A partial *involucrum.*

135. *a.* The *capitulum,* or little head of a moſs. *b.* The *operculum,* or cover. *c.* The *calyptra,* hood or extinguiſher.

136. A *ſpatha* and *ſpadix,* as in the palms, Sect. 86.

137. *a.* A common receptacle of a compound flower not chaffy.

138. The *nectaria* of the *Parnaſſia.*

139. A catkin, *amentum.*

140. A cone, *ſtrobilus.*

141. *a.* The cap. *b.* The *volva.* *c.* The ſtipes of a *fungus.*

142. *a.* The tube. *b.* The limb of a monopetalous *corolla.*

Fig.

143. *a.* The *germen.* *b.* The *ſtyle.* *c.* The *ſtigma.* *d.* The filaments. *e.* The *antheræ.* *f.* The petals of a flower.

144. *a.* The *unguis.* *b.* The *lamina* of a polypetalous flower.

145. *a.* A bell-ſhaped *nectarium* of the *narciſſus.*

146. A paleaceous or chaffy common receptacle of a compound flower.

147. The horned *nectaria* of the *aconite.*

148. The horned *nectarium* in the *calyx* of the *tropæolum.*

PLATE IX.

Parts of the flower and fruit, Sect. 86.

Fig.

149. *a.* The *perianthium.* *b.* The *germen.* *c.* The *ſtyle.* *d.* The *ſtigma.* *e.* The filaments. *f.* The *antheræ* burſting and diſcharging their pollen. *g.* Two *antheræ* whole or not burſt.

150. A ſeed crowned with a little *calyx.* *a.* The ſeed. *b.* The little *calyx.*

Fig.

151. *a.* The pollen viewed with a microſcope. *b.* An elaſtic blaſt diſcharged from it.

152. A winged ſeed. *a.* The ſeed. *b.* The wing.

153. *a.* A filament. *b.* The *anthera.*

154. *a.* The *germen.* *b.* The *ſtyle.* *c.* The *ſtigma.*

155. A legumen or cod. *a.* The ſeeds fixed along the edge of one of the valves only.

156. A *folliculus*, or little bag. *a.* The receptacle of the ſeeds.

157. A *ſiliqua*, or pod. *a. b.* The margins of both valves along which the ſeeds are fixed.

158. A *pomum*, or apple. *a.* The pulp. *b.* The capſule.

159. A *drupa*, or ſtone-fruit. *a.* The pulp. *b.* The *nucleus*, or ſtone.

160. A berry, *bacca.* *a.* The ſeeds. *b.* The pulp.

161. A *capſula* burſting at the top.

162. *a.* The valves. *b.* The *diſſepimenta*, or partitions. *c.* The *columellæ*, or little pillars. *d.* The receptacle.

163. A *capſula* cut down lengthways, that the receptacle of the ſeeds may be ſeen.

164. *a.*

Fig.

164. *a.* Hairy *pappus*, or down. *b.* Feathered *pappus*. *c.* The ſeed. *d.* The *ſtipes*, or thread, which ſupports the *pappus*.

PLATE X.

Modes of Flowering, Sect. 82. 86. 116, 117.

Fig.

163. A *Corymbus*. See Sect. 82.
164. A *faſciculus*, bunch or bundle, as in ſweet Williams. Sect. 82.
165. A ſpike, as in perennial darnel. Sect. 82.
166. A *racemus*, or cluſter, as in currants. Sect. 82.
167. An aggregate flower, properly ſo called. Sect. 116, 117. Shewn in the *ſcabioſa*.
168. A *thyrſus*. Sect. 82. Exemplified in the butter-bur.
169. A *verticillus*, or whorl of the horehound. Sect. 82.
170. A panicle. Sect. 82.
171. A *capitulum*, or little head of field calamint. Sect. 82.
172. A *cyma* of the gelder roſe. Sect. 86.
173. A floret of a compound flower.

An

An umbel. See Pl. VIII. fig. 134.
A *ſpadix* and *ſpatha*. Pl. VIII. fig. 136.
A compound flower. Pl. VIII. fig. 137, and 146.
An *amentum*, or catkin. Pl. VIII. fig. 139.
A *ſtrobilus*, or cone. Pl. VIII. fig. 140.

PLATE XI.

Foliation, &c. Sect. 163. N° 6.

The Leaves cut tranſverſly.

1. Convolute, rolled together ſingle.
2. Involute, rolled in.
3. Revolute, rolled back.
4. Conduplicate, doubled together.
5. Equitant, riding.
6. Imbricate, tiled.
7. Obvolute, rolled againſt each other.
8. Plicate, plaited.

