An experimental inquiry into the similarity in virtue between the Cornus florida and sericea : and the Cinchona officinalis of Linnaeus, together with an inquiry into the modus operandi of astringent vegetables in preventing the putrefactive fermentation / by John M. Walker.

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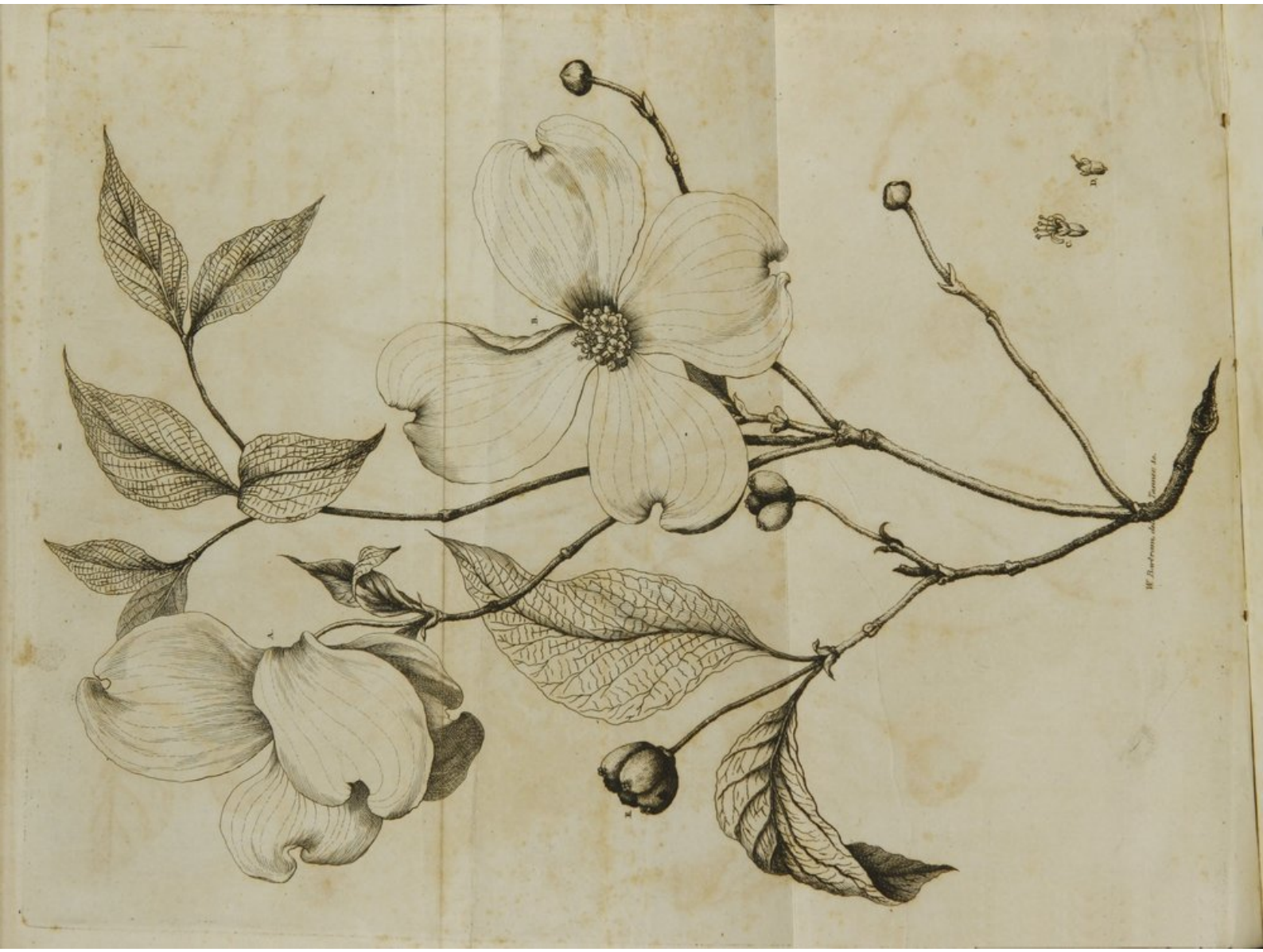

AN EXPERIMENTAL INQUIRY

INTO THE

SIMILARITY IN VIRTUE

BETWEEN THE

CORNUS FLORIDA AND SERICEA,

AND THE

CINCHONA OFFICINALIS OF LINNÆUS,

TOGETHER WITH

AN INQUIRY INTO THE MODUS OPERANDI

OF

ASTRINGENT VEGETABLES

IN

PREVENTING THE PUTREFACTIVE FERMENTATION.

BY JOHN M. WALKER,
OF VIRGINIA:

MEMBER OF THE AMERICAN LINNÆAN SOCIETY AT PHILADELPHIA, AND MEMBER OF THE PHILADELPHIA MEDICAL SOCIETY.

Every theory founded upon experiment, and not assumed, is always good for as much as it will explain.

BURKE.

PHILADELPHIA:

PRINTED FOR THE AUTHOR, BY H. MAXWELL, NO. 25, NORTH SECOND STREET, OPPOSITE CHRIST-CHURCH.

1803

AN INAUGURAL DISSERTATION,

FOR

THE DEGREE

OF

DOCTOR OF MEDICINE;

SUBMITTED

TO THE EXAMINATION

OF THE

REVEREND JOHN ANDREWS, D. D. PROVOST,

(PRO TEMPORE;)

THE

TRUSTEES AND MEDICAL PROFESSORS

OF THE

UNIVERSITY OF PENNSYLVANIA,

ON THE 8th DAY OF JUNE, 1803.

Doctor Warnsley with
compliments from his friend
& fellow graduate
the Author

TO DOCTOR ROBERT WALKER,

OF VIRGINIA.

DEAR SIR,

IT is not the pleasing recollection of the kind admonitions and instructive lessons, nor the lively remembrance of the many disinterested services and attentions which I received from you, while under your direction, that alone prompts to this dedication; but it is likewise the more pleasing recollection of the high station in the republic of medicine, which your talents, and success in the practice of physic, have long conferred upon you.

Permit me, therefore, to offer you this, the first fruits of your instruction, as the public mark of my acknowledgment, while my heart shall, in secret, ever continue to pay you the still dearer tribute of gratitude, due from

YOUR FRIEND

AND PUPIL.

TO BENJAMIN SMITH BARTON, M. D.

PROFESSOR OF MATERIA MEDICA, NATURAL HISTORY, AND BOTANY, IN THE UNIVERSITY OF PENNSYLVANIA.

SIR,

THE objects of dedications are as various as the acquirements and qualities of the mind: some are intended to express talents, zeal, and knowledge in science; others, benevolence and humanity. In you all these are concentred in an eminent degree. To none, therefore, could I with more propriety dedicate this imperfect essay, than to yourself.

Accept it then, Sir,

As a mark of the greatest respect

And friendship from the

AUTHOR.

INTRODUCTION.

IT was an opinion early held in Medicine, that every country possessed an antidote to its diseases. The history of the Peruvian Bark tended greatly to confirm this, and if there be any justness in it, this opinion may be again revived in America. For if Nature has given us, in our swamps and marshes, a Pandora's Box, she has in our forrests given us a Cornu Copia; has she in our vallies sowed the seeds of disease, she has on our hills planted the Cornus Florida; or has she, more grievously to us, given wing to the volatile miasmata, that, under protean forms, attack us in a thousand ways, she has most providently scattered in our swamps the Cornus Sericea.

But I would not be understood to overvalue these provident gifts of nature, in implying specifies. Conscious of the short-lived reputation which exaggerated virtues beget for their medicines, I shall not deal in hyperbole; much less shall I detract from the Peruvian Bark, its justly accumulated praises, to heighten the blaze of contrast; nor shall I even introduce from obscurity into notice, inert undeserving

vegetables:—Already have their virtues been perceived by the penetrating eye of professor Barton*.

I have only then to shew, upon analytical principles, what foundation there is for a similarity in virtue, between the Cornus Florida and Sericea, and the red Peruvian Bark.

The most satisfactory mode of doing which appeared to be that of subjecting the Corni to every experiment, to which the Peruvian Bark has been subjected. The desire of utility, and not the love of novelty, nor the merit which is generally annexed to it, could have prompted to such an analysis; for so many valuable experiments and observations have already been made on the Peruvian Bark, that little now remains to be added. My claim to indulgence must, therefore, rest upon the intention alone, and not the performance.

Too long has America paid tribute to foreign countries, too often have her physcians been baffled in their practice from the adulteration of the bark. Every attempt, therefore, to liberate us from importation and obviate imposition is praise worthy in itself; but how much more so must it be, when it is directed to our own, too long neglected treasures. Flattering myself that your zeal to encourage such an attempt, will draw the mantle of forgetfulness over its imperfections, I shall proceed to the investigation of the subject. In prosecuting which I cannot follow a better method, than the canon of Linnæus, " Systemate, Qualitate," Experimenta, " et experientia, eruitur omnis usus plantarum."

* Vide his collections for an essay towards a Materia Medica of the United States, page 12.

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SYSTEMATE.

THE Genus Cornus, to which the English have given the name of Cornel or Dogwood, is arranged by Linnæus, in the class and order Tetrandria Monogynia of his sexual system. In this artificial system it is associated with a number of genera, the species of which are often endued with properties very essentially different from those of the two species of Cornus, which form the principal objects of this dissertation.

In his work on the natural orders of vegetables, the great Swedish naturalist, has arranged the Genus Cornus, in his forty-seventh order, to which he has given the name Stellatæ, or Stellate plants, a name originally applied by the illustrious Mr. Ray. In this order, the Cornus is associated with a number of genera, some of which are endowed with highly useful medical, or other properties. I shall here mention the names of some of them; they are Galium, Rubia, Spigelia, Coffea, and Psychotria.

In the system of Mr. De Jussieu, the Cornus is arranged in the third order of his eleventh class, to which he

has given the name of Caprifolia. Some of the principal genera with which it is here associated, are Lonicera, Triosteum, Caprifolium, Viscum, Viburnum, and Sambucus, and the medical properties of these, as far as we are yet acquainted with them, are not very similar, to those of the species of Cornus, which are about to claim our attention. The Viscum, or Missletoe, has, indeed, been recommended by some practitioners, as a remedy in intermittent fevers, and as a tonic in other diseases.

The following is Linnæus's abridged definition of the Genus Cornus:

Involucrum 4....phyllum sæpius. Petala supera, 4....Drupa Nucleo 2....loculari.

Of this genus, many species are now known to the botanists, and of these, several, especially of the North American species, were unknown to Linnæus; with the Cornus Florida, and Cornus Sericea, however, he was acquainted.

