AN

ESSAY

Concerning the CAUSE of the

ENDEMIAL COLIC

OF

DEVONSHIRE,

Which was read in the Theatre of the College of Physicians, in London, on the Twenty-ninth Day of June, 1767,
By George Baker,

Fellow of the College of Physicians, and of the Royal Society, and Physician to her Majesty's Household.

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TO

SIR RICHARD WARWICK BAMFLYDE,
BARONET,

AND

JOHN PARKER, ESQUIRE,

THIS

ESSAY,

ON A

SUBJECT PARTICULARLY INTERESTING
TO THE COUNTY, WHICH HAS THE
HAPPINESS OF BEING REPRESENTED
BY THEM IN PARLIAMENT,

IS,

WITH THE GREATEST RESPECT, INSCRIBED

BY

THEIR MOST OBEIDENT,
AND MOST HUMBLE SERVANT,

GEORGE BAKER.
A Very small acquaintance with the writings of Physicians is sufficient to convince us, that much labour and ingenuity has been moft unprofitably bestowed on the inveftigation of remote and obscure caufes; while thofe, which are obvious and evident, *que ante pedes funt*, which muft neceffarily be acknowledged as foon as ftumbled upon, have been too frequently overlooked and difregarded. Such a fpirt of inveftigation has, in feveral inftances, been the parent of dangerous error in practice; inasmuch as Men are apt to be as partial to their own offspring; and feldom forget opinions at the bed-fide, which have been the refult of much contemplation at home. It muft however be acknowledged, that fuch a fpirt is a fault not fo much to be imputed to the prefent, as it was to the laft age. We have now learned to attend to Nature; to obferve difeafes, and the genuine effects of medicines on the human body; and to make experiment the great *bafis* of our reafoning. And although, in many cafes, we subfcrite to the doctrine of that fect of Physicians, who, according to Celfus, called themselves experience, *ab experientia, that non inter fit quid morbum faciat, fed quid tollat*; yet we are not fuch Empirics, in the modern fenfe of the word, as to pay no regard to thofe caufes, which
which are manifest and within our reach; such causes more especially, as lead us directly either to the cure of diseases, or to the prevention of them.

With respect to the provincial disease, which if the subject of this essay, I shall at present content myself with considering its origin. And if I am not mistaken in that, it would seem that, in this instance, *cognitio caufae morbum tollet*; that an obvious method is pointed out, by which this colic may become no longer and endemical disease in one part of England; and perhaps, in other parts, less frequent than it is at present. A malady, so formidable as well in its immediate effects, as in its more distant consequences, it is an office of humanity, as much as possible, to prevent. We may gain credit even in avoiding an enemy of superior force; and when we find ourselves unequal to the contention, it is a kind of victory to make our escape,-

*Faller & effugere est triumphus.*

The earliest account of the Devonshire colic, which I have met with, is in Dr. William Mufgrave’s *Differtatio de Arthritide Symptomatica*, published in the year 1703. In the fifth section of the tenth chapter *de Arthritide ex calica*, is the following passage.

“Alia vero colica, apud Damnonium, ex pomaceo immiti et acido, “nemis usurpato, derivatur; id quod ex eo liquet, fiquidem illos “folum infeftat, qui potionis isti affueti: fic ut iis tempeftatibus, quae “pomaceo abundant, crefcat, & in vulgus ea graffetur; contra vero, “Pomona copiam negante, rarius obveretur.” It fees very particular, at Dr. Mufgrave should say so much of this colic, which is represented to be the effect of cyder; and not mention those effential and pathognomonic symptoms, by which it is at this time distinguished. Are we to suppose that, when Dr. Mufgrave lived, this species of colic had not been observed to terminate in palsy, or epilepsy? Or is it more probable, that his attention was so engrossed by the general subject of his dissertation, that he forgot to mention such remarkable *phaenomena*? That he was well acquainted
acquainted with a disease exactly similar to Dr. Huxham's morbus colicus Damnoniorum, namely the colic of Poitou, is very certain; for in the fourth history of the same tenth chapter, he mentions the café of a gentleman, who “aetatis fore, colica, quam Pictonicam “appellant, aliquamdui vexatus, ex more et progreffu itius mali “ordinario, incidit in paralyfin; artus exinde marcidos, graciles, “imopen habens; per reliquum vitae clinicalus. Paralyfi fu ejus “initium accefferunt dolores erratici, incerti, horum, illorum “artuum internodia cruciante autumno et tempeftate pluvia “maximopere faevientes, et ad amuffim rheumatifmum “simulantes.”