More than one Leaf.

9. *Convoluta*, rolled together double.
10. *Involuta oppoſita*, rolled in oppoſite.
11. *Involuta alterna*, rolled in alternate.
12. *Revoluta oppoſita*, rolled back oppoſite.
13. *Equitantia ancipitia*, riding two-edged.

14. *Equitantia*

14. *Equitantia triquetra*, riding three-cornered.

Parts of an Egg and Seed. Sect. 137.

15. The containing parts of an hen's egg are; *A.* the ſhell; *B.* the exterior film; *C.* the interior film; *E. D. E.* the *chalazæ*, or membrane, incloſing the yolk twiſted at the extremities.
The parts contained are; *H.* the air within the exterior membrane at the obtuſe end of the egg; *I.* the thinner and exterior part of the white; *K.* the interior and thicker part of the white; *F.* the yolk; *G.* the *hilum*, ſcar or cicatrice.

16. A ſeed. *I.* the ſhell, or exterior film; *L.* the film including the yolk; *M.* the yolk; *H.* the ſcar, or point of life.

APPENDIX.

PLATE I.

Fig.

1. *Geranium paluſtre?* natural ſize, p. 441. *a.* The front view of the flower. *b.* The back view of the ſame; both of their natural ſize.

PLATE II.

Fig.

1. *Veronica verna,* natural ſize, p. 444.
2. 2 *A. Tillæa muſcoſa,* natural ſize, p. 448. 2 *B.* The plant in its young ſtate magnified. *a.* The flower ſpringing from the boſom of the leaf. *b.* The flower expanded and magnified. *c.* The capſules of the ſeed magnified.
3. *Ophrys paludoſa,* natural ſize, p. 450.
4. *Holoſteum umbellatum,* of the natural ſize, p. 445.
5. A ſeedling of the *juncus bufonius,* natural ſize.
6. The ſame magnified.

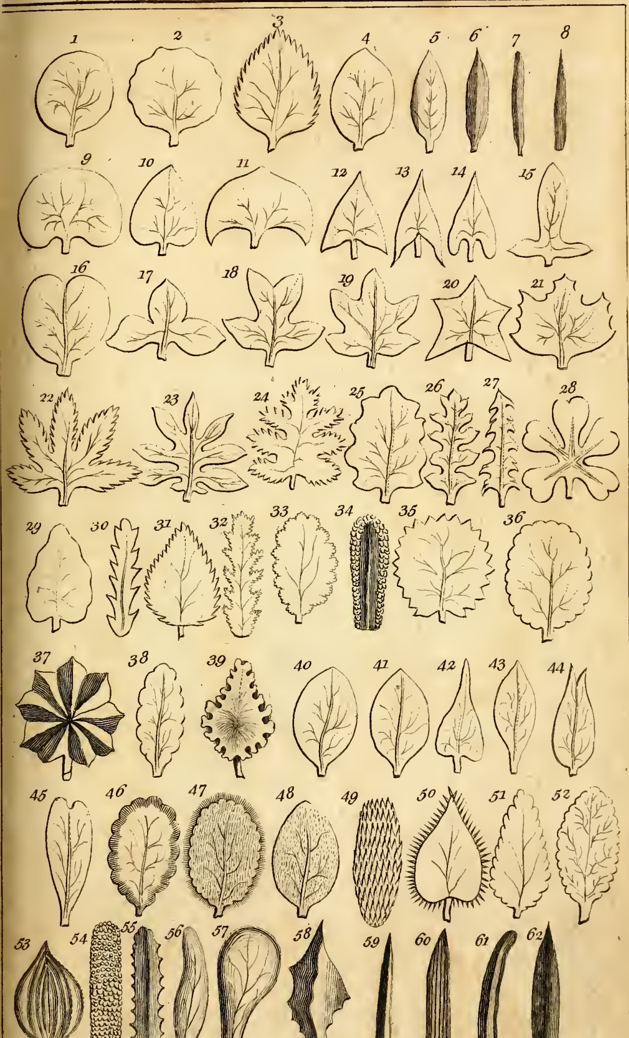
PLATE III.

Fig.

1. *Geniſta piloſa,* natural ſize, p. 452. *a.* The flower magnified.
2. *Hydnum auriſcalpium,* natural ſize, p. 454. *b.* The lower concave ſide of its ſemiorbicular head.

END OF THE PLATES.

C.Bryant delin. J.Lodge sculp.