The Cornus Florida, which is well known in many parts of the United States, by the name of Dogwood, and less generally by that of Box-wood, is a very common vegetable in many parts of North America. The following account of the Dogwood, is taken from an interesting manuscript copy of the Geographical History of the Plants of North America, read to the American Linnean Society, by Dr. Barton, president of said society. "The Cornus Florida grows as far north as latitude 45° and it extends as far south as latitude 28°. It is a tree of moderate stature. It does not in general attain the height of more than from eighteen to twenty-five feet. Sometimes, however, it makes a nearer approach to the more lofty trees of the forests, attaining to the height of at least forty feet, and near one foot in diameter." The trunk is strong and covered with a rough bark, which is much disposed to separate into longitudinal and transverse fissures, or cracks. The wood is extremely hard, and durable. Hence it has received

one of its names, that of New-England Boxwood. The branches are numerous and spreading, and sometimes placed opposite, but frequently by fours, arising from opposite points, and pretty regularly disposed. The leaves are oval, pointed, entire, and very veined. The flowers are produced at the extremity of the small branches in clusters, the individuals of which are more or less numerous.

They consist of an involucre, which is composed of four very large obcordate folioles, of a fleshy texture, and of a fine white colour. The extremity of each foliole, is marked by a notch, which sometimes exhibits the appearance of having been bitten. These parts of the involucre are generally of a dusky rose colour. The flowers, which are situated in the centre of the large involucre (involucrum maximum of Linnæus) are very small and of a yellowish colour. The calyx or empalement is monophylous, or one leafed, very small and four toothed above. It is deciduous, or falls off before the ripening of the fruit. The corolla consists of four petals. The stamens are four, and of the same length. There is one pistil consisting of a roundish germ, which is inferius or beneath. The style is filiform and nearly the length of the corolla. The stigma obtuse.

The flowers generally make their appearance, in Pennsylvania, and other middle parts of the United States, about the beginning of May. They exhibit a most beautiful appearance; the large and white involucre forming a fine contrast, with the green of the forest. They are succeeded by oblong drupes, commonly called berries, which are of a rich crimson colour. The berries ripen in September, and are the food of various species of birds, such as the robin (turdus migratorius,) thrush (turdus rufus,) &c. They have a very bitter taste, and a spiritous impregnation of them, is much used as a morning bitter, and sometimes as a remedy in intermittents, in many parts of the United States.

EXPLANATION OF THE PLATE.

(A) A view of the four folioles of the involucre.

(B) An expanded flower, exhibiting the involucre, in the centre of which are placed the flowers.

(C) A single blossom exhibiting the calyx, petals, and four stamens.

(D) The four-toothed calyx, and the pistil.

(E) The ripe drupes, or berries.

The Cornus Sericea, or American Red-rod cornel, agrees in its generic character, with the Cornus Florida. It grows in a moist soil, commonly by the sides of creeks and rivers, and seldom attains the height of more than ten or twelve feet. In general, a considerable number of stems arise from the same root, and are very straight. The bark, or rather epidermidal covering of the young shoots, is very smooth, shining, and of a rich dark red colour. This circumstance added to the manner of growth of the stems, has procured to this species, the improper name of the Red Willow, by which name it is known in many parts of the United States. In Virginia it is called the Swamp Dog-wood, and Rose Willow. The branches are placed opposite, as are also the leaves, which a good deal resemble those of the Cornus Florida. Their under surface has a somewhat silken appearance, on which account, Linnæus gave to this species the name of Cornus Sericea. The flowers are produced in clusters or cymes, of a whitish colour, and commonly make their appearance in June or July; they are succeeded by succulent drupes, or berries,

which are of a blue colour, inclining to green when ripe. They are eaten by different species of birds.

I am informed by Professor Barton, that the Indians of North-Carolina used to scrape the inner bark of this tree and smoke it in their pipes, when their tobacco was scarce; and they would frequently mix the bark of it along with their tobacco to smoke. This habit would seem to imply something narcotic.

For an excellent figure of the Cornus Sericea, I may refer the reader to the late Mr. L'Heritier's valuable Monographia on the genus Cornus.

On the uses of the Corni in the arts, much might be said; but I shall merely enumerate a few of the most important purposes to which they may be applied.

The fine texture, hardness, whiteness, and durability of the wood of the Cornus Florida, renders it an important article to the cabinet-makers and joiners, in inlaying and ornamenting their various works. To the mechanic in general, in making the most durable handles to their instruments, their guages, squares, and plane stocks, &c. for all of which purposes, it is but little inferior to the English Box-wood. To the dentist it is no little acquisition, being the only kind of wood which will answer the purpose of pluging in transplanted teeth.

The straight slender red sprouts of the Cornus Sericea, are often employed for making baskets.

The bark of these two species of Cornus are very similar in those properties, which interest the mechanic. The more abundant bark of the Cornus Florida will, therefore, recommend itself in making ink, tanning, dyeing, galling, &c. For the quantity of gallic acid in the bark of the Dogwood, intitles the latter to rival the oak and the galls in the above processes.

For the purpose of encouraging the use of our own indigenous vegetables, as well as lessening the necessity of im-

porting the galls, I have here given the result of several experiments on the subject of making ink. By mixing

½ oz. Pulv. Cort. Cor. Flor.
2 dr. Sulph. Iron.
2 sc. Gum. Arab.
16 oz. Aqua. Font.

an excellent black thin ink was made, fit for immediate use—and with which the whole MS. of this dissertation has been written. I must here observe that it is not necessary to be particular in choosing the particular parts or size of the part of the tree, in procuring the bark for this or medical purposes. I attended to this in the early part of my experiments, but I found the difference in virtue between the bark of the root, body, or branches of a moderate size not to be worthy of notice.

QUALITATE.

THE majority of practitioners of the present time, pay so little attention to this mode of investigating the medical qualities of plants, that I shall not be very minute on this part of my subject, which, according to the design and order above given, first presents together the Cornus Florida and Sericea, and the Cinchona* Officinalis for similar investigation.

Plants, like animals, have a considerable analogy in their structure.—Hence what is said on the bark of the one will apply, with but little exception, to the other two. A horizontal section of a branch of the Cornus Florida, exhibits an external thick covering or bark, which is perceptibly divided into three distinct rings or layers, the outermost of which is

* For I deemed it unnecessary to say any thing on the Botanical history of the Cinchona. It has been too long a favourite article in the Materia Medica, to require, now, an historical account.

called Epidermis,*—the middlemost Parenchyma, and the innermost is called Cortical, this latter is the part which is to occupy our attention in the present and subsequent divisions of this dissertation. The colour of this Cortical part is in the Florida, yellowish, in the Sericea greyish, and in the Cinchona red. Its taste is in all three of these vegetables nearly similar, though somewhat more bitter and astringent in the corni than the Bark: the former when retained in the mouth sometime, only impart to the tongue these two tastes, along with a pleasant warmth; whereas when the latter is retained the same length of time, along with this bitterness and astringency, it imparts an indescribable taste, which will be easily recognized by every one who has taken the bark.

EXPERIMENTA,

INCLUDING THEIR CHEMICAL ANALYSIS.

SO important is analysis to chemistry, that many, learned in that science, have honoured it by calling chemistry the science of analysis: and certainly no researches, in which man has been engaged, have unfolded the powers of his mind, in a more ample manner, than this part of chemistry. In its history we perceive the gradual developement of his intellect, in shaking off the trammels of Egyptian priests, and emerging from the veil of alchemical hieroglyphics.

But in no view do we behold him more nobly engaged, than in tracing, link after link, that elective attraction, which binds together the particles of matter, and which, it would seem, were intended by Nature to conceal them under eternal darkness.

* Grew and Malpighi, were the first who minutely examined the structure of vegetables, and gave names to the different parts. The latter was a celebrated anatomist and physiologist. Hence the above anatomical names.

But the destructive flame, while it conceals its own simplicity, developes the composition of those bodies on which it operates. By our acquaintance with this promethean torch, we approximate our works to those of nature, since we do not the less immitate her, by commencing where she terminates; and though we cannot equal her, in composition, we certainly rival her in resolving bodies into their primordial simplicity. When has a natural analysis taken place, without destroying itself in obedience to synthetic laws?

But the chemist, when he has broken the vinculum of union in bodies, collects the separated particles, and reserves them for future investigation. This is the business of analysis. In the progress of this operation, two stages may be marked; first, that which resolves compounds into their proximate or secondary principles,* such as gums, resins, &c. and secondly, that which decomposes these again into their ultimate particles, as carbon, hydrogen, &c.

Since my object is to treat the Corni as articles of the Materia Medica, I shall only prosecute their analysis to the first stage; this being the only one which enlightens the subject in such a view: for though plants by their diversity in size, colour, texture, and form display, to our observation, characters apparently the most dissimilar, yet they afford, by their ultimate analysis, results so simple and similar to each other, as not to be the objects of the Materia Medica.

In prosecuting this analysis, I have laboured to be concise. To have detailed separately the various experiments, to which each individual article was subjected, would have extended this dissertation far beyond the ordinary limits of an inaugural thesis. I have, therefore, arranged such experiments, as admitted, into a condensed tabulated form.

I have likewise laboured to be accurate. Many experiments were performed in such manner, that the succeeding either confirmed or disproved the accuracy of the preced-

* Fourcroy.

ing: thus, in ascertaining the solvent power of different menstrua, by weighing the menstruum before and after maceration on the article, the difference in weight shewed its solvent power; this was again confirmed by the residue, after evaporation, agreeing with the above difference.

The first experiment which I made, was distillation. Equal quantities, that is one ounce of the pulverised bark of the root of the Cornus Florida and Sericea, and of the red Peruvian Bark, were macerated in six ounces of water, in retorts, during six hours. Receivers were then luted to the retorts, and heat gradually applied, and continued until near half of the fluids had come over; the receivers were then changed, and empty ones adapted as before; the heat was then increased to the intensity which Argand's lamp would afford, and continued until the powders appeared, in the retorts, like dried cakes.

The products of the first distillation of the Corni were transparent whitish fluids, possessing a slight aromatic odour, resembling new whisky, without any perceptible taste. They did not produce any change with the following re-agents, employed with the products of the second distillation. Knowing that etherial oil, which is the base of vegetable aroma, appears under different forms, I did not conclude against its presence in the Corni, because it did not swim on the surface of the distilled liquor. The whiteness of the fluid indicated the presence of something which I concluded to be essential oil, having its specific gravity, equal to that of the fluid, and might, therefore, remain in any part of the fluid, without rising or sinking.