It is indeed possible, that Dr. Mufgrave might not often have seen the colic, which he mentions as peculiar to the drinkers of cyder; for, as I am informed, orchards were not in his time much cultivated in the country near Exeter, where Dr. Mufgrave resided; and there was not county-hospital at that time established. And Dr. Huxham testifified in the year 1739, that there was at that time ten times more cyder made and drunk in the County, than there had been about thirty or forty years before.

Dr. Huxham’s opusculum de morbo colico Damnoniorum, which he firft published in the year above-mentioned, contains a very full description of the malady, which is the subject of our present inquiry. He informs us, that “in the beginning of the “Autumn of 1724, if fpread itself over all the county of Devon, “among the Poulace especially, and thofe who were not very “elegant and careful in their diet; and that, though it may not rage “with the fame degree of violence, and may affect a vastly lefs “number of People, yet it infests that County more or lefs every “Autumn.” Whoever perufeth Dr. Huxham’s defcription, will readily determine the morbus colicus Damnoniorum to be precisely the fame disease, which in the year 1617, was defcribed by Francis Citois, a native of Poitiers, afterwards Phyfician to the King of France, and to the Cardinal Duc de Richelieu, under the title of novus
novus & popularis apud Pictones dolor colicus biliofus. Indeed it seems to be acknowledged by Dr. Huxham, that what is called Colica Pictonum, “which kind of disease,” says he, “is very common in the West-Indies,” is familiar to the disease which he describes; arising from a familiar cause, to wit, too * great an use “of the very acid juice of lemons, and requiring much the same “method of cure.”

Dr. Huxham’s refers the cause of the Devonshire colic principally to a very gross, effential, acid salt, or tartar, with which the expresssed juice or apples, whilst unfermented, abounds. He thinks that “by long and frequent drinking a liquor of this kind, such a quantity of crude, gross tartar is thrown into the blood, that it thence becomes very acrid; and not only the blood, but, from that impure source, all the humours thence secreted. So that instead of a very soft, lubricating mucus separated by the glands, discovered by Dr. Havers, we have as it were a sharp, coagulated matter, whence arises a great pain in the joints, and impotence of their motion. – Instead of an exceeding soft lymph to moisten the nervers, a corrosive ichor; and hence epileptical attacks. Moreover, the blood being facerate with such a great quantity of salts, they attract one the other strongly, and form greater molecules than can pass through the lymphatic arteries, scarce indeed through the sanguineous capillaries; hence various obstructions, and great irritation on the nervous extremities. At length even the very Bile, that variably useful balsam of the body, becomes corrupted and quite enervated by the super-abundant apple-acid, though in its natural state it was designed to correct acidity.”

Thus I have extracted a specimen of Dr. Huxham’s doctrine; and for the remainder of his very ingenious theory I shall refer you to the treatise itself; where you will find a sentiment, which perhaps is

1 I am credibly informed, that, at this time, both in the West Indies, and in the northern colonies of America, the juice of lemons and limes in not only much trusted to as the cure of this disease, but that it is esteemed to be a preservative from it.
is applicable on the present occasion. — “Sine experientia vana omnis theoria, bella fit utcunque.” For, notwithstanding the deference, which I always pay to the authority of this celebrated Phylician, I have for some time conceived doubts concerning the solidity of this doctrine. When I have considered, that there is not the least analogy between the juice of apples, and the poison of lead; and that this colic Devonshire is precisely the same disease, which is specific effect of all saturnine preparations; it has not seemed to me at all probable that two causes, bearing so little relation to one another, should make such familiar impressions on the human body. No author, whom I have had an opportunity of consulting, has given any intimation of having conceived the same suspicion with myself, except only the anonymous author (supposed to be M. Bouvart) of Examen d’un livre qui a pour titre T. Tronchin de Colica Pictonum, par un Medecin de Paris. This writer says, in a cursory manner, and without seeming to lay any stress on what he throws out, “Il est possible, que les vins, dont parle Citois, et les cidres, dont parle M. Huxham, aient etc, sans qu’ils l’aient pu decouvrir, alteres avec la litarge, ou quelque autre matiere semblable.”

It is evident however from what this Author afterwards says, in the forty-sixth page, that he was very far from forming any settled opinion on this subject. “Ces trois causes, savoir la bile, les matieres minerales venimeuses, et les vins verds et aufteres, quoique differentes en apparence, produifent, malgre ce qu’endpeut dire M. Tronchin, des coliques a peu pres de meme espece.”

