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AN

ESSAY

ON THE

MEDICINAL PROPERTIES

AND

DELETERIOUS QUALITIES

OF

ARSENIC:

SUBMITTED TO THE

EXAMINATION OF THE

REV. JOHN EWING, S. S. T. P. PROVOST;

THE

TRUSTEES AND MEDICAL FACULTY

OF THE

UNIVERSITY OF PENNSYLVANIA,

ON THE

SEVENTEENTH DAY OF MAY, 1796,

FOR THE

DEGREE OF DOCTOR OF MEDICINE,

BY NATHANIEL POTTER,

OF PHILADELPHIA.

"*Nor ought so vile that on the earth doth live,*
"*But to the earth some special good doth give;*
"*Nor ought so good, but strain'd from that fair use,*
"*Revolts from true birth, stumbling on abuse:*
"*Virtue itself turns vice, being misapply'd,*
"*And vice sometime by action's dignify'd.*"——

SHAKESPEARE.

PHILADELPHIA:

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1796.

TO

BENJAMIN RUSH, M. D.

PROFESSOR OF THE INSTITUTES

AND OF

CLINICAL MEDICINE,

IN THE

UNIVERSITY OF PENNSYLVANIA.

IN departing from your protection, and appearing on the wide theatre of the world, I feel like a man exiled from his friends and native country; permit me therefore, to solicit a continuation of that salutary advice, the benignant influence of which I have so often felt. The acknowledgment of the infinity of obligations I owe you, for your assiduous attention in conducting me through the arduous pursuits of a difficult profession, during six years, constitutes but an inconsiderable part of the claim you so justly hold upon my gratitude: Whether I view you as a citizen, a philosopher, or a friend, you are equally entitled to my admiration and esteem.———May the rays of light from the principles of science which you have taught, like those of the sun, fall upon the most distant parts of the earth; may their truths, which I have so often seen exemplified, like the waters of the Nile, fertilize the soil they inundate.———That your life may be as long, and as happy, as it has been useful, is the most ardent wish of

Sir, your Affectionate Pupil,

NATHANIEL POTTER.

PREFACE.

IN the ſubſequent inveſtigation little aid can be derived from the opinions of preceding writers. The few lights that have appeared on the ſubject, have been ſo faint and tranſitory, that they have only ſerved to conduct us into a ſolitary and uncultivated deſert. The ingenious Dr. Fowler, of Staffordſhire, in England, is the only author who has treated ſyſtematically of the virtues of Arſenic: Although his obſervations have been confined to intermittent fevers and periodical headachs, he has done much toward eſtabliſhing the reputation of this valuable acquiſition to the materia medica.——It may be thought by ſome, ſuperfluous to increaſe the catalogue of medicine, with which the materia medica already ſuperabounds; it muſt nevertheleſs be acknowledged, that medicine to fulfil certain indications with promptitude and energy, are the grand deſiderata of the materia medica. The man who ſhall diſcover a ſolvent for the urinary calculus, or a cure for the epilepſy, will, in my opinion, better merit immortality than all the aſtronomers from Sir Iſaac Newton to the preſent time.

INTRODUCTION.

THE man who preſumes to recommend to the world a medicine which has ever been deemed a moſt virulent poiſon, ought ſeriouſly to contemplate that mixture of admonition and conſolation, which the poet offers to the juvenile ſatyriſt.

" But tread with cautious ſteps the dang'rous ground
" Beſet with faithleſs precipices round,
" Truth be your guide ; diſdain ambition's call ;
" And if you fall, with truth you greatly fall."

ALTHOUGH eight hundred years have elapſed ſince a celebrated Arabian phyſician* preſcribed Arſenic as an internal medicine, and although its ſucceſs has been atteſted by the moſt reſpectable authorities, yet, even at this enlightened period, it is ſcarcely known as a medicine. The frequent attempts that have been made to introduce this mineral into the practice of medicine have either periſhed with their authors, or ſoon followed them in ſilence and oblivion. To de-

* Avicenna. Lib. 2. Tract. 2.

termine whether the fate of this medicine has been the juſt reward of its pernicious effects, or the inevitable conſequence of ſcepticiſm and timidity, ſhall be the buſineſs of the ſubſequent diſquiſition.

THE idea of a poiſon aſſociates itſelf ſo intimately with death, that the thought of ſeparating them would at firſt view ſeem to offer a violence to the underſtanding. The epithet poiſonous has generally been made to deſignate ſome enigmatical or inexplicable quality, and a poiſon has accordingly been defined, "whatever by its "action upon the body produces death by its "quality, without reſpect to its quantity." The reverſe of this definition is perhaps the moſt accurate idea of poiſon that can poſſibly be given. Little ſagacity will be required to perceive, that poiſons are, in their own nature, as relative as heat and cold, and that the ſame ſubſtance may be either a medicine or a poiſon, according to its ſtrength and quantity. However repugnant this opinion may have been to the feelings of phyſicians, it was familiar to the penetrating eye of the philoſophic Shakeſpeare; who makes Friar Lawrence in his ſoliloquy exclaim:

'Within the infant rind of this ſmall flow'r
'Poiſon hath reſidence and medicinal power,
'For this being ſmelt, with that ſenſe chears each part,
'Being taſted, ſlays all ſenſes with the heart.'*

* Romeo and Juliet, Act II.—Scene 3.

An ingenious living author* has expreſſed the ſame thought, with a ſtricter application to the practice of phyſic. "Poiſons in ſmall doſes "are the beſt medicines, and the beſt medicines "in too large doſes are poiſonous." There is no ſubſtance ſo replete with death as not to admit of a ſafe application to the body, both externally and internally, by a certain degree of diviſion or dilution; neither is there any ſo innocent as not to be capable of abuſe by exceſs in quantity, or by long continued application. Opium in portions accommodated to the excitability of the ſyſtem, proves a moſt exhilirating cordial, and by its univerſal ſtimulus imparts tone to every fibre of the body; but increaſed to the quantity of a few grains, it diſſipates life like a vapour.—*The oxygenated muriate of mercury, in doſes of the fourth or ſixth part of a grain, is an inoffenſive and efficacious medicine, but ten grains of the ſame ſalt will annihilate life with irreſiſtible impetuoſity. †Strammonium, ‡Digitalis purpurea, ||the cicuta virosa, and many of the metallic preparations are invaluable medicines while they are confined within their proper limits, but in large doſes derange and diſorganize the moſt vital functions of the animal economy.—

* Withering's Botanical Arrangment.

† Corroſive Sublimate of Mercury.

‡ Jameſtown weed.

§ Foxſglove.

|| Hemlock.

The virus of the ſpider, which has ſo often extinguiſhed the lamp of life, when taken into the ſtomach diffuſes the animating ſenſation of the mildeſt ſtimulant, and is often uſed in the cure of intermittents with the moſt propitious effect. *The carbonic acid in combination with wine, cyder, and malt liquors, gives to them the moſt delicious flavour, but is ſo poiſonous to the lungs as to be totally unfit for reſpiration.—†Nitrogene gas, which in combination with oxygene compoſes $\frac{72}{100}$ of the atmoſphere we breathe, is incapable of ſupporting reſpiration. Bile, by its exceſs in quantity, or by a morbid quality, revolts with deleterious malignity againſt the ſyſtem in which it was generated. Even the direful contagion of the plague and yellow fever, when diluted by water ceaſe to propagate infection.—Ardent ſpirits are as certainly poiſonous as arſenic, but they differ in this, the former requiring a ſeries of time to accompliſh what the latter effects in a moment: the one, like an enemy in ambuſh, inſinuates itſelf into the moſt vital parts, while the latter ſurpriſes the mind by an inſtantaneous operation. Every ſubſtance that can poſſibly deſtroy life by being taken into the ſtomach, muſt accompliſh this end either by its exceſs of force diſſipating the excitability and running the excitement to its higheſt pitch, terminating in

* Fixed Air.

† Impure Air, or atmoſpherical mephitis.

death, or by gradually waſting the excitability by feeble but repeated efforts of the ſame nature. In the firſt way, ſuch ſubſtances as are denominated poiſonous act, in the laſt all the ordinary ſtimuli of life produce their effect. It is almoſt an invariable law of the animal economy, that impreſſions by repetition become more feeble, until at laſt no ſenſation is produced: it is in this way that the lives of old perſons not diſeaſed go out like a taper. The ſame cataſtrophe which is effected by a poiſon in a moment, an hour, or a day, is brought about, in proceſs of time, by aliments, drinks, and all the ſtimuli that ever have been the moſt friendly auxiliaries of life, and by a perfect ſimilarity of operation. It is therefore as unphiloſophical to ſay, a man was poiſoned by arſenic, as to ſay of him who died of old age, that he was poiſoned by his drinks or aliments. To condemn a medicine becauſe it has been abuſed by the injudicious, is as illiberal as it would be to ſtigmatize the inebriating qualities of wine becauſe drunkards have ſometimes expired in a paroxyſm of intoxication.