The fluid, distilled from the Peruvian Bark, differed from the above in no respect, but in possessing a flavour not aromatic, but peculiar to the Bark. The fluid was clear and transparent.

The fluids, furnished by the last distillation, were more disagreeable in smell, with a taste somewhat acerb. Those from the Corni acquired a lemon colour; that from the Peruvian Bark was tinged with red.

The following is a synopsis of the changes which took place upon mixing the fluid, distilled from

	*With litmus paper.**	*Oxy-sulphate.*	*Acc. Lead.*	*Carb. Alumen.*
the Corn. Flor.	Red.	Black.	Precipitate.	Effervescence.
the Corn. Seri.	Red.	Black.	Precipitate.	Effervescence.
the Cort Peru.	Red.	Brown.	Precipitate.	Slight Effervescence.

This experiment sufficiently proves that the virtues of the Corni and Peruvian Bark are for the most part fixed, and that each contains the gallic acid, though it is in greater quantity in the Corni than in the Bark, as is manifest from the difference in the colour, produced by their mixture with the oxy-sulphate. The gallic acid likewise comes over in distillation in an uncombined state, as appeared evident upon applying a piece of litmus paper which had been dipped into the distilled fluid, with a similar piece taken out of a saturated solution of the carbonate of potash, a perceptible effervescence took place.

This experiment likewise adds some weight to those of Dr. Skeete, who with a boldness paramount to his ingenuity, has denied to the Peruvian Bark an aromatic quality, which had been conferred upon it for near a century, and which had been the foundation for many of its praises. Attentive to this circumstance, I conducted the distillation with a gradually increasing heat, furnished by Argand's lamp, which enabled me to regulate it in the manner I judged most favourable for the production of essential oil, but, upon examination, I could not detect the least quantity.

Discouraged at the result of this experiment, and recollecting the success of the ancient chemists, many of whom laboured thirty years in the distillation of dried vegetables, without obtaining a different result, I did not choose to prosecute the distillation farther, but preferred following the moderns in the employment of menstrua. For the improvement of this kind of Analysis, the Materia Medica is greatly indebted to the labours of Bouldoc and

* Of the shops.

Fourcroy, since it is this kind which has enriched it with some of its most important articles, as gums, resins, extracts, &c. The following table exhibits, in a synoptical view, the solvent power of water, under different modes of treatment. There is but little requisite to be said in explanation of it, since the slightest attention will render it intelligible. But it may here be observed, that the chalybeate solution, mentioned in the last column, was the oxy-sulphate of iron, dissolved in water, in the proportion of one dram of the former to four ounces of the latter, which is the proportion to be recollected, whenever this solution is mentioned, and the proportions of the preparations tested, and the test is half an ounce of the former to half a dram of the latter.

TABLE 1st. SHEWING THE SOLVENT POWER OF THE SAME MENSTRUUM UNDER DIFFERENT MODES OF PREPARATION.

	ARTICLES EXPERIMENTED WITH.	*Proportion of Solvend and Solvent in* dr.	oz.	*Time of preparation in Hours.*	*Sensible Qualities.* *Colour.*	*Taste.*	*Weight of Menstruum per oz. in* dr.	sc.	grs.	*Quantity per ounce, taken up in grains.*	*Colour with Chalybeate.*
	Water employed in all the Experiments.						7	2	11		
EXP. 2. Decoction of the	Pulv. Cort. Rad. Corn. Flor.	4	6	1	light red	Bitter acerb.	8	0	7	16	dark black
	Pulv. Cort. Arb. Corn. Flor.	4	6	1	light red	bitter acerb.	8	0	6½	15½	black
	Pulv. Cort. Rad. Corn. Seri.	4	6	1	dark red	bitter	8	0	5	14	dark black
	Pulv. Cort. Arb. Corn. Seri.	4	6	1	dark red	and acerb.	8	0	5	14	black
	Pulv. Cort. Peru. Rub.	4	6	1	red	bitter do.	8	0	0½	9½	dark
EXP. 3. Infusion of the	Pulv. Cort. Rad. Corn. Flor.	3	5	24	red	bitter	8	0	2½	11½	dark black
	Pulv. Cort. Arb. Corn. Flor.	3	5	24	red	and acerb.	8	0	1	10	ditto
	Pulv. Cort. Rad. Corn. Seri.	3	5	24	dark red	bitter	8	0	2	11	dark black
	Pulv. Cort. Arbo. Corn. Seri.	3	5	24	dark red	and acerb.	8	0	2	11	ditto
	Pulv. Cort. Peru. Rub.	3	5	24	red	ditto	7	2	16	5	black
EXP. 4. Hot triturated Inf. of the	Pulv. Cort. Rad. Corn. Flor.	4	6	½	light red	bitter	8	0	3	12	ditto
	Pulv. Cort. Arb. Corn. Flor.	4	6	½	light red	and acerb.	8	0	2½	11½	ditto
	Pulv. Cort. Rad. Corn. Seri.	4	6	½	dark red	bitter	8	0	1	10	ditto
	Pulv. Cort. Arb. Corn. Seri.	4	6	½	dark red	and acerb.	8	0	1½	10½	ditto
	Pulv. Cort. Peru. Rub.	4	6	½	light red	ditto	7	2	19	8	dark
EXP. 5. Cold triturated Inf. of the	Pulv. Cort. Rad. Corn. Flor.	3	5	½	light red	bitter	8	0	6	15	dark black
	Pulv. Cort. Arbo. Corn. Flor.	3	5	½	light red	and acerb.	8	0	5	14	ditto
	Pulv. Cort. Rad. Corn. Seri.	3	5	½	dark red	bitter	8	0	3	12	dark black
	Pulv. Cort. Arb. Corn. Seri.	3	5	½	dark red	and acerb.	8	0	3	12	ditto
	Pulv. Cort. Peru. Rub.	3	5	½	light red	ditto	7	2	18½	7½	black

Though few comments upon this table are required, it will not be improper to point out some of the peculiarities which prevailed in these experiments, and which could not be noticed in the table. The difference in all these preparations is not so great as to require describing them in separate classes. I may therefore, add, that though the taste of the Corni is a more simple and agreeable bitter than the Peruvian Bark, it has nevertheless considerable austerity combined with it; the decoctions possess most of the latter, and the hot triturated infusions the next. I may likewise add that the decoctions and hot infusions were less elegant preparations; the hot menstruum held in suspension some of the fine powder, which was not entirely deposited by cooling, nor in passing through the filter.

This circumstance accounts for the generally received opinion, that heat increases the solvent power of water on vegetables in general, and in so considerable a degree, upon the Peruvian Bark in particular, that Dr. Skeete estimated the specific gravity of the decoction to be, to that of the infusion as five to two. In this part of the Doctor's valuable observations on the Bark, his usual correctness must have deserted him. The result of the experiment in Table, 1st. article the last, in experiments the second and third, shew their specific gravity to be as, 1.900 to 1.000. Nor is this superior gravity of the decoction over the infusion owing, as the Doctor supposed, to the superior solvent power of the hot over the cold menstruum, but to the mere suspension of the fine powder of the Bark in the menstruum, which becomes so incorporated with the gum and mucilage, by the heat increasing their liquidity, and by the agitation of boiling, that it is difficult to separate it afterwards. This is rendered probable by the after analysis of the gum. What could the superior darkness of the solution of the gum obtained from the decoction, be owing to, unless to something which was insoluble in water and alcohol? Nor did the decoction manifest stronger virtues by its

sensible qualities, or from the change it produced with a solution of the oxy-sulphate, nor did the effects produced on the pulse, hereafter to be mentioned, manifest its superior power. I shall not dwell longer on this part of the table, in pointing out the peculiar advantages which each mode of preparation has, but shall only add, that experiment the fifth, shews the cold triturated infusion to be equal to any, and it has the advantage of expedition.

As the ascertaining the exact quantity of gum, resin, or extract, in any given quantity of the articles in substance, would be more curious than useful, and more difficult than either, from the tenacity of these substances to the vegetable fibre, I have* omitted such inquiry, while I have directed my experiments to the more useful investigation of what part of the vegetable their virtue resides, and the proportion which these parts bear to each other, in the more common preparations of infusions, tinctures, &c. The utility of such an inquiry must be palpable to every one who is acquainted with the powers which chemistry furnishes us, by which we may imitate, or modify these proportions when they shall be known.

Already much has been done by the artificial combination of bitterness and astringency: and though I have not the vanity to suppose I shall add any thing new, to the long sought for constitution of the Bark, yet my object will be answered in tracing its analysis with that of the Corni.

Experiment, 6. The object of this experiment was, to ascertain the constituent parts of the gum like mass, furnished by the evaporation of the decoction of the bark of the root of the Cornus Florida. Two drams of this gum, which were furnished by seven and a half ounces of the decoction, were macerated in successive quantities of the best alcohol,

* For which omission, I may expect pardon, when I add, that Dr. Percival, whose patience was equal to his zeal for science, acknowledged that twenty-five coctions, and thirty macerations were insufficient to exhaust the virtues of the Cinchona.

until the last portion ceased to be changed in colour and taste; this, like the former portions, was separated from the gum by the filter; after the gum had dried upon the filter, it was collected, and weighed only half a dram. The dried gum was then dissolved in a small quantity of water. Its solution was imperfect, not transparent, nor bright coloured; it possessed no particular taste, which might not be ascribed to its viscid consistence; and it produced no change of colour with a solution of the oxy-sulphate of iron. The want of transparency led me to suppose there might be some mucilage in the solution; to determine which I added, in small portions, diluted sulphuric acid to the solution: a precipitate slowly fell to the bottom in a coagulated form. When the precipitation had ceased, it was separated from the solution by the filter, and evaporated to dryness, at the same time with the solution. By weighing each residium, I found the mucilage to be in the proportion of three to five, that is eighteen grains of gum, and twelve of mucilage.

I should here observe, that upon the addition of the acid, the solution turned dark, and that I do not ascribe the want of transparency in the gummy solution to the prescence of mucilage entirely; but to the fine powder of the medicine, which the viscidity of the fluid suspended and concealed;—and probably the change of colour, just mentioned was owing to the carbonation of these particles by the acid.