But to return to Dr. Huxham. — And first, how much forever our Cyder may agree with Rhenish and Moselle wines in the circumstance of containing a large quantity of effential salt, of a familiar figure; no argument, from analogy, will be here be valid, unless it can be shewn that Rhenish and Moselle wines have ever produced the colic of Poitou in an unadulterated state *. Secondly, if Cyder is the cause of this disease, as being an acid,
acid, why is the colic of Poitou very little known in the eastern countries, where the Turks, whose religion obliges them to abstain from wine, drink every day very large quantities of an acid fherbert? Does the experience of Jockeys, who, in order to reduce themselves to a certain ftandard of weight by sweating, are faid to drink largely of vinegar, ftrengthen fuch an obfervation? Do find it to be true, that childre, and valetudinary people, and particularly chlorotic girls, whose primae viae abound with acid, are on that account fubject to this colic? Is not a Diarrhoea, or Cholera, the ordinary effect of eating unripe fruit immoderately? What rea fon can be given, why the poorer inhabitants of the counties of Worcester, Gloucefter, and Hereford, who ufe, as their common drink, a weak acid cyder, are fubject to no fuch colic? Why is this difeafe no longer endemic in the province of Poitou? Is it that the grapes are brought to mo re maturity, than they were formerly? Has the Sun more power now, than in the time of Citois? Why, in the Bahama-iflands, is this difeafe unknown? I am informed by a gentleman, who lived there many years, that this has been the café, ever fince rum has been no longer deftilled in thofe iflands. The fame gentleman informs me, that the inhabitants drink very large quantities of fmall punch, made extremely acid with the juice of limes; the labouring people to the amount of two gallons of it every day. And laftly, is it rea fonably to be fufpected, that the effential falt of a vinous liquor can raife fuch tumults in the bowels, whether by corrupting the Bile, or otherwife; when it is vulgarly known, even among the Miners in Derbyshire, that Patients, afflicted with this fame difeafe, do not receive a more immediate, or more important relief from any medicine whatever, than by taking large and repeated dofes of this very effential falt, the Cremor Tartari; and when it appears, that Dr. Hillary greatly depended on it for the cure of the dry-belly-ach in the Weft-Indies? Zeller, in his docimafia, figna caufae, & noxa vini lithargyrio mangonifati, gives an account of the revival of the adulteration of wine with litharge in
in the Duchy of Wirtemberg, in the beginning of the present century. In this dissertation he affirms, that though the wines, in the neighborhood of Tubinga, were as acid as vinegar, the inhabitants had long drunk them with impunity, 'till this fraud was introduced. "Constat viciniam nostram, ubi alias montes lachrymantur, acetum, "et istiufmodi vina immatura et acida per plures annos, imo luftra "ab incolis & militibus largiter hauffa fuerunt, ab omnibus tamen "his symptomatibus penitus liberam fuiffe, cum a fuco quoque "libera fuerit: Imo in ipfa hac noftra Civitate quae ante duo luftra "truculentia hac tantum non oppreffa fuit, poftquam fraudem hanc "plurimi tam Vietores, quam Caupones, tecte quidem exercuerunt, "omnes ifti, qui a Cauponibus vinum vel non emerunt, vel in "eorum aedibus non biberunt, a torminibus et cruciatibus hisce "immunes evaferunt; licet eorum domeftici per aliquot annos "aufterum & acidiffimum hauffent vinum, ut acidius guftar vel "dari nequeat; aliis interea, quos dulcedo inefcavit, miferrime "patientibus, aut evervatis, elumbibus redditis, pendulis artibus et "refolutis incedentibus, aut neci traditis; plurimi enim miferrime "perierunt."

The experiment, mentioned by Zeller proves nothing against the general wholesomeness of acids. Upon his giving to a Dog three ounces and an half of very strong vinegar, the respiration of the animal immediately became sonorous and difficult; and he died in the third hour after he had swallowed the vinegar, having thrown up great quantities of froth, which at last was mixed with blood. The Dog being opened, no signs of inflammation appeared in the stomach: the mischief is described to have been in the lungs only. Some of the vinegar probably found its way into the lungs; and suffocation seems to have commenced in the very act of swallowing. Whereas Brunnerus, (Ephermerid. Germanic. an. 4. Obfervat. 92.) who killed a Dog with an ounce of powder of litharge, diffolved and boiled in vinegar, found the effects of that poison to be principally in the stomach, intestines, urinary bladder, and the rest of
of the viscera of the abdomen.

I shall only add one more observation concerning acids. Physicians, who have resided some time in the hotter countries, have testified, that there are no better remedies against spasms, dysenteries, and the other endemic diseases in hot climates, than the acid vegetables, with which Nature has most liberally supplied the warmer countries. This opinion is expressed in a strong manner by Jacobus Bontius in his Hiftoria Naturalis Indicæ Orientalis, lib. vi. cap. 27. “Videtur Natura vouiffe ex profeso multas acidas et “conftringentes herbas e terra producere contra violentos & “endemios morbos, dyfenteriam nempe, cholera, & fpasmum, “plerumque a Bile ortos: ut quafi digito monftraret, ubi haec vel “fimilia mala nafcuntur, ibi locorum remediorum manifefta et “etiam culta qualitate pugnantium penuriam non fore.”