Other reaſons no leſs formidable, and equally unjuſt, have co-operated to prevent the introduction of arſenic into the practice of phyſic. An ignorance of its true operation, as well as of the pathology of the diſeaſes in which it has been preſcribed, have rendered its exhibition hazardous and uncertain. Without previous informa-

tion on theſe two particulars, it muſt be impoſſible to adapt any medicine to thoſe ſtates of diſeaſe which they are intrinſically calculated to relieve. Without the minuteſt attention to the condition of the ſyſtem at the moment the medicine is taken, how vague and uncertain muſt be the proſpect of relief? The neglect of this particular has induced ſome practioners to aſſert, that bliſters are uſeleſs in the Scarlatina, yet, what phyſician who has applied them in the typhoid ſtate of that diſeaſe cannot teſtify in their favour? The ſame cauſe has produced ſuch repugnant accounts of the digitalis in the treatment of dropſies, a medicine which I am confident never cured that diſeaſe, unleſs it was accompanied by ſome degree of inflammatory diatheſis. The want of attention to the ſame circumſtance, I have no doubt, cauſed that colliſion of opinion between Mr. Chaptall and Doctor Beddoes on the ſubject of vital air in phthiſis pulmonalis; yet, as in other diſſenſions, both may have been right or wrong. In the inflammatory ſtate of phthiſis, ſo ſtimulating a power as oxygene cannot rationally be expected to harmonize with the tender veſſels of the lungs, altho' it might prove the moſt ſalutary cordial, at a more advanced period of the ſame diſeaſe. We ſhall ſee in the ſequel, whether or not this important circumſtance has led Doctor Clark to deny the efficacy of arſenic in the cure of intermittents.

HOWEVER much phyſicians may felicitate themſelves on the boaſted advantages of experience, without juſt principles to direct them in deducing their indications of cure, they muſt ever float upon an ocean of doubt and uncertainty. If the materia medica contained the principles upon which medicines produce their effects upon the different *departments of the ſyſtem, the practitioner would then poſſeſs a luminary to conduct him, but how little better is the materia medica in its preſent ſtate, than a compages of empyriciſm and contradiction? There is no ſuch thing in nature as a ſpecific; no remedy will infallibly cure any diſeaſe. No diſeaſe appears invariably with the ſame ſeries, degree, ſucceſſion and continuation of ſymptoms, even in thoſe bordering neareſt on uniformity: No two perſons of an hundred will be affected with the ſame ſymptoms, alike in number, force and order. The phyſician who preſcribes for the picture of a diſeaſe as it is delineated on paper in a ſyſtematical noſology, acts as ſcientifically as he would do, were he to write a preſcription for the day of the month, or for the colour of his patient's ſkin. If all the wiſdom from Hippocrates to the immortal Cullen could be concentrated in one man, he could not, after defining a diſeaſe, ſay with what ſymptoms it would appear the next year. He therefore, who ſpends

* See page 9.

his time in ſearching after ſpecifics will find his ſcheme as viſionary as the purſuit after the philoſopher's ſtone, or as that of the Alchymiſts, who imagined themſelves capable of forming a ſubſtance that, like the hand of Midas, could metamorphoſe every thing into gold.

The exhibition of ſuch an heroic medicine as arſenic renders the ſtricteſt attention to the preceding obſervations indiſpenſibly neceſſary; for, he who expects it always to ſucceed in diſeaſes of the ſame name which it has occaſionally cured, will ſoon have reaſon to lament the fallacy of his own errors.

Of the Internal Operation of Arſenic.

PREVIOUS to treating of the therapeutic virtues of Arſenic, it may be uſeful at leaſt to attempt an explanation of its operation, eſpecially as its internal effects (ſo far as I can inform myſelf) have never publicly been the ſubject of a conjecture. No branch of medicine is veiled in more myſtery than the true operation of medicines. The following diviſion of the human body into different ſyſtems by a late writer,* opens the faireſt proſpect of improvement in this department of ſcience. 1. The brain and nerves.

* Ruſh on the Yellow Fever.

2. The liver, lungs, and alimentary canal. 3. The ſanguiferous ſyſtem. 4. The muſcular.—5. The glands and lymphatics. 6. The cutaneous. 7. The ſecretory and excretory organs. 8. The blood. 9. The ſenſes and appetite.

As health conſiſts in a due proportion of excitement being kept up between theſe different ſyſtems, ſo diſeaſe conſiſts in divided excitement, or a loſs of that equilibrium which conſtituted health. To cure diſeaſes, it therefore becomes neceſſary to find out what ſyſtem or ſyſtems are more immediately the ſeat of the diſeaſe, and to accommodate the remedies accordingly. There is ſo intimate a connection between theſe ſeveral ſyſtems, that the action of a medicine upon one, may bring another or more into ſympathy, yet it is ſufficiently demonſtrable, that ſome medicines poſſeſs a greater affinity to one ſyſtem than another.—The fœtid gums have a greater attraction for the nerves.—Mercury acts more particularly upon the lymphatics.—Cantharides ſeem to ſtimulate the urinary organs ſpecifically.—The oil of amber excites moſt particularly the muſcular fibre.—Antimony is determined to the ſkin.—Strammonium affects the brain violently; and Columbo root does not extend its influence far beyond the alimentary canal. I am ſo ſenſible of the propriety of conſidering the operation of medicines in this view, that were it not for

the implication of juvenile preſumption, I ſhould be led to hazard an opinion, that no great improvement will be attained in the materia medica, until its different articles ſhall be claſſed agreeably to the ſyſtems on which they principally exert their influence; and however diſcordant this idea may be to the minds of phyſicians, I flatter myſelf that future obſervation will demonſtrate, that it is neither the viſion of a youthful brain, nor the offspring of a diſtempered imagination.

As Arſenic is taken immediately into the ſtomach it acts primarily on the primæ viæ, and frequently proves eccoprotic. The Chineſe are not ignorant of this property: travellers inform us, "that they manufacture a variety of vaſes, "pagods, and other ornamental works, from "that union of arſenic and ſulphur which chy-"miſts call realgar. They make uſe of theſe "veſſels to obtain a purgative medicine; for "this purpoſe they leave vinegar or lemon juice "ſeveral hours in theſe veſſels, and afterwards "drink it." In doſes larger than can be judiciouſly adminiſtered with a curative intention, it affects the brain and nerves with vertigo and tremours. The arterial ſyſtem is ſubject to the action of this medicine; the quantity uſually taken as a medicine increaſes the force of the pulſe in a ſmall degree, but does not ſeem to impart that tenſion and fullneſs occaſioned by the Peru-

vian bark: By increaſing the doſe until it begins to diſorder the bowels, it increaſes the frequency of the pulſe, diminiſhes its force, and deprives the muſcles of their firmneſs and vigor. The glands and lymphatics are not exempt from the penetrating influence of this medicine, as is demonſtrated by its power of removing obſtructions, and of reſolving ſchirri. Its action on the ſkin is ſtill more conſpicious; the effluvia emanating from it, even in a ſtate of reſt, frequently affects the face with ſwellings, and its internal uſe often produces an eryſipelatous efflorescence over the whole body; but the power of this medicine on the cutaneous ſyſtem of veſſels will be more perſpicuouſly illuſtrated by its property of eradicating cutaneous affections. Some have imagined, that this mineral muſt prove diaphoretic, on account of its eaſy determination to the ſuperficies; but we never have been able clearly to trace ſuch an effect to its operation. A diuretic property has moreover been attributed to arſenic; but when pure arſenic has been adminiſtered, ſuch an effect has ſo rarely occurred, that it would appear more rational to conſider it as an accidental concomitant of the diſeaſe, or the effect of other remedies uſed at the ſame time. *Doctor Fowler obſerves, that arſenic has no pretenſions to the character of a corroborant, but has not

* Fowler's reports on the effects of arſenic in intermittent fevers and periodical head-achs.