The alcohol which had been employed in the early part of this experiment, was next examined, and found to possess an intense bitter taste along with considerable astringency: it produced an intense black colour, with the oxy-sulphate of iron. Its colour was a beautiful dark red, not inferior to the tincture of kermes. By evaporating the alcohol, I obtained a dram and a half of what ancient chemists called saponaceous matter, but what I shall, after the example of Mr. Hermstadt,* to whom I am indebted

* Vide Med. and Phys. Journal of Lond.

for the suggestion of many of the re-agents employed in these experiments, call extractive matter; which he says may be distinguished from all other vegetable matter, by being soluble in water and alcohol, and not in sulphuric ether. But I must here observe, that this character is more extensive than Mr. Hermstadt appears to be apprized of, for it equally applies to the Tannin principle. May not Tannin be the extract of vegetables altered by the gallic acid? The above character of extractive matter, suggested the maceration of it in ether, to ascertain whether the water, by boiling the medicines in substance, had taken any of their resin. Accordingly two ounces of sulphuric ether was poured on the ninety grains of extract, which, at the end of thirty-six hours, was separated by the filter; and this was repeated as often as the last portion of ether was changed in taste or colour, which changes indicated the presence of resin. After the last filtration the extract was suffered to dry upon the filter; when collected and weighed, it had lost only six grains of its former weight.

The ether had acquired a bitter taste, without astringency. It did not produce a black colour with a solution of the oxysulphate of iron. The evaporation of the ether left a brown resinous mass in the vessel, which weighed nearly six grains. From the difficulty, if not the impossibility, of accurately separating the tannin and the gallic acid from the extractive matter, at this stage of the analysis, I omitted the attempt, and preferred considering the extractive matter as a terniary compound, possessing a very bitter taste, along with considerable astringency; it produced a black colour with the oxy-sulphate.

The gum from the decoction of the bark of the root of the Cornus Sericea, and of the Peruvian Bark, were treated in a similar manner. Their ingredients, along with their proportions, may be seen in the following synopsis.

The sensible and chemical qualities of the decoction of the bark of the trees Cornus Florida and Sericea, dif-

fered so little from those of the roots of their respective trees, that I thought it unnecessary to analize their gums in the above manner—

In { 7½ oz. of decoc. of Cor. Flor. there is in grs. 18 12 6 84
8½ oz. of decoc. of Cor. Ser. there is in grs. 18 10 9 83
13 oz. of decoction of Peruvian Bark, 20 6 14 80 } *Gum. Muc. Res. Ext.* making 120 120 120 grains of gum-like mass.

TABLE II. SHEWING THE SOLVENT POWER OF DIFFERENT MENSTRUA, PER OUNCE.

ARTICLES EXPERIMENTED ON	*Proportion of Solved & Solvent.* dr.	oz.	*Time in Days.*	*Sensible quality, Colour.*	*Weight of Menstruum per ounce in* dr.	sc.	grs.	*Quantity taken up per oz. in grains.*
SPIRIT VINI.				colourless	6	2	4	
EXP. 7. Tinc. with Spirit-Vini. Pulv. Cort. Rad. Corn. Flor.	3	6	9	light red	6	2	19	15
Pulv. Cort. Arb. Corn. Flor.	3	6	9	light red	6	2	18½	14½
Pulv. Cort. Rad. Corn. Seri.	3	6	9	deep red	6	2	16½	12½
Pulv. Cort. Arb. Corn. Seri.	3	6	9	deep red	6	2	16	12
Pulv. Cort. Peru. Rub.	3	6	9	dark red	7	0	2	18
PROOF SPIRIT.				Light yellow	7	0	4	
EXP. 8. Tinc. with proof Spirit of Pulv. Cort. Rad. Corn. Flor.	4	6	8	lemon colour	7	1	4	20
Pulv. Cort. Arb. Corn. Flor.	4	6	8	ditto	7	1	3½	19½
Pulv. Cort. Rad. Corn. Seri.	4	6	8	deep red	7	1	0	16
Pulv. Cort. Arb. Corn. Seri.	4	6	8	ditto	7	1	0	16
Pulv. Cort. Peru. Rub.	4	6	8	dark red	7	1	3½	19½
PORT WINE.				deep red	7	1	9	
EXP. 9. Vinous tincture of Pulv. Cort. Rad. Corn. Flor.	4	6	8	increased	7	2	0	11
Pulv. Cort. Arb. Corn. Flor.	4	6	8	ditto	7	1	18	9
Pulv. Cort. Rad. Corn. Seri.	4	6	8	dark red	7	1	19	10
Pulv. Cort. Arb. Corn. Seri.	4	6	8	ditto	7	1	18½	9½
Pulv. Cort. Rub. Peru.	4	6	8	deep red	7	1	17	8

This table, as well as the former, proves the superior solubility of the Corni in aqueous and diluted spiritous liquors, while the Peruvian Bark is equal to it in alcohol. The inferior solubility of the Bark in aqueous fluids can only be owing to its possessing resin in the greatest quantity, which is sparingly soluble in such fluids, while the Corni, possessing more gum and extract, are nearly soluble alike in water and alcohol. They are likewise more miscible in water, than the Bark, as might be inferred from the latter possessing the greatest quantity of resin. And I may observe that the Cornus Sericea approaches nearest to the Bark, in the proportion of its constituent parts, as may be seen by an attentive examination of their analysis. To add more on their sensible qualities, would only be a repetition of the sensible qualities of the Bark, which, it is presumed, are sufficiently known; for, as far as I can perceive, they are exceedingly alike. Their colours being different shades of red, and their tastes bitter and astringent.

The tenth experiment had for its object the separating the extractive matter taken up by the alcohol, from the resin. With this intention I macerated one dram of the resinous mass of the Cornus Florida with repeated small quantities of sulphuric ether: the solution was very imperfect. The first and second portions of ether acquired a dark colour, the third was so little altered in colour, that I judged it had taken up all the resin. This portion of ether, like the other two, was separated from the insoluble mass by the filter, and mixed with them. The ether was now of a bitter taste, without much astringency; it did not strike a black colour with the oxy-sulphate: upon evaporation it afforded forty-five grains of resin, of a yellowish colour. The extract now collected from the filter was of a dark colour, with considerable bitterness and astringency, produced an intense black colour with the oxy-sulphate, and weighed fifteen grains. It is to be recollected that the small quantity of the medicine, employed in this experiment, to be

tested, was equal in all these articles, and for which allowance has been made. The following synopsis exhibits that

		Resin.	*Extract.*		grs.
In	4 *oz.* of alcoholic tinc. of Cor. Flor. there is in grains	45	15	making	60
	$4\frac{1}{4}$ *oz.* of alcoholic tinc. of Cornus Sericea, there is in grains	$47\frac{1}{2}$	$12\frac{1}{2}$		60
	4 *oz.* of alcoholic tinc. of red Peruvian Bark, there is in grains	51	9		60

I am here to observe that the extract is to be considered as a compound of extract, tannin, gum, perhaps a little mucilage, and the gallic acid; for alcohol has the property of taking up all these in a small quantity from vegetable matter.

A summary recapitulation of these experiments shew that the Cornus Florida and Sericea, and the Peruvian Bark possess the same ingredients, that is gum, mucilage, and extract, which last contains the tannin and gallic acid, though in different proportions. The Florida possesses most of the gum, mucilage, and extract; the Sericea the next, which appears to be an intermediate between the Florida and Peruvian Bark; while the latter possesses most of the resin. Their virtues appear equally similar in their residence. The extract and resin possess all their active virtues. The extract appears to possess all their tonic power. The resin, when perfectly separated from the extract, appears to be purely stimulant; and probably the tonic power of the extract is increased, when combined with a portion of the resin, as in the spiritous tincture.

THEIR RELATIVE POWER OF RESISTING THE PUTREFACTIVE FERMENTATION.

BY this term, which was first introduced into chemistry in the sixteenth century, by Van Helmont, is understood "that spontaneous decomposition which takes place in vegetable and animal substances, after death." Although

the surprising phœnomena which attend this natural analysis of bodies, were not unnoticed by the antients, yet they remained for many years in the greatest obscurity. Nor was it until the close of the eighteenth century, that this cloud began to be dispelled, by the illustrious but unfortunate chemist, whose discoveries have immortalized his name by giving a new æra to chemistry. Lavoisier, the ornament of philosophy, and the boast of chemistry, taught us the nature of those gasses which have a principal share in this process. It was Lavoisier, for whose untimely fate, philosophy mourned, and chemistry acknowledged her loss, that gave origin to the present theory of chemistry, which now adorns the ninteenth century. But unfortunate for this subject, the rapid improvements which distinguish this age have not been equally extended to it. For notwithstanding the labours of a Macbride, a Percival and a Priestly, the complicated changes which take place in putrefaction, are still inveloped in darkness and uncertainty.

Equally uncertain is the modus operandi of certain medicines in preventing or checking these changes, when they have commenced. I feel the less diffidence in declaring their manner of action to be the object of my present inquiry, since I shall not wander in the maze of theory, nor go a step beyond the broad basis of experiment. And as "every theory founded on experiment and not assumed, is always good for as much as it will explain," I shall confine my observations to astringent vegetable substances.

Since the time of Anaximenes, with whom Nature's great law* was uniformity, philosophers and chemists have united in acknowledging the homogeniousness of Nature's works: from this universal principle sprung the co-extensive law of chemistry, that every body has either an efficient or predisposing affinity for every other. These affinities are changeable into each other, and upon their mutual

* Enfield's History of Philosophy.

conversion, which, however, is modified or prevented by every possible variety of circumstances, depends those secret and wonderful operations of nature. Thus the sugar in the matured grapes, possesses, within their integuments, a predisposing affinity for oxygen, and no sooner do the circumstances of its development into a fluid, the access of air, and increase of heat, take place, than this predisposition is changed into efficiency, which constitutes the vinous fermentation, whose degree and continuance is modified by the paucity of sugar, or deficiency of heat. Hence the vast variety of alcoholic products. Or it is changed by the too long continuance of these circumstances, or their existing in too favourable a degree, which facilitates the too speedy union of the oxygen with the carbon of the sugar, and thereby reduces it to mucilage, by the decarbonation of the sugar in the form of carbonic acid. Hence the acetous fermentation. Or this conversion of affinities may be again changed by the too great heat, too free access of air, or too great fluidity, which while it evolves the gluten of the vegetable, conducts to the putrefactive fermentation, which ends in the volatilization of the ingredients. Or, lastly, this change may be prevented by destroying the efficient affinity of the sugar, mucilage, or gluten for oxygen. Thus has Nature, in stamping similarity on her productions, planted within them the germ of their destruction; thus does she make affinity the principle of synthesis and the cause too of analysis; and thus does she accomplish the perpetual circle of compositions and decompositions, which demonstrates her fecundity, while it anounces equal grandeur and simplicity in her operations. Hence the difference between Nature and Art. Nature is rich in poverty, Art is poor in riches. Nature has few materials*, her works are innumerable: Art has many, her works are few.