It seems therefore not to have been without sufficient foundation, that I have for some time suspected, that the cause of this Colic is not sought for in the pure Cyder; but in some, either fraudulent, or accidental, adulteration.

Upon inquiry, I find that the disease is very common all over the county of Devon; but that it particularly affects those parts of the county, where the greatest quantities of Cyder are made. I likewise find that it is not only common among the lower class of inhabitants; but that it is much more frequent among people of all ranks, than in other parts England; and that it is not entirely confined to that autumnal season. Not long ago I had an opportunity of seeing several wretched victims to this cruel disease; who answered to the representation drawn by Citois. “Per “vicos, veluti larvae, aut arte progradientes ftatuæ, pallidi, “fqualidi, macilenti confpiciuntur, manibus incurvis et fuo “pondere pendulis, nec nifi arte ad oset caeteras fupernas partes “fublatis, ac pedibus non fuis, fed crurum mufculis, ad ridiculum, “ni mi ferandum, inceffum compositis, voce clanginga & ftrepera.”

I lately received from Dr. Andrew of Exeter the following account
account of all Patients, under this disease, admitted into the hospital at Exeter since September 1762.

<table>
<thead>
<tr>
<th>Period</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Sept. 1762 to Sept. 1763</td>
<td>72</td>
</tr>
<tr>
<td>Sept. 1762 to Sept. 1764</td>
<td>1764–75</td>
</tr>
<tr>
<td>Sept. 1764 to Lady-Day 1766</td>
<td>86</td>
</tr>
<tr>
<td>Lady-Day 1766 to July 6, 1767</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>285</td>
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Of this number 209 were cured.

Dr. Andrew likewise informs me, that Patients are brought to the Exeter hospital from all parts of the county; but chiefly from those parts, where most cider is made. – That the most violent symptoms of this disorder, such as pain and costiveness, are generally removed, before the sick are brought to the hospital; and that nothing commonly remains but a paralytic weakness in the arms. Dr. Andrew adds, “I have known this complaint cured “radically; tho’ I confess, a return often happens. When the disease “proves obstinate, we always endeavor to get our Patients into the “hospital at Bath; the Bath-water, tho’ not a specific, being “esteemed by us the most effectual remedy, both internally and “externally used.”

According to my information, eighty Patients, under the effects of the Devonshire colic, were admitted into the Bath-hospital in the course of the last year; forty of whom are said to have been cured, and thirty-six sent away greatly relieved. I likewise am informed from the Bath-hospital, that the proportion of such Patients from Devonshire, to that from the counties of Hereford, Gloucester, and Worcester, is generally as eight to one.

In some letters, which I have lately received from Dr. Wall, of Worcester, the following facts are mentioned. “The counties of “Hereford, Gloucester, and Worcester, are not, so far as I know, “subject to the colic of Poitou, or any other endemic illness, unless “it may be the rheumatism; which, I think, the inhabitants of “Herefordshire
“Herefordshire are more liable to, than those of some other counties. There is no Lead, which can give occasion to that colic, used in any part of the apparatus for grinding or pressing the apples, or fermenting the liquor. Once indeed, in a plentiful year of apples, I knew a Farmer, who wanting casks, filled a large leaden cistern with new cider, and kept it there, till he could procure hogheads sufficient to contain the liquor. The consequence was, that all who drank of it were affected by it as the Lead-workers usually are. We had eleven of them, at one time, in our Infirmary.

“I have lately had two or three Patients in that distemper, occaisioned by their having distemper, occaisioned by their having drunk cider made in a press covered over with Lead. But this fact of a cider-press covered with Lead, is a singular, and perhaps the only instance of the kind in this part of England. It happened in a part of the county of Worcefter, adjoining to Warwickshire, where very few apples grow; and the bed of the press being therefore cracked by difure, the sagacity of the Farmer contrived this covering, to prevent a loss of his liquor. In general, the cider-drinkers with us are healthy and robust; but for the most part lean. The liquor is clear, and passes off readily by urine and perspiration; which enables the common people to drink immense quantities of it when at labour, to the amount of several gallons in a day. I have heard it observed by a Physician, late of this place, who was much concerned in the cure of Lunatics, that more of those unhappy Persons came to him from Herefordshire, than any other place. The fact, if true, may possibly arise from the quantity drunk, rather than the quality.”