decided on its operation. It would, indeed, appear to be leſs durable and invigorating than ſome other tonics, particularly the Peruvian bark; yet when we compare the modes in which they are generally exhibited, we ſhall find it more difficult to draw a line of diſtinction between their tonic powers, than we might on a ſuperficial view, be induced to ſuppoſe. Arſenic is not generally preſcribed more than three times a day, by which means the ſyſtem relapſes into its former atony; whereas bark is given at leaſt every two hours in the ſame diſeaſes: The former, from an ignorance of its immenſe power, has been preſcribed in doſes ſo large as ſeldom to be accommodated to the excitability of the ſyſtem, while the latter acts more feebly, and requires but little judgment to manage it to the greateſt advantage. By the ſtimulus of arſenic the ſyſtem is irreſiſtibly precipitated into indirect debility, and even by a very inconſiderable doſe; to obtain its corroborating effects it is therefore neceſſary, to begin with the minuteſt doſes, and to increaſe them in the moſt gradual proportions. The Peruvian bark may be compared to a ligature, while arſenic more aptly reſembles a two-edged ſword. One of the moſt valuable attributes of this medicine is, its inherent power of accummulating the dormant excitability of a callous ſyſtem; it would ſeem to faſten on the ſtimulability of the ſtomach, while it was inſenſible to all other impreſſions. It may be eſtabliſhed as a

general poſition, (and I ſhall have frequent occaſion to repeat it) that arſenic can never be judiciouſly adminiſtered while the ſmalleſt degree of inflammatory diatheſis is preſent; it is therefore in a ſtate of fever not to be put in competition with the Peruvian bark, which being leſs ſtimulating, may overcome a ſlight fever by a ſtronger action, without throwing the ſyſtem into thoſe turbulent commotions excited by arſenic. The dominion of this medicine will be more conſpicuous when we come to apply it to particular ſtates of diſeaſe; and firſt of thoſe of the

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Arterial Syſtem.

THE patent ague drop, formerly ſo celebrated in England, has been the principal means of calling the attention of phyſicians to the internal uſe of arſenic; for, although it had been before recommended by the indefatigable Baron Stork, it had not obtained much celebrity. *Doctors Fowler, Arnold and Withering have united their teſtimony in favor of arſenic in the cure of intermittents. The firſt of theſe gentlemen has recorded, that he relieved or ſuſpended two hunhundred and forty two caſes out of two hundred and forty ſeven, one hundred and ſeventy one of

* See Fowler's works for the letters of Drs. Arnold and Withering.

which number were radically cured. Dr. Withering informs us, that thirty three out of forty eight perſons were cured under his care by Dr. Fowler's mineral ſolution. Dr. Arnold does not mention the number which he either treated or cured, but obſerves, "that the ſolution ſeldom "failed." †Dr. Clark informs us, that he only cured twelve out of twenty five patients by the mineral ſolution, and that another phyſician of the Newcaſtle diſpenſary ſucceeded in only eight out of eighteen caſes, but adds, that he received a communication from an ingenious medical friend which informed him, that only four caſes out of an hundred had reſiſted this remedy. During my reſidence in a part of the ſtate of Maryland where autumnal fevers prevailed epidemically, I reſolved to try the comparative efficacy of arſenic and the Peruvian bark. Many of the fevers at that time aſſumed the remitting type, to ſuch I gave either emetics or purges of calomel previous to the exhibition of tonics; by this practice I either obtained a complete apyrexy, or ſo far ſubjugated the fever as to venture with ſafety on the uſe of ſtimuli. For fifteen caſes of this deſcription I preſcribed the ſolution, ſix of whom were cured, and four ſuſpended: I then gave the bark to an equal number under ſimilar

† See Obſervations on the Diſeaſes which prevail in long voyages to hot climates, and on the ſame diſeaſes as they appear in Great Britain, by John Clark, M. D.

circumſtances, thirteen of whom were cured, and the other two ſuſpended. From the unpleaſant effects produced by arſenic in theſe caſes it was obvious, that it was a ſubſtance too ſtimulating for the remaining portion of phlogiſtic diatheſis which ſtill accompanied the remittent ſtate. I likewiſe adminiſtered the bark to twenty perſons laboring under tertians, without previous evacuations of any kind, and found ſixteen of that number effectually cured: I repeated the experiment with the ſolution, and found it to ſucceed equally well. In many other caſes I premiſed evacuations, and found whether I uſed the bark or the ſolution, that no advantage reſulted from them in purely intermittent fevers. From the fifteenth of October to the fifteenth of November, I perceived that moſt of the intermittents had degenerated into quartans, and that thoſe recently attacked, now generally wore that type. The two remedies were now again put in competition: The bark cured twelve out of twenty, whereas the arſenic out of an equal number of caſes cured nineteen. This experiment was again attended with nearly the ſame reſult. In a few caſes both remedies failed; I then combined them, and found them more ſucceſsful, but ſtill ſome obſtinate caſes reſiſted their power. Reflecting on the pathology of this diſeaſe, and upon the nature of the remedies upon which I had ſo repeatedly experimented, it appeared to

me, that the inſenſibility of the ſyſtem was obviouſly the cauſe of failure in the few caſes unſucceſsfully treated: I therefore adminiſtered the arſenic three times a day, in doſes ſo large as to produce ſome ſenſible effect, by thus increaſing the excitability, I found, that the bark given in ſmall doſes, and gradually increaſed according to the ſtate of the ſyſtem, proved almoſt univerſally ſucceſsful; for I do not remember more than two who returned for cure after I inſtituted this method.

Although it may be reaſonably inferred that arſenic and the Peruvian bark are nearly equal in point of efficacy in the cure of intermittents as they occur in their variety of types in different ſeaſons, yet the former poſſeſſes ſome advantages over the latter with reſpect to the facility of its adminiſtration to all ages and conditions. Patients (more eſpecially children) can ſeldom be prevailed on to perſevere in the uſe of the bark until a complete cure is obtained. In an economical point of view arſenic has a ſtill ſtronger claim upon the attention of phyſicians. An ounce of the beſt Peruvian bark at this time coſts two ſhillings and ſix pence, and will ſeldom cure more than one perſon when it may be proper to exhibit it; whereas the ſame money will buy as much arſenic as will make as much of the mineral ſolution, as will (at the moſt moderate

calculation) cure ten thouſand perſons of the ſame diſeaſe.

I attempted the cure of intermittents by arſenic in Philadelphia during the autumns of 1794 and 1795, but was compelled to deſiſt from its uſe; it occaſioned thoſe unwelcome ſymptoms which I ſhall hereafter notice, ſo frequently, and in doſes ſo inconſiderable, that independent of its inefficacy it became at beſt a very diſagreeable remedy. It only ſucceeded in a few quartans, for ſo great was the inflammatory diatheſis of the intermittents of thoſe ſeaſons, that their cure was moſt commonly effected by remedies of a very oppoſite character. From a retroſpect of the preceding facts and obſervations, it will not be difficult to account for Dr. Clark's unfavorable deductions from the exhibition of arſenic, eſpecially as he concludes his paragraph on that ſubject with this obſervation—" when the continuation of the ague had brought on much weakneſs, I ſeldom in ſuch caſes tried the ſolution."

To elucidate more ſatisfactorily the operation of arſenic in the cure of intermittents, it may be uſeful to reaſon on the condition of the ſyſtem under the influence of that diſeaſe. Whatever may be the ſpecific nature of miaſmata, or of other remote cauſes of this ſtate of fever, they all give a pre-diſpoſition to diſeaſe, by inducing a ſtate of either direct, or indirect debility, which when

not induced by causes of a long continued or slow operation, leave the system more sensible to impressions. In this defenceless capacity of the system, every stimulus acts with double force, and the arterial system which would always seem to be the first to take the alarm whenever the harmony of the animal economy is molested, is thrown into convulsive motions.* In this situation of things, the excitement is divided, and that portion which belongs to the others is concentrated in the arterial system. This state which is a *fever*, continues to agitate the system, until it depletes from the arteries so much as to leave them upon a level with the other systems. With this picture of an intermittent before us, let us attempt its removal. In that preternatural state of excitement which constitutes a paroxysm, the disease is confined exclusively to the arterial system, and to cure it, the remedy should be directed specifically to that system. The use of stimuli will ever be an unavailing mode of practice, unless their power is so great as to overcome the

* These irregular motions have generally been attributed to the friendly interposition of an imaginary vis medicatrix, but they seem to be nothing more than the effect of stimulus disproportioned to excitability, or impulse disproportioned to resistance: we might as well say, that a ship under sail was actuated by a vis medicatrix because she did not stand still, for it is an universal law that force unequal to resistance shall produce irregular motions or a deviation from order, nor will the difference between animate and inanimate matter afford us a means of discrimination.