Such are the principles of pneumatic chemistry, which teach us, we have only to substitute gelatin for gluten,

* Or elements.

to make the above illustration apply to animal putrefaction.

The illustration already given shews us, too, the foundation for two kinds of antiseptics, which may be called mechanical and chemical. The enveloping the gelatin in a body impermeable to air, as resin, or the condensing the particles of the gelatin within the sphere of a too strong attraction, by boiling and drying, as in making portable soup, belong to the first, while those bodies, which present to the gelatin an affinity superior to that for oxygen, belong to the latter; such are astringent vegetable substances.

The first experiment which was made on this class of vegetables, was with a view to ascertain the comparative antiseptic power of the Corni and Peruvian Bark. Accordingly four drams by weight of fresh veal, were immersed in equal quantities, that is two ounces of the filtered infusion of the Cornus Florida and Sericea, and the Peruvian Bark, in separate tumbler glasses. The immersion of the veal soon occasioned a precipitate, of a greyish colour, in the infusion from the Corni, and reddish in that from the Peruvian Bark, and also of unequal quantities, being greater in the Florida and next in the Sericea. The result of this experiment (see Table 3. Exp. 11.) shewing considerable proportion between the antiseptic power of the articles, and the precipitates, induced me to ascribe the antiseptic power, to the precipitate; which, upon examination, was found to be the tannin principle; a substance to which our attention was first called by Sequin, and afterwards investigated by Proust.

The changes which the muscular fibre underwent, greatly confirmed this opinion; its juices were soon decomposed, the red blood lost its colour, and the fibres appeared corrugated and condensed, though these changes were less in the infusion from the Peruvian Bark. These changes rendered it very probable that the gelatin of the fibre, and of the blood united to the tannin, and formed a compound

capable of resisting putrefaction in proportion to the quantity of the tannin present: for on the sixth day, at which time the veal in the infusion from the Peruvian Bark was offensive, a portion of veal was taken out of the infusions from the Cornus Florida and Sericea, which was perfectly sweet; when dry I found it pulverable between the fingers, but could not trace the fibrous texture: so intimate was the union with the tannin. For though there was a difference in this respect, between the muscle and tanned leather, I nevertheless ascribed the change to the tanning process, judging the difference in appearance and qualities, to be owing to the difference in texture.

To prove this more decisively, I precipitated the tannin from fresh infusions of the medicines, by a saturated solution of glue. The liquor was then separated from the precipitate, formed in this manner, by the filter, and four drams of fresh veal were added, as in the former experiment, but with a very different result. Its antiseptic power was destroyed. See Table 3. Exp. 12.

It is unnecessary to dwell longer on this part of the experiment, since the following table shews the experiments which were made, and the changes which took place.

For the better understanding the table, it is to be recollected that all the infusions of the different medicines were made under similar circumstances, and in similar proportions. Thus the simple infusion employed in experiments 11. 12. 13. 14. were made with two drams of the powder, and four ounces of water, macerated twenty-four hours, and then filtered. The compound infusions were made by triturating two drams of the powder, and one dram of the calcareous earth, with six ounces of water; which, after standing the same length of time, were filtered.

TABLE III.

SHEWING THE ANTISEPTIC POWER OF THE INFUSIONS OF DIFFERENT MEDICINES, IN THE TEMPERATURE OF ABOUT 72° OF FAHRENHEIGHT'S THERMOMETER.

Changes which took place (the figures stand for days.)

	MEDICINES.	Proportion of Infus. oz.	Veal. dr.		The relative quantity of Tannin.	Change with Gallic acid.	Time it remained sweet.
					A	B	C.
EXPERIMENT 11. Simple infusion of the	Simp. aqua.	2	4	1 Pale, 2 texture diminished and greenish, 4 putrid.			
	Cort. Rad. Corn. Flor.	2	4	1 Copious, precipitate, 6 sweet, fibre condensed, 15 inf. acid, 16 mouldy on the surface, taken out and dried, sweet.	10	pale brown.	26
	Cort. Arb. Corn. Flor.	2	4				
	Cort. Rad. Corn. Ser.	2	4	1 Copious precipitate, 6 sweet, fibre condensed, grey colour, 14 acid and mould infusion, and nearly evaporated, taken out, on 15.	9	ditto	26
	Cort. Arb. Corn. Ser.	2	4				
	Cort. Peru. Rub.	2	4	1 Small precipitate, 4 fibre lax and pale, 6 greenish, 8 penetrating smell.	4	ditto	14
	Cort. Querci. Rub.	2	4	1 Copious precipitate, 10 sweet, 15 solid and firm, 18 infusion mouldy.	15	ditto	30
	Rad. Columb.	2	4	1 No precipitate, 2 pale and soft, 4 offensive.	0	ditto	7
	Pulv. Gallae.	2	4	1 Copious precipitate, 4 condensed, 8 sweet, 10 mould infusion, 18 acid.	12	Brown.	30

Changes which took place when the tannin was precipitated.

EXP. 12. Simple inf. of	Cort. Rad. Corn. Flor.	2	4	1 No precipitate, nor corrugation of fibre, pale, 3 green, 5 putrid.
	Cort. Rad. Corn. Ser.	2	4	1 Ditto pale and relaxed, 3 greenish, 4 unpleasant smell, 5 putrid.
	Cort. Peru. Rub.	2	4	1 Ditto, 3 greenish colour, soft, 4 unpleasant, 5 putrid.

TABLE III. &c.—CONTINUED.

Changes which took place upon mixing the Inf. with Putrid Veal.

	MEDICINES.	Inf.	Put.	
EXP. 13. Simp. infusion of	Cort. Rad. Corn. Flor.	2	4	1 Fermentation suddenly checked, 4 sweet, 6 hardened, 10 acid.
	Cort. Rad. Corn. Ser.	2	4	1 Ceased disengaging air, 2 hardened, 6 sweet, 10 acid smell.
	Cort. Rub. Peru.	2	4	1 Suspended, 2 colour pale, 4 discharges air, 6 offensive.

Changes upon mixture with fermenting mass.

		Inf. oz.	Mass. oz.	
EXP. 14. Simp. infusion of	Cort. Rad. Corn. Flor.	2	2	1 Fermentation checked, 4 dark coloured, 6 acetous smell.
	Cort. Rad. Corn. Ser.	2	2	1 Checked the disengagement of air, 6 acetous smell.
	Cort. Peru. Rub.	2	2	1 Moderated the fermentation, 4 acid to taste and litmus.

		Infus. oz.	Veal. dr.		A Quantity taken up.	B Change with acid. Oxalic.	C Gallic.	D Sensible quality, taste.
EXP. 15. Comp. infus. with cal. lime, and	Cort. Rad. Corn. Flor.	2	4	1 No precipitate, 3 fibre lax, 4 bluish, 5 putrid.	19	precipitate.	black	Nauseous without Astringency.
	Cort. Rad. Corn. Ser.	2	4	1 Ditto slight change in colour, 5 putrid.	18 1-2		black	
	Cort. Rub. Peru.	2	4	1 Ditto muscle redish, 4 soft and offensive.	10		black	
EXP. 16. Com. inf. with cal. and mag. and	Cort. Rad. Corn. Flor.	2	4	Nearly the same changes took place in this and the 17th Exp. as in the 15th, all putrid in 5 1-2.	20	ditto	ditto	ditto
	Cort. Rad. Corn. Ser.	2	4		18 1-2			
	Cort. Rub. Peru.	2	4		11			
EXP. 17. Comp. inf. with carb. and mag. and	Cort. Rad. Corn. Flor.	2	4	ditto	19	ditto	ditto	ditto
	Cort. Rad. Corn. Ser.	2	4		18			
	Cort. Rub. Peru.	2	4		10			

COMMENTS

ON THE CLASSES OF EXPERIMENTS CONTAINED IN THE PRECEDING TABLE.

Strongly impressed with the justness of the principle, which the great Newton laid down on experimental evidence, which is, that "though the arguing from experiments and observations, by induction, be no demonstration of general conclusions, yet it is the best mode of arguing which the nature of things admit of; and may be looked upon as so much the stronger, by how much the induction is the more general." I have, to profit by the authority of so great a philosopher, extended my experiments to several articles which were not the objects of my dissertation; the plain induction from all of which, is, that the tannin principle of astringent vegetables, which is thrown down by the gelatin of the flesh, is the antiseptic principle; and that it acts by chemically uniting with the gelatin, and thereby destroying the efficient affinity of the latter for oxygen, which is the septic principle. The changes which the muscle underwent in the infusions, as far as they could be expressed in the table, agree with the quantity of tannin present in those infusions, as expressed under A. Experiment 11. The relative quantity of tannin, expressed in this column, was ascertained by adding equal quantities of a saturated solution of gelatin to equal quantities of the different infusions concentrated by partial evaporation, the quantity of precipitate showed the relative quantity of tannin—letter B. of the same experiment, shews that the gallic acid is precipitated along with the tannin, when gelatin is the precipitant. For upon the addition of the oxy-sulphate of iron, to the infusion out of the tumblers, a very slight change took place.

C. This shews the length of time the simple infusions will remain free from acidity in the common stopped phials, the figures stand for days. Why those infusions which have the greatest quantity of tannin, should remain un-

changed the longest, is difficult to account for. Unless it be that the tannin principle has a stronger affinity for oxygen than the mucilage of the infusion, upon the union of which with oxygen, acidity depends. This is somewhat probable from the circumstance that tannin will reduce the oxy-sulphate of iron to the common sulphate—May not this be the cause of the change of colour of the blood and muscle, above-mentioned? The tannin uniting to the oxygen of the blood deprives it of that principle, to which the present chemico-physiologists ascribe its red colour.

What farther can be required to prove the above manner of accounting for the antiseptic power of astringent vegetables, is given in the 12th experiment, which proved, that the previous precipitation of the tannin destroys this power.

Experiment 13th shews, that these medicines check putrefaction after it has commenced in the same manner and proportion. The 14th, shews they prevent or check the acetous fermentation, probably by absorbing oxygen from the mucilage of the fermenting mass.

Experiments 15, 16, and 17. B. The precipitate which takes place upon adding the oxalate of ammoniac to these compound infusions, shews that the calcareous earth is dissolved in them, which, by forming a new compound with the tannin, destroys* its astringency and antiseptic property. C. D. The results in these two columns, agree with the experiments of Professor Woodhouse†. For though the astringency of the compound infusion was destroyed by the mixture with the calcareous earth, it nevertheless struck a black colour with the oxy-sulphate, but did not possess the taste of astringency, nor corrugate the flesh immersed in it.