Were the apparatus for making cider the same in all the cider-counties, it would appear very remarkable, that the inhabitants of one county should experience such terrible effects from the use of this liquor, while those of the other counties drink it with impunity. But, if we inquire into the method of making cider in
in the county of Devon, we shall be able to conjecture with some degree of probability, what it is that occasions such a difference. The large circular trough, is generally composed of several pieces of moor-stones, cramped together with iron, some melted Lead being poured into the interstices. It frequently happens, that these stones, which are thus to be joined, are unequal, and do not correspond with each other; so that considerable chafms are left between them; and these chafms are filled up with Lead. In this case the apples, ground by the pressure of the roller, immediately come in contact with no small quantity of this poisonous mineral.

It is likewise common, in several parts of the county, either to line the cyder-presses entirely with Lead, in order to prevent their leaking or to make a border of Lead quite round the press, in order to receive the juice of the apples, and to convey it into a vessel, made of wood or stone, placed underneath. And in many other places, where these methods are not used, it is common to nail sheet-lead over any cracks or joints in the presses; and likewise to convey the juice of the apples from the presses in the leaden pipes. Moreover I am informed, that it is the practice of some farmers, in managing their weak cyder, made early in the year, before the apples are ripe, to put a leaden weight into the casks, in order to prevent the liquor from growing sour; and that this cyder is the common drink of their servants and labourers. But I am willing to believe, that this pernicious method of adulteration (against which several laws have been enacted, as well in France as in Germany, and which crime, in both countries, is deservedly punished by death is not often practised by our countrymen.

Dii meliora piis, erroremque hostibus illum!

Dr. Wall informs us, that in some parts of the counties of Hereford, Gloucester, and Worcester, the mills, in which the apples are ground, being 16, 18 and 20 feet in diameter, consist of several pieces of stone or timber, joined together with cramps of iron, joined
joined together with cramps of iron, faftened with Lead: but that thefe cramps are fixed in the bed of the mill, or on the outide of the curb, and not in the groove where the apples are ground. The fame Gentleman obferves, that, if many apples, full of juice, lie long on the bed of the mill, (where the apples are placed in an heap, that they may be ready to be thrown into the groove,) fome of which may perhaps be rotten, others bruifed in the gathering, and a moifture fpread over the whole, from the fermentation and fweating of the fruit, it may perhaps be doubted, whether ther fome part of the Lead, ufed in the cramps, may not be diffoved; tho’ it muft be, at moft, in a quantity extremely fmall: there being but very little Lead ufed in the junctures; and the furface expofed to the apples being almoft imperceptible. But I am informed by another perfon, that in many parts of Herefordshire, and the neighboring counties, the ftones of the mills, are joined together with putty; (which is whiting, mixed with oil into a tough pafte) and that neither iron nor Lead are originally ufed in the conftuction of them; but that, if any of the joints, in wearing, happen to ftart (which is fometimes the café) they are repaired with iron cramps faftened with lead.

These facts having been well afcertained, I determined to make ufe of the firft opportunity, which might occur, of informing myfelf by experiment, whether or no there are really marks of folution of Lead in the cyder of Devonshire. Being therefore, in the month of October 1766, at Exeter, I procured fome of the expreffed juice of apples, as it flowed from a cyder-prefs, lined with Lead, in the parifh of Alfington. On this I made and repeated feveral experiments by means of the atramentum fympatheticum, or liquor vini probatorius defcribed by Neuemann; and of the volatile tincture of fulphur. These experiments intirely fatisfied me, that the Muft contained a folution of lead. The fame experiments were made of fome cyder of the preceeding year. This likewife fhewed evident figns of lead contained in it; but in lefs proportion

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proportion than in the Muft.

But, being unwilling to make any positive assertion, solely on the authority of my own trials, more especially as I had been under the influence of a preconceived opinion; I brought with me a London fome of the fame Muft, which I had examined at Exeter. This Muft, together with fome Devonshire cyder of the preceding year, which I purchafed of the maker, (who affured me that he ufed no Lead in any part of the appartus for making cyder, except only what is neceffary for comofing the trough, as was mentioned above,) were the fubject of fome experiments, in making which, Dr. Saunders, in an ingenious Gentleman, who teaches Chemiftry, kindly gave me his affiftance.

Before I give an account of the feveral experiments, which we made, in order to afcertain this adulteration, it may be proper to make a few obfervations, which will perfectly explain the mode of union, which takes place between wine, or cyder, and lead.

The expreffed juice of the grape, or of the apple, has a confiderable quantity of acid united with the saccharine matter. This juice, when subjected to fermentation, has its acid, during the progrefs of that fermentation, gradually affimilated and converted into an alcohol or inflammable spirt. But if the original juice, or Muft, be crude and acid, without having much saccharine matter in it, the native acid is with difficulty affimilated; or, when it arrives at the proper period of affimilation, it does not remain there ftationary, but haftens on to the acetous fermentatio. When lead is added to fuch wines, their acidity is covered; a fweetnefs is communicated to them; and their acetous fermentation is checked.