† diſeaſed action of the heart and arteries, to attempt which might often prove dangerous; we therefore leave this ſtate to be treated by other remedies. Where the fever in almoſt in an evaneſcent ſtate, and the action ſo feeble as not to call for a treatment in ſome meaſure antiphlogiſtic, the preſumption then may be, that it can be ſubdued by arſenic, bark or other ſtimulating powers: but that ſtate of atony in which a paroxyſm leaves the ſyſtem, is what more particularly demands our attention in the cure. In this ſtate the excitement although at a very low ebb, is preſumed to be perfectly equal, but the ſame remote cauſes continuing to operate, reproduce the ſame coincidence of excitement and excitability, from which the diſorder firſt originated, and thereby invite the ſame repetition of motions, with which it was before aſſociated.

The excitability of the ſyſtem, after the paroxyſm of an intermittent is, whether in a ſtate of direct or ‡ indirect debility, eaſily excited by the

† No two unequal actions can exiſt in the ſame ſyſtem at the ſame time, the ſtronger always depoſes the weaker. I would as ſoon ſuppoſe that two cubic inches of a ſolid, could each occupy the ſame cubic inch of ſpace at the ſame inſtant: yet the arterial, lymphatic and nervous ſyſtems may each labour under a diſtinct diſeaſe at the ſame time.

‡ Dr. Brown has told us, that in caſes of indirect debility the moſt powerful ſtimuli are neceſſary, but independent of

action of ſtimuli: unleſs the diſeaſe has become chronic, by a long continued operation of cauſes, or a reiterated repetition of paroxyſms. Arſenic may be advantageouſly uſed to prevent the recurrence of that condition from which the paroxyſm firſt originated: This indication will be moſt effectually fulfilled, by adminiſtering it as nearly preceding the acceſſion as poſſible. If the diſeaſe ſhall have become chronic, although the debility be ever ſo great, a powerful ſtimulus will generally be requiſite to excite the ſyſtem above the danger of a relapſe. Although the verſatility of the excitement and the excitability of the human frame is ſo great as often to render it difficult to account for all the phenomena of its morbid ſtates, yet, from what we have already ſeen, we may preſume with ſome confidence on the operation of arſenic in this and other ſtates of diſeaſe, and perhaps diſtinguiſh ſome of thoſe to which it is more particularly adapted. As we have already learned that arſenic acts powerfully upon the ſkin, ſome may be led to attribute the cure of intermittents to ſuch an operation: If any benefit is derived from this part of its operation, it conſiſts (like other ſtimuli) in reſtoring the excitement of the languid extremities, thereby equalizing it throughout the whole ſyſtem.

the impropriety of ſtimuli in many caſes of indirect debility recently induced, this theory is erroneous, becauſe whether the debility be direct or indirect, the excitability is equally ſuſceptible of the action of ſtimuli.

It is probable that arſenic frequently excites ſome degree of inflammation in the ſtomach, which communicates a temporary artificial inflammatory diatheſis to the whole ſyſtem, and may thereby occaſionally ſuperſede the diſeaſed action.

THE epithet intermittent, has generally been intended to convey the idea of a diſeaſe of extreme debility, ſo great as always to require ſtimuli; but as diſeaſes of a very malignant nature ſometimes aſſume that type, and exhibit the ſpecious aſpect of a mild diſeaſe, when the patient is in the moſt imminent danger, particular care is neceſſary to diſcriminate: The cauſes producing ſuch a diſeaſe often proſtrate the ſyſtem ſuddenly into the moſt abject ſtate of indirect debility, rendering the pulſe almoſt imperceptible, with many other ſpurious ſymptoms of a common intermittent. Should a phyſician unfortunately attempt the cure of ſuch an intermittent by arſenic, he would preſcribe as judiciouſly as he would do, were he to adminiſter liquid laudanum to a patient poiſoned by opium.

In Periodical Head-achs.

DOCTOR Fowler, to whom we are already ſo much indebted, has recorded ſeven caſes of *periodical head-ach* ſucceſsfully treated by the mineral ſolution of arſenic, without the excep-

tion of a failure. I do not know of a more vague appellation than that of HEAD-ACH; we hear of nervous head-achs, hyſteric head-achs, and a variety of others, yet as we preſume them all to be diſeaſes of the arterial ſyſtem, we ſhall arrange them accordingly. As the words periodical head-ach, are an indefinite mode of expreſſion, it will be neceſſary to affix ſome determinate ſtate of the ſyſtem to the terms, before we can deduce our indications of cure with any degree of certainty. All the caſes of periodical head-ach which have occurred to my obſervation, appeared to have been no more than intermittent fevers under a *concealed form, appearing at the ſame ſeaſons with other intermittents, and yielding to the ſame remedies. The Peruvian bark often ſucceeds in the cure of this diſeaſe, but ſo far as I have been able to aſcertain, is far inferior to the ſolution; nor need this ſurpriſe us, for this affection generally exhibits a more chronic appearance, is not attended by much inflammatory diatheſis, and is conſequently admirably adapted to the operation of arſenic. There is no reaſon why this medicine ſhould cure a periodical head-ach more certainly than others, provided they are conſtituted by the ſame degree of action; and from the general operation of arſenic we ſhould be induced to expect the happieſt effects from its uſe, in all caſes not the conſequence of conſider-

* Febres intermittentes ſub forma larvata of Dr. Senac.

able inflammatory diatheſis. The head-ach is often a chronic diſeaſe; the effect of a feeble morbid action in the veſſels of the brain, while the other parts of the ſyſtem poſſeſs their uſual powers. In all ſuch caſes as cannot be traced to ſome offending matter in the ſtomach, or to ſome local cauſe, arſenic may be recommended with the moſt flattering proſpect of ſucceſs. Although the action in this diſeaſe is ſo inconſiderable as to be eaſily overcome by arſenic, it is nevertheleſs indiſputably the effect of exceſſive morbid excitement, and the pain is incontrovertibly the effect of inflammation, *without which there can be no pain. The proximate cauſe of all fever conſiſts in an irregular action of the arterial ſyſtem, and the moſt abject ſtate of typhus is as eſſentially a fever, and as certainly the effect of ſome degree of inflammation, however inſignificant, as a phrenitis or a pneumony. As the proximate cauſe of all fever is the ſame, there cannot poſſibly exiſt any other juſt diſtinction between them, than what ariſes from their different degrees of inflammation. The cure, with this view of fever, divides itſelf into two parts; ſuch as require depletion to ſubdue them, and ſuch as are capable of being overcome by the action of ſtimuli. Arſenic may be uſed advantageouſly in all ſuch caſes as require a new action to be ſuddenly excited,

* See Dr. Alexander's ingenious diſſertation on the effect of one diſeaſe curing another, page 20.

unleſs ſo great a degree of debility exiſts as to render other tonics, more certainly invigorating, indiſpenſible.

In Diſeaſes of the Alimentary Canal.

AMONG the variety of caſes in which I had occaſion to preſcribe this medicine in the diſeaſes of children, I ſometimes obſerved, that ſuch as were affected with ſymptoms uſually judged to be moſt characteriſtic of worms, recovered under its uſe. The worms were in ſome caſes diſcharged, but this occurred in a very ſmall proportion of caſes, in which the moſt prominent ſymptoms were effectually removed. In many of theſe caſes the ſymptoms were ſo ambiguous, that I found it difficult to determine whether the arſenic acted by obviating a ſtate of debility with which worms were accidentally connected, or by deſtroying the worms acting as the cauſe of an idyopathic diſeaſe. In two caſes where the moſt unexpected cures were obtained, the ſymptoms rather indicated the phenomena of an atrophy from lymphatic obſtructions, than of any other diſeaſe, and whoever reflects on the inſinuating properties of arſenic, will not think it irrational to conjecture that it it might have operated as a deobſtruent upon the meſenteric glands. The pulvis ſtanni has formerly been a remedy much celebrated as a vermifuge, and has by ſome

been ſuppoſed to act mechanically ; although it is poſſible that it may produce ſome effect in this way, it would appear to me more philoſophical to aſcribe its virtues to the arſenic it contains. As this remedy which ſuggeſted itſelf fortuitouſly is yet problematical, with reſpect to its operation as an anthelmyntic, we ſhall not preſume to recommend it in preference to the more ordinary remedies ; nevertheleſs, as they are all occaſionally fallible, it will be laudable in ſuch caſes, to experiment with judicious caution on this new remedy.