A. Soon after the introduction of the Peruvian Bark into practice, physicians not content with its solubility in

* Vide sixth Law of the Affinity of Composition.

† See his observations on the combination of Acids, Bitters, and Astringents.

aqueous menstrua, combined many different articles with it, to increase its solubility, and virtue in other respects; among which were magnesia, lime, &c. These experiments prove, that whatever the combination with lime or magnesia, may do in other respects, its solubility cannot be said to be increased, for B proves the superior weight of the infusion to be owing to the calcareous earth—D that its astringency is destroyed—and the 15. 16. 17 Experiments at large, prove that its antiseptic power is also destroyed.

Experiment 18. On the styptic power of the Corni, and Peruvian Bark. With a view to ascertain this, I cut out three portions from the glutæi and vasti externi of a dog, with a dull scalpel to imitate common incised wounds, on which I sprinkled the three powders, the Florida and Sericea soon stopped the Hæmorrhagy, the Peruvian Bark was slow in stopping it; the blood and powder appeared to be chemically united, and formed a defence to the open tubes: the Cornus appeared not only to act upon the surface of the wound, in corrugating it, and thereby diminishing the orifice of the bleeding vessels, but the tannin likewise precipitated the gelatin of the blood, with which it formed an adhesive mass, that remained on the surface of the wound.

EXPERIMENTS ON THE TANNIN PRINCIPLE.

IT is not my intention to give, in this place, a treatise on the art of Taning. But as the Corni promise to be profitably subservient to this art, and as there has lately appeared on this subject some ingenious speculations, which, as well from the author, as their own merit, deserve attention, I hope the following digression will not be unacceptable.

Though the art of tanning is of ancient date, yet the tannin principle is of modern discovery, with the particular nature of which, we are not well acquainted; chemists, how-

ever, suppose it to be a distinct principle in vegetables. The ancients were content with ascribing this property to such vegetables as contained a gum-resinous matter, along with astringency; and their choice of tanning substances was chiefly confined to such vegetables. Though an established opinion and long practice in any art, only give sanction, without proving the correctness of such opinions; yet I am convinced the choice of the ancients was very judicious.

The ingenious Mr. Biggins, supposes the tannin principle is all that is necessary for this process of tanning, and "as the gallic acid* corrugates the surface, and does not seem to combine with the matter of skin:" he thinks "it not only useless but detrimental†." Induced by the novelty and ingenuity of this opinion, I instituted the following experiments to see how far it would obtain in practice. I obtained some pure tannin, by partially evaporating a strong decoction of the Cornus Florida, and adding to it a saturated solution of the carbonate of potash, a copious precipitate fell down, which was collected upon the filter, afterwards washed in a small quantity of cold water, then dissolved in the like quantity of boiling water. This was tested with litmus paper to detect the excess of alkali,—the paper being slightly changed green. Diluted sulphuric acid was now added until the litmus paper indicated it to be neutralized. A greyish precipitate began again to appear, which increased by standing.—When it had ceased subsiding, it was again separated by the filter, and then dissolved in a small quantity of cold water, to which was added a small piece of fresh calf-skin, previously deprived of the hair and small pieces of flesh, by the ordinary means for such purposes. It was examined on the sixth day, but there was no appearance of the action of the tannin; and the skin appeared as unaltered as if it had lain the same length

* It is here to be understood that Mr. Biggins means by the gallic acid the astringent principle.

† Phil. Trans.—

of time in pure water; it was soft, white, and slippery between the fingers, and had undergone what tanners call swelling. Convinced that the tannin thus separated, differed from the tannin in the fresh decoction in no other respect than the deprivation of the gallic acid, I determined to see what effect another vegetable acid would have. Strong acetous acid was accordingly added to it, under the above circumstances. The changes which took place in the skin in ten days afterwards, were so similar to such as appeared in a similar piece of skin, which had been immersed in some of the decoction* from which the tannin had not been precipitated, and which had been employed as a standard by which to judge, of the facility of the two processes, that I could not forbear concluding, that astringency was essential, in the process of tanning. I should here observe that the gallate of tannin (for they unite together by a strong affinity), is very astringent. Now as the gallic, acid though somewhat acerb in taste, cannot, from its weakness in this respect, be strictly called astringent, it is probable that the tannin contains some alumen, the union of the gallic acid with which, Dr. Woodhouse, has satisfactoirly proved to be astringent: this is somewhat confirmed by the increased astringency of the acetite of tannin; for the

* I shall here give the reason, why the dcoction was preferred as a standard. From the experiments of Messrs. Davy, Proust, and Sequin, it appears that heat evolves the tannin principle: their experiments were made chiefly upon coffee; they found that a strong infusion of this article did not exhibit any marks of the tannin principle, nor of the gallic acid; but if it was first toasted, or a decoction made from it, the liquor thus prepared contained the tannin principle, and struck a black colour with the oxy-sulphate of iron. Is it not probable that the heat produced this change, by increasing the affinity of the base of the gallic acid, for oxygen, which was furnished by the air in toasting, or the water in boiling, and thus produced the gallic acid, which united to the extractive matter, and formed the tannin principle. However, this may be, it is worthy the attention of tanners, for I am convinced from the experiments which I have made, that thin skins may be perfectly tanned, in the decoction of the Corni or oak bark in ten days.

potash above employed, by saturating the gallic acid, might have precipitated the alumine along with the tannin, and which, by uniting with a portion of the acetous acid, might have increased its astringency.

In what manner astringents act in tanning is difficult to be explained; but it appears probable that they serve the same purpose in tanning, which mordents do in dying—they fix the tannin and gelatin to the cuticular fibre.

The success of the acetate of tannin above mentioned, gives considerable countenance to the conjecture already made, that the tannin principle is the mere extract of vegetables altered by the gallic acid.

Under this impression I endeavoured to immitate the tannin principle, by uniting the extract of common flour* with weak alum water, to which mixture a thin piece of skin, properly prepared, was added: the changes which took place (being perfectly similar to the tanning process), convinced me that this artificial combination of extract and acid possessed the true properties of the natural tannin.

Hence I conclude astringency is essential in tanning.

The present subject involves the consideration of astringency in so palpable a manner, that I cannot, though I willingly would, have passed it over in silence; for astringency is a problem that has never been satisfactorily solved; nor do I pretend to such a solution, but only claim the privilege of opinion.

From the experiments of authors, as well as those which I have made upon this subject,† I am convinced we cannot

* In many parts of our country, the country people tan thin leather, by first immersing it in flour and water several days, and then placing the skin in alum water.

† I thought it unnecessary to introduce the experiments which I made on the astringent principle, because their results only agreed with the experiments of Dr. Woodhouse, that the gallate of alumine was astringent. But they, in no manner, tended to shew that astringency was

limit astringency to the combination of a single acid, the gallic, with a calcareous base. Astringency, like bitterness, is the result of many biniary combinations. Its production depends upon those secret changes which take place upon the union of bodies, in conformity to the sixth law of the affinity of composition.* Limited would be the expression, that the sulphate of magnesia was alone the bitter principle; equally limited must it be, if it affirms the gallate of alumine to be alone the astringent principle. Are not the sulphate, the muriate, the nitrate, and acetate of alumine astringent? And what experiments have detected the presence of the gallic acid in these salts? or, how many detections would convince us of its existence, when we know that the sulphuric, muriatic, and nitric acids, convert the gallic into citric, malic, or oxalic acids—as little do we know of the tests for the astringent principle. Doctor Woodhouse, whose ingenious labours have greatly enriched chemistry, proved in a pamphlet, which has already been quoted, that the property of producing a black colour with the chalybeate solution was fallacious. Taste has been supposed the most certain criterion of its presence. But so little do we know of the modus operandi of astringents on the organ of taste, or on the solida viva, that even with this we are subject to fallacy. Thus, alcohol, by attracting the saliva from the surface of the mouth, produces a taste similar to that of astringency. The dry air, by favouring the evaporation of the saliva, produces a similar taste, and were it not for our senses correcting the deception of taste, we should taste astringency whenever we walked in dry air.

Many other articles, by stimulating the absorbent system, the excretories of which being more simple and facile

an undivided principle, confined to a single neutral salt. But, on the contrary, every salt, of which alumine was the base, was astringent to the taste, and many other articles are confessedly astringent.

* According to which compounds possess properties different from their component parts.

in motion than the secreting, evacuate their tubes as fast as they are filled, and consequently produce corrugation of the part, by the sides of the emptied tubes approaching each other, which disposition of parts constitutes the astringent taste. This opinion, that astringents act upon the solida viva, in consequence of their stimulus, is not a novel one. Percival and Darwin, long since, entertained it. What are we then to conclude respecting astringency—Shall we, with Dr. Moore,* deny their existence; or, shall we, with more probability, acknowledge it the property of many combinations.

EXPERIMENTS ON THE HEALTHY SYSTEM.

THE following is a synopsis of the effects of the different medicines, and their different preparations, on the healthy human body. And I must here observe, that the greatest attention was paid to obviate those circumstances which affect the pulse, by myself, as well as by my friendly fellow graduates, who assisted me in these experiments; and whose names I with pleasure insert to be messrs. Massie, Downey, Wilson, and Young, and my friend Mr. Gregg.

To avoid unnecessary prolixity, I have only expressed the quantity and kind of medicine taken, in each experiment, without inserting the name, time of day, &c. since it is to be presumed that every circumstance was attended to, which could be favourable to the success of these experiments. And to render them as satisfactory as possible, I have noted down the state of the pulse, and the affection of the system in general, opposite to the time when they took place.

* Vide his Materia Medica.

A SYNOPSIS OF THE EXPERIMENTS ON THE PULSE.

EXPERIMENT 20.

30 *gr.* Pulv. Cort. Rad. Cor. Flor.

Min.	*Pulse.*	
0	62	soft, natural
5	62	slight change
10	63	full, heat at
15	63	stomach
20	65	quick and full
25	66	full and strong
30	68	do.
35	69	quick, tense
40	70	flushed face
45	70	tense, heat in-
50	70	creased
55	70	do.
60	70	do.
75	68	full, regular
85	68	do.
95	65	reduced in
105	63	fulness.

EXPERIMENT 21.

30 *gr.* Pulv. Cort. Rad. Cor. Seri.

Min.	*Pulse.*	
0	70	naturally full
5	72	quick, soft
10	73	do.
15	74	slight nausea
20	76	full
25	76	nausea ceased
30	78	full and tense
35	78	do.
40	79	do. red face
45	79	regu. hard
50	78	full
55	78	do.
60	78	do. headach
75	77	do. quick
85	75	do.
95	73	slight
105	70	decrease.