The richer wines, of which the original juice contains a larged proportion of saccharine matter, are lefs liable to adulterations of this kind, than the poorer wines of northern climates, fuch as the Rhenifg and the Mofelle wines, and our Englifh cyder.

It is here to be obferved, that the vegetable acid, ither in its native
native state of Muft, or in its fermented state of vinegar, or in its intermediate state of cyder, very readily receives an impregnation from Lead, whether it be applied in its metallic or calcined state. We are therefore to consider Lead, when united with wines, as in the condition of faccharum Saturni.

By attentively observing the variety of changes produced by certain bodies, when added to a solution of faccharum Saturni; and by applying these observations to the wines, which are the most frequent subjects of this adulteration, Chemists have been enabled to detect such frauds, wherever they have existed.

EXPERIMENT I.

A small quantity of Devonshire cyder being exposed upon clean paper to the fumes of the volatile tincture of sulphur, became immediately of a darkish colour, approaching to black. And we could only imitate this colour by exposing a dilute solution of faccharum Saturni to the same fumes. A small quantity of cyder, make in the county of Hereford, exposed in like manner to the same fumes, exhibited no such appearance, until a few drops of a solution of faccharum Saturni were added to it.

OBSERVATION I.

From this experiment we are to understand that the acid, before united with the Lead in the cyder, before united with the Lead in the cyder, and the volatile alkali in the tincture of sulphur, mutually attracted each other; and that it was the precipitate of the Lead united with the sulphur, which produced the dark colour above-mentioned.

EXPERIMENT II.
A small quantity of *Hepar Sulphuris* (prepared by digesting together in a sand-heat one ounce of orpiment, and two ounces of quick-lime, with twelve ounces of water, in a close vessel) being added to some Devonshire cyder, in a few minutes occasioned a darkish colour in the body of the liquor, approaching to black; and the whole became very opaque. No such change was produced in the cyder of the county of Hereford, until a few drops of a solution of *faccharum Saturni* were added; when the same appearance, which was produced in the Devonshire cyder, was perceived.

**OBSERVATION II.**

The reasoning, made use of in the former observation, is applicable here. The decomposition of the *faccharum Saturni* and of the *Hepar Sulphuris* was effected by the same laws of elective attraction.

**EXPERIMENT III.**

To a small quantity of Devonshire cyder a few drops of *Hepar Sulphuris* (prepared by boiling equal parts of fixed vegetable alkali and sulphur together in water) were added; and a precipitation of a very dark colour was produced.

When some Herefordshire cyder was treated in the same manner, the precipitate produced was as white as milk; and it was only upon the addition of a few drops of a dilute solution of *faccharum Saturni*, that a precipitate of the same colour with the former could be obtained.

**OBSERVATION III.**

There is some nicety required in making this experiment. The *Hepar Sulphuris* is not to be added in any large quantity; for as
as all the lead is precipitated upon the first addition, it is easy to perceive the several successive shades of colour in the precipitate, until all the lead is separated; and then the precipitate, upon a farther addition of *Hepar Sulphuris*, assumes the whiteness of the precipitate obtained from the Herefordshire cyder, which intitles it to the appellation of *Lac Sulphuris*. If a large quantity of *Hepar Sulphuris* be at once added, the whiteness of the too copious precipitate is such as to render the dark colour of what is first precipitated imperceptible.

**EXPERIMENT IV.**

Some Devonshire cyder was examined by means of the volatile tincture of sulphur, as in Experiment III. A very dark coloured precipitate was obtained. A similar precipitate could be only obtained from Herefordshire cyder, after that a weak solution of *Saccharum Saturni* was added to it.

Some of the Must (taken from the prefs in the parish of Alington, as was mentioned above) treated in the same manner with the cyder, produced precipitates of a deeper black colour. This sufficiently shews, that the solution of Lead in the Must was stronger than that in the cyder.

It is a matter of no consequence, whether the Lead, the existence of which is proved, was applied to the cyder in its state of Must, or in that of a vinous liquor. However, as the must afforded more considerable signs of impregnation than the cyder, it would seem probable that the lead was added to the Must; and that, as the acid, during the fermentation, is in a great measure converted into alcohol, a proportional quantity of lead will consequently be precipitated.

The same experiments were afterwards tried on several other specimens of Devonshire and of Herefordshire cyder. The result of them was constantly and uniformly the same as has been described.
It has been proposed by several Authors, to detect such adulterations of wines by means of the vitriolic or of the muriatic acid; which, by uniting with the lead, will make it precipitate. But it is ascertained by the experiments, made with the acids, are less conclusive than those which have been described.