In Diſeaſes of the Skin.

WERE we to ſpeak ſtrictly anatomical, we might have claſſed theſe diſeaſes with thoſe of the arterial ſyſtem, and indeed ſome of thoſe under this head, invade likewiſe the glandular and lymphatic ſyſtem ; but as they appear more conſpicuouſly on the ſuperficies, and affect more particularly this part, we have judged it moſt convenient to arrange them with the cutaneous affections. Whoever obſerves the force which this medicine exerts upon the ſkin, will find the tranſition to its uſe in cutaneous diſeaſes natural, and the proſpect of its advantages plauſible. I received the firſt information of its ſucceſs internally in cutaneous diſeaſes, from the judicious Doctor Martin, of Maryland ; who had witneſſed its

victory over an obſtinate caſe of leproſy. Soon after I received this uſeful inſtruction, I was appealed to, to decide on the nature of a caſe which had run the ordinary routine of remedies generally reſorted to in ſuch caſes, and which ſo ſtrongly reſembled the deſcription the Doctor had given of the caſe which he had cured, that I did not heſitate to denominate it the lepra græcorum of medical writers. As this caſe had already become one of the opprobria of medicine, I undertook it with much diffidence, rather to gratify the ſolicitations of the patient's friends, than becauſe I expected to perform a cure. I directed ten drops of the mineral ſolution to be taken morning, noon, and night; diſtance prevented my ſeeing the patient for the ſpace of two weeks, but the medicine was aſſiduouſly perſevered in: I now had the pleaſure to obſerve, the hard white ſurfaces of the ulcers which had uſurped almoſt the whole ſuperficies of the body, beginning to moulter away in white, pulverulent ſloughs, and the bottoms of many of the ſores, before of a phagedenic appearance, aſſuming a more ſalutary complexion. At the end of ſix weeks the diſeaſe was completely eradicated, and had not returned two years after. On my return to Philadelphia in the ſummer of 1792, I informed my preceptor, Dr. Ruſh, of what I had heard and ſeen concerning the internal uſe of arſenic; he ſoon had an opportunity of trying its efficacy in an obſtinate herpetic eruption

which had reſiſted the uſual remedies ; it ſucceeded, but as it had been a tedious chronic caſe, and the prediſpoſition not completely removed, ſome ſymptoms of the diſeaſe have ſince returned.

I have repeatedly ſeen this remedy tried in various anomalous cutaneous affections, and find it a powerful medicine where neither fulneſs nor inflammatory diatheſis exiſt ; in which caſes we ſhall ſoon ſay, previous depletion is neceſſary. In cutaneous diſeaſes we may obſerve two ſtates of the excitement diametrically oppoſite to each other : Some caſes depend upon a loſs of tone in the extreme veſſels, by which means the excitement is divided. The cure of this ſtate conſiſts in reſtoring the excitement, either by raiſing it by external applications, or by ſuch internal powers as exert their influence principally upon that ſyſtem of veſſels. To prevent the veſſels upon the ſurface from relapſing into their former atony, it will be found requiſite in this ſtate of the ſkin, to raiſe an higher tone than that which is the ſtate of the ſame veſſels in a ſtate of health ; an indication which may often be effectually fulfilled by arſenic. But, one ſtimulus will not always anſwer the deſired indication, although it may be ſufficiently ſtrong, it will therefore often be prudent to uſe them in ſucceſſion. The want of a certain knowledge of the particular ſyſtem, which a ſtimulus ſpecifically affects, often renders its exhibition problematical.

The remaining ſtate of cutaneous diſeaſe, is in every reſpect the reverſe of that already delineated. In both the excitement is divided and unequal, but in the latter, its morbid force is concentrated in the ſkin, and may be denominated a *febris extroverſa* with a propriety as ſtrictly phyſiological, as the dyſentery has been a febris introverſa by Dr. Syddenham. This ſtate is truly a local fever, and the indication of cure is to diminiſh the excitement in the extreme veſſels, until it ſhall be reduced to an equality with the other parts of the ſyſtem. It would be ſuperfluous and perhaps hazardous in this ſtate of the ſyſtem to preſcribe aſtringent topics, or to adminiſter ſtimuli internally, unleſs ſome can be found ſufficiently powerful to raiſe a ſuperior action in the veſſels, a thing not eaſily accompliſhed. As there is no medicine more ſtimulating than arſenic, there can conſequently be none more improper in this ſtate of the ſyſtem. Agreeably to this idea of the inflammatory nature of ſome cutaneous diſeaſes, we find a fact recorded by *Sir William Jones, who obſerves, "The natives (of Indoſtan) cure the elephantiaſis by one part of white arſenic united to ſix parts of black pepper; but the remedy is more certain when gentle cathartics and bleeding are previouſly uſed." By this practice two advantages are gained; firſt, the tone which prevented a more healthy action from being excited is removed; ſecondly, the excita-

* Jones's Aſia, pages 479—80. Publiſhed 1793.

bility of the whole ſyſtem is accumulated, by which means ſtimuli act with more force and certainty. The ſame author relates the caſe of a gentleman "ſo affected with a confirmed lues, (called in Aſia, the Perſian fire) with his hands and feet entirely ulcerated and almoſt corroded, that he became an object of diſguſt and abhorrence. Some blood was taken from his arm, and a cathartic adminiſtered on the next day; in a fortnight his recovery was complete." He farther adds, "But the power of this medicine has been chiefly tried in the cure of what has been called the Juzam, a diſeaſe affecting the whole maſs of blood, attended in the laſt ſtage with an eroſion of the fingers: It is alſo hereditary, and in that reſpect has been claſſed by medical writers with the gout, conſumption and white leproſy." This learned author aſſures us, that this preparation of arſenic and black pepper was ſucceſsful in every caſe in which it was uſed, and relates a great variety of caſes, but from his having placed the cauſe of the diſeaſe in a contamination of the fluids, he has not developed the diſeaſe ſo clearly as to enable us to follow him in its inveſtigation. The pathology of the fluids is ſo obſcure a corner in the field of ſcience, that I would not preſume to determine what ſhare they may have in the cauſes of diſeaſes. Whatever might have been the preciſe meaning of phyſicians by that claſs of medicines called *alteratives*, I am perſuaded, that arſenic merits

that character to a very eminent degree; perhaps not by a direct operation upon the blood, but by changing the ſtate of the excitement, by its ſudden and energetic action on the ſeveral ſyſtems it affects. I ſhould have ſuſpected the accuracy of the author's obſervation on this ſolitary caſe of ſyphylis, had it not been corroborated by a caſe which lately came within my own notice. A medical gentleman from the Weſt-Indies, having been baffled in his efforts to cure a cutaneous affection of a ſyphylitic origin, conſulted Dr. Ruſh, who adviſed the internal uſe of arſenic with the moſt propitious reſult. Arſenic in ſuch inveterate chronic caſes, ſeems to act by its power in exciting the ſyſtem inſenſible to other ſtimuli, for in this caſe, even mercury had been uſed in vain. In buboes, that after ulceration have become callous, and not diſpoſed to heal, but put on a cancerous appearance, I can ſay, both from my own obſervation and that of others, that no remedy with which we are acquainted, is ſo powerful as the internal uſe of arſenic.

In Diſeaſes of the Glandular and Lymphatic Syſtem.

MUCH has been ſaid concerning the uſe of arſenic in cancers, but from having ſeen it fairly tried in only two caſes of ulcerated cancer, I can-

not ſay much of its virtues.* It has been dogmatically aſſerted that arſenic is competent to the cure of every condition of cancer; an opinion which, ſo far as I can inform myſelf, is extremely preſumptuous. Cancer, like all other diſeaſes, is attended with different ſtates of action, no one remedy can therefore cure every caſe. There is no diſeaſe whoſe pathology is involved in more obſcurity than that of cancer, and every internal remedy that can be preſcribed for it muſt be in ſome meaſure empyrical, until its cauſes are better underſtood. If there ſhould ever be a radical cure for cancer found, (and no doubt there will) it will probably be one that acts ſpecifically powerful upon that ſyſtem principally occupied by the diſeaſe, or by altering the condition of the whole ſyſtem. The chimeras of fancy have often conſtituted a part of the theory of diſeaſes, but none which I have ever read, are more viſionary than the phantoms of Mr. Juſtamond's† imagination. This gentleman has by his boldneſs contributed in ſome meaſure to leſſen the prejudices of phyſicians againſt the internal uſe of arſenic; but from his ludicrous hypotheſis of the diſeaſe depending upon inſects in

* See remede eprove pour guerir radicalement le cancer occulte, et manifeſte ou ulcére. Par Meſſire C. R. Le Febure. Docteur en medicine, Paris.—and Med. Comment. Vol. 2, page 304, &c.