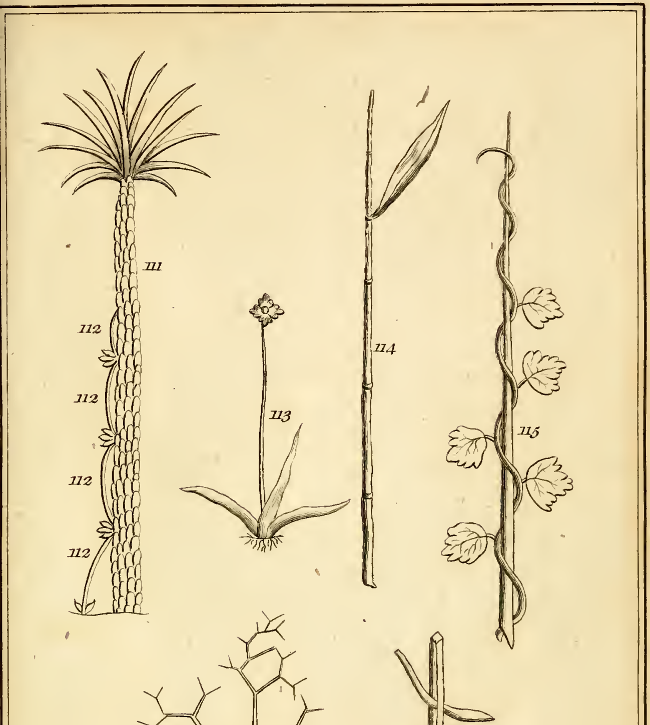


C. Bryant delin. J. Lodge sculp

C. Bryant delin.

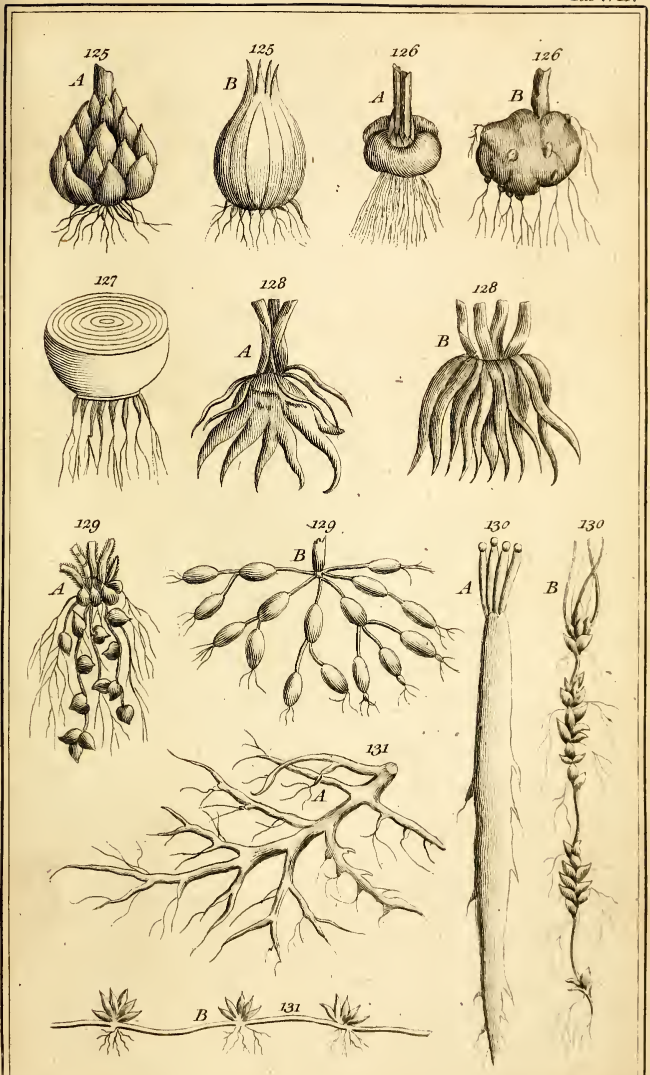
J. Lodge sculp.