EXPERIMENT 22.

1 *gr.* Pulv. Cort. Per. Rub.

Min.	*Pulse.*	
0	66	natural
5	66	no change
10	67	quicker, full-
15	67	er do.
20	68	full and
25	69	tense
30	69	do.
35	70	do.
40	70	strong and
45	71	regular
50	71	do.
55	72	do.
60	72	do.
75	71	slight head-
85	70	full [ach
95	68	do.
105	67	nearly natural

EXPERIMENT 23.

* 12 *gr.* of the Resin of Cor. Flor.

0	62	soft, natural
5	62	slight disgust
10	61	nausea
15	61	in a slight deg.
20	62	quick and
25	63	fuller
30	63	quick and
35	66	frequent
40	68	do.
45	70	do.
50	72	do.
55	73	do.
60	71	do. slight
65	69	headach
70	67	full
75	68	irregular
80	65	
85	63	
95	60	small

EXPERIMENT 24.

* 12 *gr.* of the Resin of Cor. Seri.

0	72	natural
5	72	small
10	72	do. and
15	73	quick, consi-
20	75	derable nausea
25	75	fuller
30	76	full
35	77	do.
40	77	do.
45	79	do. tense
50	80	do.
55	82	tense, regular
60	82	& flushed face
65	80	heat of the skin
70	79	tense
75	79	do.
80	77	full and softer
85	75	
95	72	

EXPERIMENT 25.

* 12 *gr.* of Resin of P. Bark.

0	64	natural
5	64	full
10	65	and
15	66	regular
20	68	do.
25	68	do.
30	68	full and
35	69	tense
40	69	do.
45	70	do.
50	71	regular
55	72	do.
60	72	do.
65	73	full, flushed
70	73	face
75	70	do.
80	66	do.
85	65	diminished in
95	65	fulness.

* Obtained by the simple evaporation of the alcoholic tincture—for its constituent parts vide page 29.

EXPERIMENT 26.

* 12 *grs.* of Extract of Corn. Flor.

M.	*P.*	
0	68	natural and
5	68	soft, full
10	69	quick and
15	70	full
20	70	do.
25	72	do. agreeable
30	73	heat, tense
35	73	and regular
40	74	do.
45	76	do.
50	77	fuller, tense
55	77	do. flushed
60	77	do. face
65	77	do.
75	76	hard and tense
95	69	stro. than nat.

EXPERIMENT 27.

12 *grs.* of Extract of Cor. Ser.

M.	*P.*	
0	76	natural
5	76	soft and full
10	77	quicker
15	78	anxiety,
20	78	full and
25	79	regular
30	80	tense, flushed
35	81	face
40	81	do.
45	82	do.
50	82	do.
55	80	do.
60	79	diminished in
65	79	hardness
75	78	
95	77	soft and full

EXPERIMENT 28.

12 *grs.* Extract of. P. Bark

M.	*P.*	
0	66	natural
5	60	full and
10	67	strong
15	68	quick
20	69	do.
25	69	do.
30	69	do.
35	70	full and
40	70	tense
45	72	do.
50	72	do.
55	72	do.
60	71	full and tense
65	70	do.
75	68	diminished in
95	67	strength

EXPERIMENT 29.

† 12 *grs.* of Gum of Cor. Flor.

0	62	natural
5	62	slight change
10	63	in fulness
15	65	full and quick
20	66	do.
25	67	do.
30	70	fuller and
35	70	regular
40	70	do.
45	71	moderately
50	70	tense
55	70	do.
60	69	do.
65	69	do.
70	68	soft but full
75	64	

EXPERIMENT 30.

12 *grs.* of Gum of Cor. Flor.

0	64.	natural
5	65	full and
10	65	regular
15	67	quicker
20	67	and fuller
25	68	do.
30	71	tense and
35	71	strong
40	72	do.
45	73	do.
50	71	slight change
55	70	full
60	69	do.
65	68	do.
70	68	quicker than
75	67	natural.

EXPERIMENT 31.

12 *grs.* of Gum of P. Bark.

0	72	natural
5	72	no change
10	73	fuller
15	75	do. and
20	75	quicker
25	77	tense
30	78	do.
35	80	do.
40	81	fuller and
45	82	stronger
50	82	do.
55	82	do.
60	80	quick and full
65	79	ditto
70	76	ditto
75	75	above natural

EXPERIMENT 32.

2 oz. of Decoction of Cor. Flor. R.

0	66	natural
5	67	increase in
10	68	strength and
15	68	fulness
20	70	do.
25	72	do.
30	72	do.
40	77	tense and
50	80	strong

EXPERIMENT 33.

2 oz. of Decoction of Cor. Ser. R.

0	68	natural and
5	68	quick
10	69	fuller
15	70	do.
20	71	do. quicker
25	71	do.
30	73	do.
40	74	do.
50	74	flushing of

EXPERIMENT 34.

2 oz. of Decoction of P. Bark.

0	62	natural
5	62	soft
10	63	do.
15	65	quicker
20	65	with fulness
25	67	do.
30	68	do.
40	69	considerable
50	71	tension

* See Chemical Analysis, page 29.

† By evaporating the aqueous solution—For its component parts, see p. 27.

M.	P.		M.	P.		M.	P.	
60	80	bounding	60	76	the face	60	72	do.
70	78	slight pain in	70	80	full and	70	73	do.
75	77	the head	75	79	strong	75	71	tense with
80	74	and flushing of	80	76	slight affection	80	77	flushing of the
90	73	the face	90	73	of the head	90	69	face
100	67.	quick and soft	100	70.	quick pulse.	100	66	full and quick

EXPERIMENT 35.			EXPERIMENT 36.			EXPERIMENT 37.		
2 oz. of Infusion of Cor. Flor. R.			2 oz. of Infusion of Cor. Seri.			2 oz. of Infusion of P. Bark.		
0	72.	natural	0	76	natural	0	64	natural
5	73	quicker	5	76	slight change	5	64	no change
10	74	do.	10	79	in quickness	10	66	quicker
15	74	do.	15	80	fuller	15	68	do.
20	75	fuller	20	81	quick and full	20	69	fuller
25	76	do.	25	82	do.	25	70	do.
30	78	full and	30	84	do.	30	72	tension
40	79	tense	40	84	tense	40	73	increased
50	81	do.	50	85	do.	50	74	do.
60	84	do.	60	87	do.	60	76	full and
70	84	strong	70	85	do.	70	76	tense
75	83	do.	75	84	do.	75	76	do.
80	81	do.	80	82	heat of the skin	80	74	do.
85	79	flushing of	85	79		85	74	full
90	78	the face	90	79	quicker	90	73	do.
100	75	above natural.	100	77		100	66	above nat.

I have but little to add on these experiments. From the difficulty of performing them, from the long and constant attention they require, and the difficulty of avoiding every circumstance, which though insignificant in itself often affects the pulse, in a considerable degree, it is not pretended, but some slight inaccuracy may have been noted down: but it is hoped they will shew the resemblance between the three medicines. They likewise will shew the greater solubility and quicker action of the Cornus Florida. The Sericea appears to be next. This agrees with their chemical Analysis. Their regularity, and durability of action is likewise apparent, for in no one of them did the pulse return exactly to its natural state, but was often fuller and stronger, and always quicker.

EXPERIENTIA.

The little opportunity of applying a new medicine to practice, by the student of medicine, must be known to every one. It will not, on that account be expected, that many experiments on the diseased subject, will be related. However, from the kindness of Dr. Church, to whose friendship and attention I am greatly indebted, I shall relate the success of an experiment with the Cornus Sericea in the case of an intermittent fever which came under the doctor's direction.

April 13th, 1803. W. F. aged 34, was taken with a chill about 10 o'clock, A. M. which continued 4 hours, and was succeeded by a fever which lasted 10 hours, it went off in the ordinary manner by a copious perspiration.

14th, Free from fever but debilitated.

15th, A similar paroxysm as on the 13th.

16th, As on the 14th. He now commenced with the arsenical solution of Fowler, in the dose of ten drops three times aday.

17th. Had another severe paroxysm. The drops were now omitted and blisters applied to his wrists.

18th. He had given him six papers of the Cornus Sericea, containing a half dram each, to be taken three times in the day.

19th. Free from fever. His intermittent has not returned, May 10.

The following is a case afforded me by my friend and fellow graduate Mr. Hutchison, in his own words.

On the 25th. of April 1803, I was desired to visit Samuel Anderson, aged 30, with an intermittent fever. I found his pulse active, tongue furred, and his skin warm, he complained of pain in his head and back, he informed me he had had two paroxysms previous to my visit.

Four grains of tartar emetic were given him, which produced a copious vomiting. On the morning of the 26th I found him free from fever, and ordered 30 grains of Cort. Peru. to be taken every two hours. This was continued until 11 o'clock A. M. of the 27th, when the paroxysm returned.

28th. Finding him free from fever, I gave him 20 grains of the Cornus Sericea in powder, every three hours, which was continued for several days: he has had no return of his fever, May 6. 1803.

It may here be added, that this species of the Cornus was used by the Physicians of the French army in America during the Revolution, as a substitute for the Peruvian Bark.

On the subject of the Cornus Florida, I have received a communication, through the hands of my friend and fellow graduate Mr. Warmsley, from Dr. Amos Gregg of Bristol Pennsylvania, which will be found doubly interesting; first, because it comes from a practitioner, whose success and zeal for the promotion of medical science, endears him to his medical brethren—and, secondly, because his opinion of the Cornus Florida is founded on an experience of twenty-three years practice with it. The following is an extract of the communication.

"About the year 1778, during the American Revolution, the great scarcity and high price of the Peruvian Bark, and the embarrassment from the want of it, induced me to search for a substitute. With this intention I tried the yellow Poplar, in which I was disappointed. The common Dogwood (Cornus Florida) was the next which I selected. And having at that time the intermittent fever, I took several ounces of the decoction of it, which effectually cured me, though it produced some pain in my bowels, which was relieved by a few drops of Laudanum. This property of affecting the bowels with pain, I found it to possess only

in its recent state, and never after it was twelve months old, did I find it disagree, in exciting pain, cathartic or emetic effects. I have, therefore, at different times had considerable quantities well dried and pounded, so as not to be without it in my shop for tweenty-three years. During which practice, I have found its virtues, such as to convince me that it was not inferior to the Peruvian Bark in curing intermittents, nor inferior as a Corroborant in all cases of debility. I must observe, however, that I have generally given the Dogwood in doses of 35 grains. Which I have always found equal to 30 of the Peruvian Bark. I have used the Dogwood in several other cases, the most interesting of which are, first in a dropsical patient, who, after a few days of violent pain in his legs, had them swelled to a very large size, and considerably inflamed: soon after, small blisters appeared upon them, which in eight-and-forty hours turned of a dark purple colour; at this time I gave him 30 grains of the Dogwood in powder, with 6 grains of Virginia snake-root every half hour for two days, and once an hour for the succeeding 24 hours. The man recovered.