† Juſtamond's Tracts.

the cancer, he has detracted from the weight his obſervations might have carried with them; for his animalcules, like thoſe of Liewenhoech, have either never been demonſtrated, nor ever ſeen by any but their authors. In both thoſe caſes in which I have ſeen this medicine tried in cancer, the diſeaſe had ſo totally contaminated the whole ſyſtem, that little hope could be reaſonably entertained from any remedy, for if even in ſuch caſes the ulcer ſhould be healed, unleſs the prediſpoſition could be eradicated, a return of the diſeaſe would ſtill await the unfortunate patient. It muſt be acknowledged that in thoſe caſes wherein I attempted the uſe of arſenic in this diſeaſe, it was not altogether an inert medicine, the excruciating pains were mitigated, and the intolerable fœtor of the ulcers entirely corrected. Theſe temporary alleviations, were of a very tranſitory duration, for thoſe ſymptoms returned with their uſual virulence as ſoon as the remedy was withheld. This medicine was perſevered in ſix months in one caſe, and four in the other, yet no advantage was gained as to the healing or diminution of the ulcer. What might have been the iſſue of theſe caſes under the uſe of arſenic at a more early period of the diſeaſe, I cannot venture to conjecture, but eſteem it ſome conſolation to poſſeſs a medicine that can, when death is inevitable, ſtrew flowers on the borders of the tomb, From the penetrating nature of arſenic, it would ſeem to pro-

miſe the moſt beneficial effects in all caſes of ſchirrous and obſtruction in the glandular ſyſtem: and from this property it has obtained the reputation of having cured the more inveterate ſtates of cancer. It is often a deſirable indication to rouſe the torpid veſſels of a part into vigorous action; under ſuch circumſtances, arſenic may be adviſed with more plauſibility than any other remedy with which we are acquainted, provided it affect that ſyſtem of veſſels occupied by the diſeaſe.

As this mineral operates forcibly upon the lymphatic ſyſtem, what would be its effects in Scrophula? Although I have not ſeen it experimented upon in this diſeaſe, I ſhould, a priori, be induced to think favorably of its powers, more eſpecially where the ſyſtem had been ſufficiently reduced to admit of its moſt extenſive influence. Wherever the ſame indications of cure are to be fulfilled, in the cancerous, callous, or fungous ſtate of ulcers, the internal uſe of arſenic in moderate doſes, affords the faireſt proſpect of ſucceſs. In many caſes where its external application is proper, it may be found advantageous to conjoin its internal uſe. There is no fact in the ſcience of medicine, of which I am more decidedly convinced, than that arſenic is an improper medicine in all caſes where ulcers are accompanied with an inflammatory diatheſis.

THE following letter from Dr. Martin may tend to corroborate ſome of the preceding obſervations, eſpecially as it was written by a gentleman whoſe authority in medicine is inferior to none.

EASTON, *Feb.* 1ſt. 1796.

DEAR SIR,

I HAVE long promiſed you ſome obſervations on the uſe of arſenic, which I ſhall confine within the bounds of my own experience. I have been in the practice of preſcribing arſenic, about five years, in cutaneous diſeaſes and intermittents only.—My friend Dr. Birchhead firſt recommended the uſe of arſenic, and referred me to the diſpenſatory lately publiſhed, for ſome hints under the head of mineral ſolution. Here I found that arſenic was recommended in cutaneous diſeaſes. As I had been baffled in a caſe, (which I had called Lepra Græcorum) after uſing every remedy which could be thought of by myſelf or others, I reſolved to try the mineral ſolution of arſenic on my old patient, Thomas Mc. Namara, who had wearied out every phyſician and others, who would adminiſter any thing for his relief. As he had retired to ſome unknown part of the country, I mentioned my intention to Dr. Johnſon, who had witneſſed his deplorable ſituation in the poor-houſe, while a ſtudent with me, and deſired that he would adminiſter the ſolution whenever he ſhould find

him, engaging that I would do the ſame if I ſhould ſee him firſt. The Dr. ſhortly after this fell in with him, and told him what we had agreed on. Poor Thomas was always eager to catch at any thing for relief. He was deſired to take twelve or fifteen drops three times a day, but in a week or two the poor fellow had increaſed the doſe to thirty drops, becauſe he found his ſores healing in a manner he had never before experienced, for at leaſt five years, and I think, in leſs than four weeks, every ſore or part affected, was healed up. Thus relieved, contrary to all expectation, Thomas began to make free with ardent ſpirits, when ſome appearance of the diſeaſe was again diſcovered, which was a ſecond time relieved; but his intemperance ſoon brought on the diſeaſe with worſe appearances, when he was once more admitted into the poor-houſe. I was aſtoniſhed to obſerve how ſoon his ſores began to heal, and to vaniſh entirely, except one up his noſtrils, and even this to appearance was cured, when Thomas begged to be diſcharged. This winter he is a third time admitted, and it yet remains to be tried, whether he can be again relieved by arſenic. Quere, if arſenic had been uſed earlier, and this patient had been a temperate one, whether the prediſpoſition to this diſeaſe might not have been entirely eradicated? A mulatto man in this county (Talbot) aged about forty years, had ſymptoms of the Lepra Græcorum before he was twenty one, and I am

well ſatisfied, when I ſaw him fifteen months ago, he had this diſeaſe with every characteriſtic ſymptom. The mineral ſolution of arſenic had a moſt aſtoniſhing effect in this caſe, for every ſymptom vaniſhed in the courſe of a few weeks, except one ſore on his leg or foot, and I have not ſeen him ſince laſt March. I once thought the mineral ſolution had a wonderful effect in a ſchirrous breaſt, but the prediſpoſition ſtill remained, the woman was of a bad habit of body, and ſome hardneſs continued to her death.

In agues and fevers I am ſometimes induced to think this a valuable remedy, but like every other it is fallible, and I am frequently diſappointed in its effects, yet I have known it to ſucceed, when the bark has failed. In ſome children in the ague and fever, it has an immediate effect. That it is a ſafe and uſeful remedy I am well convinced, and therefore give it to my own children without ſcruple. In my ſon it ſeemed to have no effect, good or bad, but has greatly relieved my little daughter in the ague and fever.

In the periodical head-ach I have ſometimes thought arſenic better entitled to infallibility than any other remedy in the materia medica.

Thus my dear Sir, I have ſummed up all that I can ſay about this ſafe, agreeable, and valuable acquiſition to the materia medica. You are at liberty to make any uſe you may think proper,

of the above obſervations, with my beſt wiſhes for your ſucceſs in life,

I am Your Friend,
ENNALLS MARTIN.

Of the External uſe of Arſenic.

HOWEVER much timidity and ſcepticiſm may have influenced the minds of practitioners reſpecting the internal uſe of arſenic, both empyricks and theoriſts have been leſs ſcrupulous in its external application. Two opinions have divided practitioners concerning its application to cancerous and other ulcers. Dr. Moſely* condemns its uſe unequivocally and obſerves "That it will not produce the ſalutary "effects obtained by corroſive ſublimate. It rots "indiſcriminately the ſound and unſound fleſh "wherever it comes in contact. Corroſive ſub-"limate is bounded in its corroſive action by "healthy fleſh, or acts but ſlightly as a deſtroyer. "Arſenic has a tendency to deſtroy or deaden "the functions of organized parts: corroſive ſu-"blimate to inflame thoſe parts." In the introduction to this eſſay, I adverted to the diſaſtrous conſequences of not attending particularly to the doſes of medicine, and the ſtate of the part to

* See Treatiſe on Tropical Diſeaſes, by Benjamin Moſely, M. D. pages 521--2--3.