C. Bryant delin.   J. Lodge sculp.

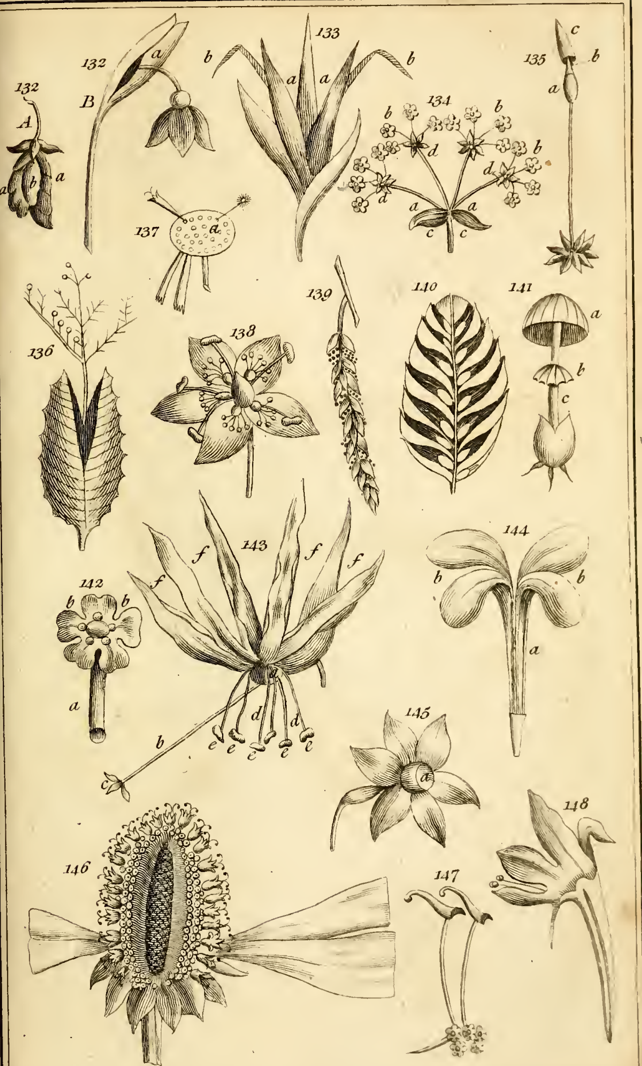


C. Bryant delin. J. Lodge sculp.

C. Bryant delin. J. Lodge sculp.

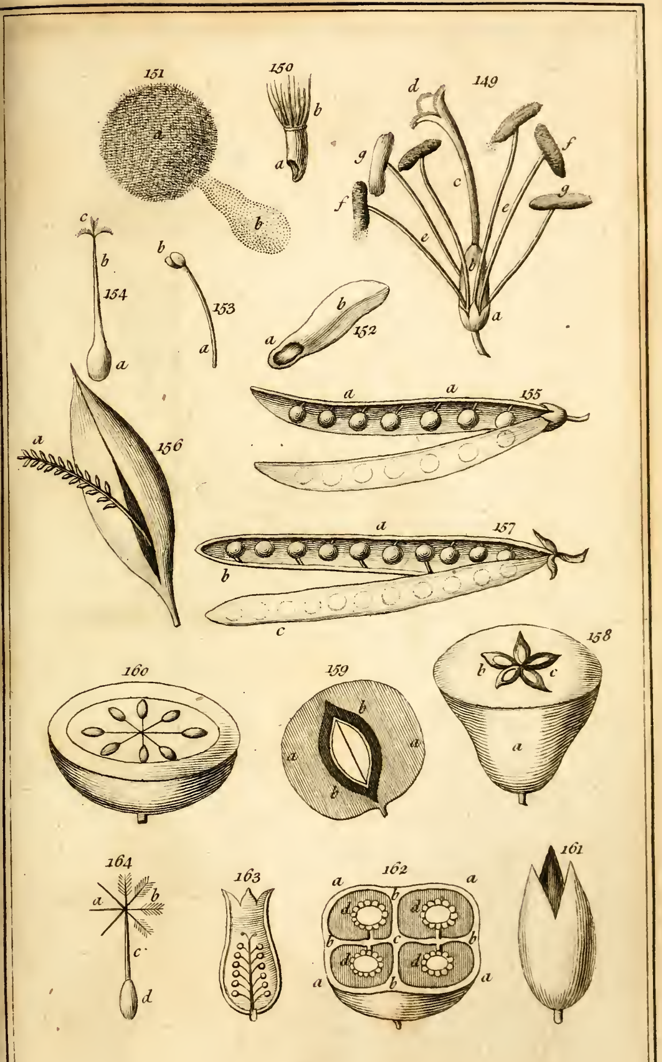


C. Bryant delin.
J. Lodge sculp.



C. Bryant delin.

J. Lodge sculp.



C. Bryant delin. J. Lodge sculp.

Tab. X.

C. Bryant delin. J. Lodge sculp.

C.Bryant delin. J.Lodge sculp.

C. Bryant delin. J. Lodge sculp.


1
2A
2B
a
b
c
3
4
5A
5B
C.Bryant delin.
J.Lodge sculp.

C. Bryant delin. J. Lodge sculp.