" The other was a patient, who, by accident, had a great portion of the muscular part of his leg torn off, the weather being excessive warm, the purulent discharge soon became very great, and offensive. I gave him the Dogwood joined with the Snake root as above, the man soon recovered, and is now living. I have often used the Dogwood, joined with Gentian, Columbo, Camomile, and with Aromatics in bitters, and have found it equal to the Peruvian Bark, and therefore concluded it is a valuable medicine."

APPLICATION.

WHEN we look back upon the similarity between the Corni and the Cinchona, in their sensible qualities, in their Chemical Analysis, and their similarity of action on the incised, and dead fibre, and particularly when we view their similar operation on the healthy and diseased subject, we cannot but receive the most flattering inducements to estimate these provident gifts of Nature. And when we reflect upon the causes of the various forms of disease, which are the endemics of our country, we cannot but receive additional inducements to regard the Corni as the most valuable vegetable, which Nature, in the prolificness of her bounty, has scattered through the wide forests of North America. For so long as the mouldering ruins of our swamps, and the uncultivated condition of our marshes shall afford materials for the peccant operation of an Autumnal sun, we shall view, with peculiar delight, the virtues of these two vegetables, which inherit the two essential characters of the most valuable division of the Materia Medica; I mean bitterness and astringency; to the 'happy union' of which the Corni have a claim, as respectable as that which has procured for the Peruvian Bark a celebrity as extensive as the bounds of rational medicine. Indeed so striking is the similitude, so exact the result, from comparative trials, that in this attempt to recommend the Cornus Florida and Sericea, to the attention of practising physicians, I cannot even review the forms of disease, in the particular states of which the Corni are indicated, without encroaching upon the reputation of the Cinchona: for, in truth, it may be said, that in whatever form of disease the Cinchona has been decidedly service-

able, the Corni will be found equally so. And if we make allowances for the chances and inducements to adulteration in the former, for our relationship to the latter, for its wide extent through the very soil in which are engendered the seeds of those maladies, their virtues are fitted to remove, we must acknowledge their superiority. Experiments, of a diversified nature, warrant this conclusion. They are, like the Bark, bitter and astringent in the mouth, tonic and febrifuge in the stomach, and their chemical analysis afford results perfectly analogous. But shall I, on this account, recommend, in Intermittents, Remittents, Coleras, Diarrhœas, and Dyssenteries, the corroborant virtue of the Corni, because the same virtue, in the Cinchona, has been said to be their specific remedy. This would, indeed, be following the usual mode of introducing new medicines into notice. But would it not be adding a specific to Nosological titles, and one more powerful nostrum to the long catalogue of Empyricism?

Had the improvements in Pathology and Therapeutics kept pace with the rapid enlargement of the Materia Medica, an attempt at this day to have added one more article to the latter, would have been regarded as fruitless and unnecessary.

But while the medical mind was busily employed in drawing nosological distinctions, and wasting the efforts of genius in searching for specifics, the embryon of rational science was rising in the western horizon. In its growth it viewed, with grief and horror, the species of diseases *multiplying themselves in numbers and augmenting their malignity. And no sooner had it arrived at its zenith, than its first act was to liberate Medicine from the trammels

* In proof of which the following is given as an example.

Sauvage has, in his Nosology, 10 classes, 44 orders, 300 genera. with species and varieties innumerable.

Linnæus has 11 classes, 37 orders, species proportionally numerous.

Vogelius has 11 classes, containing 560 genera, with their species and varieties proportionally numerous.

of Nosological complexity, and restore to disease that unity and simplicity, which allied it with its proximate cause.

Fully impressed with the inestimable value of this improvement in Medicine, which does distinguished honour to its author, I shall neglect the Nosological order: nor shall I say that the Corni are indicated in Remittents or Intermittents, merely because they consist of paroxysms, remissions or intermissions, but shall pay particular attention to that state of the system, which affords the only rational indication for Tonic Medicine. I assume it a truth, sufficiently established by the illustrious Professor of Clinical Medicine, in this University, "that disease is the same, however variously it may be modified by age, constitution, climate, season, remote or exciting causes, or by its duration." But if none of these circumstances, are sufficient to establish a specific difference in the nature of disease, what criterion are we to adopt, by which we may regulate the administration of the Corni, or any other article of the Materia Medica, all of which, though differing greatly in their respective qualities, have nevertheless an appropriate point in the scale of morbid excitement? The very circumstances carry along with them the answer; namely, the existing state of the system, which is to be judged of by the season, age, and duration, &c. but more particularly by the state of the arterial excitement, as pointed out by the pulse. So important is the nosometrical power of the pulse in shewing the force of arterial action in the system, that it may emphatically be called the *alter occulus* of physicians.

In taking, therefore, this nosometer of the system for my guide, my labour in the application of the curative powers of the Corni, will be greatly abridged. Instead of

Cullen, 4 classes, 59 orders, 350 genera, with their species and varieties.

Sagarus, 13 classes, 54 orders, 350 genera, containing 2,500 species with their varieties.

"Hei mihi! Tot mortes homini quot membrana, malis que,
Tot sumus infecti mors ut medicina putetur."

tracing their application through the catalogue of Nosologists, I am guided to that particular state of the system, which may occur in every form of disease, and which whenever it does occur, calls for the Corni, or such medicines as possess similar virtues.

In tracing the pulse, in disease, we find it in two very opposite states. In the one we find it full, strong, hard and frequent, accompanied with heat of body, thirst, restlessness, &c. To which state has been attached the term of Inflammatory action. In the other it is weak, small and quick, accompanied with debility and prostration of strength, heaviness and dejection of spirits, and various other circumstances, which has attached to this state, the various terms of nervous, jail, hospital, ship, petechial, putrid or typhus fever. Every form of disease in its various modifications, approaches more or less near to one of these two opposite states, between which there are several gradations of morbid excitement, indicated by corresponding degrees of arterial action.

I have only, then, to say that the Corni or other tonics, whose virtue consists in increasing and supporting the strength of arterial action, and thereby removing that debility which is the principal symptom of this latter state, are indicated here. And that their exhibition may be extended, with probable success, to every other form of disease, in proportion as it approaches to this latter described state.

But I cannot here omit, the golden rule in the exhibition of this class of medicines, for the authority of which we have the exalted names of a Darwin, a Rush, and a Barton, that is whenever in the exhibition of tonics or stimulants, the pulse becomes slower, fuller, and stronger, their administration is judicious, and should be continued; but when on the contrary it becomes quicker, more frequent with an increase of heat on the body, anxiety, and dryness in the mouth, they are improper, and we may say with Ovid, " parce stimulis, et utere loris."

In attending to disease, as it occurs in our own country, we perceive that some forms of disease approach more uniformly to that particular state, just described as requiring tonics, than others, such are those which occur in the Summer and Autumnal months. I shall therefore briefly enumerate them—In attempting which, I feel sentiments of gratitude in adopting the division and doctrines of the illustrious Professor of the practice of physic, who enumerates six original forms of Autumnal disease. In all of which the Cornus Florida and Sericea, may be employed with the happiest effects, according to circumstances—They are, " 1. The Malignant Yellow Fever. 2. The Inflammatory Bilious Fever. 3. The Remittent Bilious Fever. 4. The Intermittent Bilious Fever. 5. Chronic Fever, and 6. Febricula." These embrace all the affections of the alimentary canal, in the shapes of Cholera, Diarrhœa, and Dyssentery; of the skin, in various eruptions, of the Pulmonary System, in the form of Peripneumony Notha; of the spleen and pancreas, in inflammations and obstructions; of the brain, in the shape of Hydrocephalus and Coma; and of the arterial system, in all the grades of arterial excitement, from the Malignant to the Typhus action.

My limited time will not admit my dwelling on these forms of disease; all that I shall say therefore is, that the disease which generally occurs at this season of the year, generally shapes itself in such a manner, as to enable us to derive the greatest advantage from the tonic power of these vegetables. The remissions and intermissions which succeed to the paroxysms of morbid excitement, often presenting favourable opportunities of conquering by the active powers of the Corni, the growing habitudes of morbid excitement.

On the particular indications which may be answered by the small difference in the proportions of the constituent parts of the Corni and Cinchona, as pointed out in their chemical analysis, I have but little to say, they are easily

judged of. Thus the superior miscibility and solubility of the Corni, shew that they may be given in smaller doses, and oftener repeated; whereas the more difficult solubility of the Peruvian Bark, requires that it should be given in larger doses and at longer intervals.

When in debilitated habits along with which there is a Dyspeptic state of the stomach, the Peruvian Bark disagrees with the latter, probably from its insolubility; the Corni should be given.

In the Remitting fever, where the remission is not so complete as to admit the stimulating resin of the Bark, the Cornus Florida, as possessing less of this, may be employed.

When an indication is founded upon great debility and laxity of the muscular system, accompanied with morbid irritability, and probably sensibility, depending upon this debility, the superior astringency of the Corni promises its aid.

In those persons, whom from a particular state of the bowels, the Bark purges, the astringency of the Corni recommends itself.

The greater antiseptic power of the Corni, claims for them a superiority in external application, in the form of fomentations, &c. to sphacelus parts.

In debility of the alimentary canal in general, and of the stomach in particular, which gives rise to acidity in the latter, as often occurs in Dyspepsia, which require tonics, the superior anti-fermentative power of the Corni, should be employed. For however satisfactorily physiologists may account for digestion by the powers of solution, in the healthy state of the stomach, there are too many evident marks of acidity in its diseased state, to deny the acid fermentation in the latter condition of this Viscus.

Conscious of the imperfect manner, in which I have treated this truly important and interesting subject, I must do it the justice to conclude in the words of Mr. Pope.

"If vain our toil,
We ought to blame the culture, not the soil."

But before I take a final adieu of you, illustrious Professors, permit me in this humble manner to return you my most sincere thanks, for the inestimable principles which I have received from each and all of you in the science of medicine. For it is from the most impressive evidence I add, that it is in this University, that new avenues to medical knowledge have been unfolded, and the just importance of former ones established: in which University, the genuine principles of medicine have received a development, and a kind of demonstration hitherto unknown. And lastly, in which its students enjoy that profound liberality, and indulgence in sentiment which banishes superstition, and its concomitants blind veneration and credulity.

THE END.