which they may be applied; here we ſee it exemplified in a peculiar manner: we ſee prejudice co-operating with ſophyſtry, producing a concluſion from falſe premiſes equally rediculous and abſurd. Every practitioner who has ſeen arſenic applied externally in different degrees of ſtrength, muſt teſtify againſt the injuſtice of Dr. Moſeley's criticiſms. The principle upon which the operation of arſenic eſſentially depends, is the ſame that actuates corroſive ſublimate, of which he has ſpoken ſo extravagantly. Arſenic in the ſtate it is uſed externally, is a true metallic oxyde, or the ſemimetal united to vital air.—Corroſive ſublimate is compoſed of the oxygenated muriatic acid and mercury, and owes its activity to the oxygene it contains, otherwiſe calomel which is compoſed of the ſame metal, united to the common muriatic acid, would prove equally corroſive. Red precipitate, which is a calx of mercury, or that metal united to vital air is likewiſe a cauſtic of conſiderable power, but if it be ſubjected to a ſtrong heat, the oxygene will be diſſipated, the metal will reſume its native ſtate, and is as innocent in actual contact with the moſt irritable ſurface as ſo much water. It would therefore appear that the operation of theſe medicines depend upon the oxygene they contain, and that their powers are accurately apportioned to their relative degrees of fixity and concentration. Nothing can illuſtrate this idea more clearly than what we muſt have often ob-

ſerved; that cauſtics and eſcharotics in a ſtate of dilution or diviſion act as the moſt certain aſtringents. In this ſtate arſenic and corroſive ſublimate, produce the moſt ſalutary effects, and are nearly entitled to infallibility, in all caſes of tenia, herpes and other ſtates of the ſkin, not ſupported by fulneſs or inflammation. The particular condition of the part to which arſenic is to be applied, ſhould be carefully obſerved; if much inflammation attend, it ſhould be uſed in a very diluted ſtate, and may then be advantageouſly applied to any part. At the requeſt of Dr. Ruſh, I applied a ſolution of arſenic to a cancerous inflammation in the internal canthus of the eye, where the rapid progreſs of the diſeaſe menaced the eroſion of the lachrymal ſack, and probably the patient's life: we had the ſatisfaction of ſeeing the diſeaſe completely extirpated, and the man ſoon reſtored to health.

In the year 1784 Dr. Ruſh* detected the preſence of arſenic in the celebrated cancer powder, ſo ſucceſsfully adminiſtered by Dr. Hugh Martin; and has favored us with obſervations on the uſe of this cauſtic. He remarks, "I ſhould ſuppoſe from the examination of the powder I made with the eye, that the proportion of arſenic to the vegetable powder could not be more than $\frac{1}{40}$ part of the whole compound. The great art

* See Ruſh's medical enquiries and obſervations, Vol. 1. page 235.—or Philoſophical Tranſactions.

of applying arſenic ſucceſsfully is, to dilute and mix it in ſuch a manner as to mitigate the violence of its action. Dr. Martin's preparation was happily calculated for this purpoſe. It excited a moderate inflammation, which ſeparated the morbid from the ſound parts, and promoted a plentiful afflux of humours to the ſore during its application. It ſeldom produced an eſchar, hence it inſinuated itſelf into the deepeſt receſſes of the cancers, and frequently ſeparated thoſe fibres in an unbroken ſtate, which are generally called the roots of the cancer."—Thus we ſee, that however uſeful it may be to attend minutely to the ſtate of the ſyſtem in the internal uſe of arſenic, that it is equally indiſpenſible in its external application. Its operation depends upon the ſame principles of excitability and excitement, and it muſt be obvious to all who are the leaſt converſant in the practice, that ſo acrimonious a ſubſtance muſt require the moſt cautious attention. Upon a review of all the caſes of the external uſe of arſenic that have been recorded, we find no diſcrimination of the different ſtates of the parts to which it has been applied; but from all that we can learn on this ſubject, we are authoriſed to ſay, that its beneficial effects are principally confined to ſuch as have been already enumerated.

In the year 1783 an itinerant practitioner, who called himſelf Lafferti, travelled through

the ſtate of Maryland ; he aſtoniſhed the practitioners of that country by curing ulcers long deemed beyond the reach of the ſurgical art, and it is not to be controverted that his ſucceſs was unparalelled. It was obſervable, that he refuſed to undertake the cure of recent ulcers, and, unlike moſt of his empyrical brethren, candidly acknowledged, that he had no ſkill in ſuch caſes as others conſidered moſt curable. The author's deceaſed father, who at that time practiced phyſic and ſurgery in that country, left the following account of this practitioner, in a letter which he intended to have ſent to a medical friend. " We have in this county (Caroline) a man who does wonders in the cure of obſtinate old ſores ; but he uſes ſo much myſtery, and applies his powder with ſo much ſecrecy, that he does not ſeem to intend to let us into the ſecret. However, I have juſt procured a ſmall parcel of his medicine ; at firſt I thought it looked like corroſive ſublimate, but upon trial found myſelf miſtaken: I put ſome of it on the fire, which ſoon perfumed the room with the ſmell of garlic, from which it muſt be arſenic."—Mr. Juſtamond, who has recommended arſenic ſo ſtrenuouſly in cancer, mentions the authority of Sir Hans Sloane for its good effects in ſchrophulous ulcers, and thinks it a valuable medicine in ſuch caſes. I have no doubt but that arſenic will remove the ſtate of atony often attending ſuch ſores, or that cancerous ſtate of calloſity into

which they ſometimes degenerate; but to cure them radically the diatheſis on which they depend ſhould be removed. *The muriate of barytes is ſaid to have proved uſeful in ſchrophula, as it often contains a ſmall portion of arſenic, it is not improbable that it may owe its virtues to this active mineral. What might be the effect of the arſenical acid, as a medicine, I leave future reſearches to inſtruct us.

Pharmaceutic Treatment of Arſenic.

IT may perhaps be thought neceſſary to inveſtigate the chymical properties of arſenic, but as all I could ſay on that head would be no more than plagiariſm from authors already in general circulation, I ſhall content myſelf with as laconic an explanation as poſſible of the pharmaceutic treatment of that preparation, which appears to me to poſſeſs ſome advantages over all others, and which, ſo far as I am capable of judging, admits of no improvement.

The following receipt for making the mineral ſolution is tranſlated from the Latin of Dr. Fowler, and the table of doſes which we ſhall have occaſion to mention, is taken from the ſame author; both of which it may not be improper to inſert, as arſenic is a medicine ſo little known.

* See Bell on the venereal, and the Med. Comm. vol. 5.

"Take of the powder of white arſenic, and of the pureſt vegetable alkali, each ſixty four grains, of diſtilled water half a pound, apothecaries' weight.—Put them into a veſſel and ſubmit them to a ſand heat, let them boil moderately until the arſenic ſhall be perfectly diſſolved: then add to the cold ſolution half a pound of the compound ſpirit of lavender, and ſo much diſtilled ſpring water as will make the whole accurately fifteen ounces."

The ſimplicity of this chymical preparation renders it preferable to more complex forms. The vegetable alkali has not the ſmalleſt effect in diminiſhing its virtues, for that proportion of the ſolution which we know to contain any given quantity of arſenic, will act as forcibly upon the ſyſtem, as the ſame quantity in pills, or even in a ſtate of pulverization. The almoſt infinite diviſibility of this form renders its doſes variable to the exigencies of all poſſible caſes. The ſmall proportion of compound ſpirit of lavender is added to give it a more medicinal appearance, not with a view of captivating the eye, by drawing the veil of myſtery over the compoſition, but leſt from its being colourleſs and inſipid, thoſe who may be entruſted with its exhibition ſhould be tempted to uſe it with too much liberality, the conſequences of which might prove troubleſome, if not dangerous. To a pound of the ſolution, ſixty four grains are added for

the purpoſe of a more accurate calculation, by which means the preciſe quantity of arſenic contained in any given number of drops may be aſcertained. If the alkali ſhould not be perfectly pure, it will be found inadequate to the production of a perfect ſolution; a circumſtance which might occaſion great confuſion and uncertainty in the doſes of the medicine. If therefore, the alkali cannot be obtained pure, a double proportion of purified nitre may be ſubſtituted, for there is a ſtronger attraction between the arſenic and the vegetable alkali, than between the ſame alkali and the nitric acid, which laſt, is therefore diſengaged. The two ſolutions do not differ in point of efficacy, and, by attending to the preceding directions, they will be found to poſſeſs an uniform degree of ſtrength; a circumſtance of importance in the uſe of ſuch an heroic medicine.

ALTHOUGH we cannot altogether approve of Dr. Fowler's mode of adminiſtering the ſolution, and muſt therefore obſerve, that his doſes are rather larger than we prefer (at leaſt in this country). His table may be uſeful in graduating the doſes for different ages.

PATIENTS are to take, according to their ages, the following doſes of the ſolution:

YEARS.		DROPS.
From 2 to 4	-	from 2 or 3 to 5.
—— 5 — 7	-	—— 5 — 7.
—— 8 — 12	-	—— 7 — 10.