**EXPERIMENT V.**

In order to leave the matter entirely without doubt, an extract from 18 common quart bottles of Devonshire cyder (first strained through a cloth) which had been in my cellar more than three months, was prepared. This extract, being assayed with the black flux, a quantity of Lead, weighing four grains and an half, was found at the bottom of the crucible. These experiments were made in October 1766.

In the latter end of the last century, when the physicians of Germany (particularly Vicarious, Cockeilius, and Brunnerus, whose dissertations of this subject may be found in the Ephemerides Germanicae) had taken great pains to discover the true cause of the epidemic colic, which, to use the language of Brunnerus, (Ephemerid. Germanic. Dec. 3. an. 4. Observat. 92) “non minus aegrotantium viscera, quam medentum animos, torserat;” And when they had at last demonstrated, that this disorder was wholly to be referred to small acid wines, adulterated with litharge, there appeared a writer (a certain Seerup, a physician of Copenhagen) who endeavored to exhibit a specimen of his reading and ingenuity, by maintaining a bold paradox. This man, in very pompous language, and with an air of the greatest confidence, affirmed in his *triumphus lithargyratorum*, that no danger was to be apprehended from wines in which litharge was dissolv'd; and that all the ill effects, supposed to have been derived from that cause, were really to be attributed to the austerer acid of wine made of unripe grapes. This
This opinion he endeavors to defend by the authority of Drawitzius, Sennertus, Van Helmont, Theodorus Zwinger, Boyle, Wepfer, and several other Writers. He likewise quotes several authors, to shew the salutary effects produced in the human body by the internal use of lead; and insists, in the virtue of their testimony, that it had cured affections of the spleen, arising from an acid cause; the hypochondriacal diseased; sudden inflammations; colics occasioned by the Bilis aeruginosa; obstinate quartan fevers; ulcerations of the lungs, as well as other parts; and the plague itself. He adduces other authorities to shew, that the \textit{Aqua Saturni} had been of very great use in disorders occasioned by worms; that the \textit{Spiritus Saturni} had cured the leprosy; that Paracelsus held it to be a specific remedy in madness; and that in the smallpox, and all other inflammations, it had been proved to be an efficacious medicine: That it was the great sudorific medicine of Faber; and that it was Mynficht’s secret for the cure of the phthisis, and diseases of the spleen and colic; and that the great success, which had attended the practice of Petrus Matthias was ascribed to the use of \textit{Saccharum Saturni}, and other preparations of lead: and lastly, that a constipation of the belly could not justly be attributed to \textit{Saccharum Saturni}, since Antonius de Heide afferts, in his medicinal observations, that he cured that disorder by administering to his patients five grains of that remedy, mixed with Crabs-eyes.

It is presumed that, the presence of lead in the Cyder of Devonshire being demonstrated, there is no one, at this time of day, likely to revive the argument of Seerup, and still insist on the deleterious quality of the acid: For a poison is discovered, which is experimentally known to be adequate to all those dreadful effects, so pathetically described by Dr. Huxham. It likewise presumed that no opinion, unsupported by facts and experience, (how respectable soever the character of its author may be) will be admitted in evidence, when contrasted with the authority of a fact, which seems to
to be clearly demonstrated to our senses.

The general character of lead, and the preparations of lead, when given internally, has been, that they cool, incraffate, repel, abforb, and obtund acrimony. And it is very well known, that their real power has, in many instances, seemed to answer to such a general character; for there are scarcely any medicine, which produce their effects more immediately, or with greater certainty, in colliquative sweats, in fluxes, and in haemorrhages. But it is as well known, that the relief given, which for the most part, is only temporary, has been frequently followed by violent pain in the bowels, obftinate coftiveness, suppreffion of urine, tremors, fpasms, palfy, afthma, and suffocation. And altho’, if we give credit to the testimony of credible writers, we muft allow that Patients, of certain constitutions, may have taken thefe medicines with fuccefs, and with impunity; yet surely Physicians cannot be too cautious in avoiding the ufe of medicines, the effect of which, for aught that they can presume to afcertain, may be more formidable than the diseafes to which they are oppofed. That preparations of lead were formerly very fafhionable medicines, we may judge from the oldeft difpenfatories, in which we find an almoft infinite number of Magifteries, Elixers, and Balfams, which have that metal for their bafis.

We are informed by Mr. De Haen, that the ufe of thfe medicines is much more common even now than is generally imagined. He thinks that the number of Patients, affected by the colic of Poitou, is immenfely increafed by fuch means. He mentions the formula of a medicine, compounded of Saccharum Saturni, of Ceruffe, and of water. By this medicine taken cochleatim, a Patient, he fays, was cured of a gonorrhoea; but foon afterwards was feized with the moft excruciating pain in his bowels, followed by a vomiting of his excrements. He adds, that this man, tho’ he efcape’d death, even after three years, felt and lamented the reliques of that moft dreadful cure. I could quote from
from my own experience more than one instance of cafes, in several respects similar to this, which I have taken from Mr. De Haen’s ratio medendi.

What then can we think of the practice of the Chinese, who very frequently administer internally various preparation of lead, to which they ascribe extraordinary virtues? The observation made on this subject by Mr. Malouin, in his Chymie Medicinale, seems judicious. “En reflichissant fur l’usage interieur que les Chinois font du Plomb, on est porté a croire que ces peuples font differemment construits ou temperes; ou que leur Plomb differe du notre.”

Dr. Huxham finds it a difficulty to account for the reason, “why the juice of apples in one year produces a coltive belly, with violent colical pains, but in another, a loose belly with scarce any gripes attending.” I have been informed by others, that small quantities of new cyder will frequently produce a diarrhoea in every year. But Citois observes, that the colic, which infested the inhabitants of the province of Poitou, was often attended, “per initia praefertim, cum alvi frequenti, fed non ita copiofo, fluore, faepius cum eujdem adftrictione.” M. Douzam, who writes on this disease in the journal de medicine for the month of October, 1760, affirms that “Il en eft plufieurs, qui non feulement n’ont point eprouve de conftipation mais meme qui fe font plaints d’un flux de ventre.” The same thing is sometimes observed in the café of painters, and of other workmen employed about Lead. Some of them are cured by a spontaneous looseness of the belly. Mr. James Wilfon, who (in the Effays and Observations phyfical and literary, publifhed at Edinburgh, Vol. I. Art. 22.) gives an account of a disease, called by the miners Mill-reek, which all the inhabitants of Lead-Hills are subject to, but particularly thofe, whose daily bufinefs it is to melt down the Lead, obferve, that, in the firft ftage of this disease, a diarrhoea fometimes makes a cures.

A queftion may be asked, “If the mifchiefs occafioned by Cyder,
Cyder, particularly when it is new, arise from the poison of lead diffolved in it, how happens it, that all, who drink this liquor, do not suffer in proportion to the quantity of poison swallowed; and that some people, who have long accustomed themselves to it, have never experienced any of its bad effects?” this difficulty, (which is in its full force, whatever general cause be supposed) can only be solved by recurring to that inexplicable idiofyncrafa, in which there is so remarkable a difference among men. But it is likewise to be remembered, that the Physicians of Germany, who, in the latter end of the last, and in the beginning of the present century, wrote concerning wine adulterated by litharge, and the general effects of it, made the same observation. The words of Zeller are, “Multi tamen, imo innumeris ab eo laefi non fuerunt, utut ad “ebrietatem uſque illud hauferint; alii leviter tantum.”

I shall only add, that it will not be easy to determine the exact quantity of lead diffolved by the acid of Cyder, unless an evaporation and an assay be made, as soon as the juice is expressed. For it seems probable, that, as it happened in the café of the adulterated wines of Germany (which, we are informed, after a few months, lost that apparent, but pernicious improvement, which a fraud had given them) the Cyder may, in some time, deposit the greatest part of its poison. But that a very small quantity of this poison is capable of producing most terrible effects, is certain from what was formerly observed in Germany. For a calculation having been made, according to the method of adulterating wines which is described by Cockelius, a measure of wine, called the menfura Wirtenburgica major, (which Reifelius estimates at sixty-four ounces) scarcely contained one half of a grain of litharge.

May not I presume to hope, that the present discovery of a poison, which has for many years exerted its virulent effects on the inhabitants of Devonshire, incorporated with their daily liquor, unobserved, and unsuspected, may be esteemed by those who have power,
power, and who have opportunities to remove the fource of fo much mischief, to be an object worthy of their most serious attention? I have long lamented, that a County, which is distinguished by some peculiar blessings, should likewise be distinguished by a peculiar calamity, as it were in consequence of its fertility. The subject therefore having appeared to me important, I have spared no pains in this investigation; and I am infured of my reward in the consciousness of having endeavored to preserve my countrymen and fellow-creatures from one of the most dreadful diseases, incident to the human body.

This essay will probably be hereafter be published in a medicinal collection. Some copies of it are now printed, with a particular view of giving to the inhabitants of the county of Devon the earliest intimation of their danger; in order that they may take the proper steps to preserve their health, and to secure the value of their property.

FINIS

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