—— 13—18 - —— 10—12.
—— 18 and upwards - 12.

THUS from five to ſeven years the doſe may be apportioned by allowing a drop for each year, but a drop for each year under that period will be inſufficient, and ſoon becomes too much beyond it, as twelve drops are a medium doſe for an adult.

THIS medicine may be adminiſtered with conſiderable latitude to adults, but a very general rule may be eſtabliſhed which will often prevent moſt of thoſe unwelcome conſequences which follow the uſe of large doſes. It will generally be found moſt advantageous in the end, to begin with an under doſe, and to increaſe it until it ſhall affect the ſtomach ſlightly, unleſs a cure be obtained. If the ſyſtem ſhould be much diſordered by the ſolution, it will be proper to diſcontinue it a day or two, and inſtead of ten drops, three times a day, five drops ſix times a day may be adminiſtered, which will often agree with the ſtomach, and perform a cure as certainly, though not as expeditiouſly, as a larger doſe. It will often be neceſſary to continue the medicine for ſome time after the cure is apparently complete; by this practice a relapſe may often be effectually prevented. Where nauſea, vomiting, or pains in the bowels ariſe from the ſolution, they may not only be mitigated, but often prevented,

by combining a few drops of laudanum with the ſolution, and this will ſeldom interfere with the virtues of the medicine, as the former is generally admiſſible where the latter is proper. A combination of their ſtimulant effects will ſometimes be found more powerful than either of them alone, eſpecially in curing intermittents. In ſome caſes inſtead of diluting the doſe by a tea-cup full of cold water (the uſual vehicle) in caſe of turbulent ſymptoms ſupervening, a larger proportion of water will be a ſucceſsful method of obviating them. This obſervation applies more particularly to the uſe of the ſolution among *children, whoſe tender organs are often moleſted by a very ſmall doſe of the ſolution: inſtead therefore of giving the medicine in a tea-ſpoon or table-ſpoon full of water, double the quantity may be uſed to advantage. The diſeaſe for which the medicine is preſcribed, will likewiſe require to be noticed, both with reſpect to the quantity of the doſe, and the times of adminiſtering it. In intermittent fevers and periodical head-achs moſt advantage will reſult from the adminiſtration of as large a doſe as the ſyſtem can conveniently bear, as nearly preceding the paroxyſm as poſſible. In the treatment of cancers and many diſeaſes of chronic debility, it may be neceſſary to continue the uſe of the ſolution for weeks, and

* It is nevertheleſs worthy obſervation, that children often bear larger doſes in proportion to age and other circumſtances than adults.

even months, to obtain all its advantages. Under ſuch circumſtances, the ſolution muſt frequently be gradually increaſed, for the ſyſtem becomes ſo habituated to its ſtimulus, that an ordinary doſe will be altogether inert. I have gone as high as thirty drops three times a day, in a caſe of cancer, without producing one diſagreeable ſenſation. In the exhibition of this medicine, little is to be learned from an apparent delicacy of conſtitution, for women whoſe appearance would lead us moſt to expect irritable frames, often bear the medium doſe of an adult with the greateſt compoſure; whereas the moſt robuſt men frequently feel very ſenſibly the commotions excited by a ſmaller doſe. I have given this medicine to pregnant women laboring under intermittents, with ſafety, in very conſiderable doſes, but cannot avoid obſerving, that although theſe caſes were ſuch as in every reſpect (their gravid ſtate excepted) might from common experience be ſuppoſed moſt eaſily cured, I was leſs fortunate than in any equal number of caſes that came within the ſphere of my notice. The tenſion imparted to the arterial ſyſtem by the ſtimulus of diſtenſion, or that artificial inflammatory diatheſis which accompanies a ſtate of pregnancy, muſt have prevented the medicine from exciting an action ſufficient to cure the diſeaſe.

It has been alledged againſt the internal uſe of arſenic, that it deſtroys the tone of the ſtomach,

thereby laying a foundation of dyſpepſia and general debility. If this objection ſhould be founded on truth, it will alone be ſufficient to exclude arſenic from the materia medica, and to baniſh from the mind of every reaſonable phyſician all thoughts of advocating its character. To determine this important queſtion beyond the poſſibility of a controverſy, I examined all thoſe caſes wherein I was under the neceſſity of perſiſting long in the uſe of arſenic. Out of forty perſons whom I interrogated touching this point, I found but two who diſcovered dyſpeptic ſymptoms, both of whom were notorious for their attachment to ardent ſpirits, by which the diſeaſe had been produced years before they had taken arſenic. Even dogs that had been poiſoned by it and recovered, exhibited no marks of indigeſtion.

It has moreover been objected to arſenic, that both from its internal and external uſe, it has ſometimes produced paralytic ſymptoms and a vertiginous diſpoſition in the brain; but in all the caſes where I have ſeen it uſed, even where, from a long protracted external application, an abſorption might have been thought probable, no ſuch conſequence followed. Such effects have doubtleſs followed the poiſonous influence of arſenic, but thoſe who cannot draw the line of diſtinction between its medicinal and poiſonous degrees, would do well not to interfere

with the feelings of mankind. *Mr. William Gaſkill, an ingenious ſurgeon, at Rotherhythe, inſtituted a ſeries of experiments upon the external abſorption of arſenic, from which he proved deciſively that no ſymptoms of a diſordered economy were even perceptible. He has not taken notice of its diuretic qualities, although they are dwelt upon with ſo much emphaſis by †Mr. John Sherwin, ſurgeon, who performed the ſame experiments with tartarized arſenic, and attributes the diuretic effects it produced upon himſelf and four others, excluſively to the operation of arſenic. But the concluſion he has drawn is by no means juſt, and a very ſuperficial knowledge of chymiſtry will be required to detect its fallacy. By the union of the chryſtals of tartar and arſenic, the tartarized arſenic is formed, a ſubſtance which, although it partakes in ſome meaſure of an arſenical nature, is yet widely different from the pure ſemi-metallic oxyde, and poſſeſſes properties peculiar to itſelf.

Dr. Fowler has recorded many unpleaſant effects of the ſolution; ſuch as nauſea, vomiting, ſwellings of the face, and ſometimes of the abdomen, all which, he ſays, vaniſh from the uſe of gentle aperients, and moſt of them by a temporary omiſſion of the medicine. Doctors Arnold

* See a pamphlet entitled, Experiments on the external abſorption of arſenic and emetic tartar.

† Medical commentaries, vol. xv. page 220 et ſequent.

and Withering, although much in the habit of uſing the ſolution, have not mentioned ſuch effects; and even Dr. Clark, who inveighs with ſo much acrimony againſt arſenic, has been ſilent on this particular. I firſt began the uſe of the ſolution in the doſes preſcribed by Dr. Fowler, and experienced many of the painful ſenſations which he has aſcribed to it. I afterwards found it eaſy to prevent them in moſt caſes, by diminiſhing the doſe, and obſerving the precautions already mentioned.

One of the moſt characteriſtic properties which we have attributed to arſenic, is, its power of accumulating the ſtimulability of the ſyſtem, a circumſtance of much importance to be attended to in practice, eſpecially in a ſtate of convaleſcence, inaſmuch as both medicine and diet are to be regulated accordingly, either of which, in over doſes, might be productive of the moſt alarming conſequences. This caution cannot be better enforced than in the emphatical words of the elegant Dr. Armſtrong.

——————"When the vital fire
Burns feebly, heap not the green fuel on;
But prudently foment the wand'ring ſpark
With what the ſooneſt feels its kindred touch:
Be frugal even of that, a little give
At firſt; that kindled, add a little more,
'Till by deliberate nouriſhing, the flame
Reviv'd, with all its wonted vigor glows."

Of the Deleterious Qualities of Arſenic.

HITHERTO we have viewed Arſenic as a remedy capable of abſtracting from that portion of pain and diſeaſe to which the frailty of human nature is ſubjected. But as this mineral, like all other things deſtined for the uſe of man, is liable to abuſe, and ſubject to a deviation from that order which was originally impoſed upon it; we are conſtrained to the melancholy neceſſity of reverſing the picture, and of contemplating human nature in the moſt deplorable ſtate that the imagination can poſſibly conceive. Happily for mankind, ſuch cataſtrophes as this poiſon is capable of producing do not often occur, but as phyſicians are ſometimes ſummoned to arreſt the progreſs of death from this cauſe, the moſt effectual antidote becomes a deſideratum of the higheſt importance.

IT would far exceed the limits of this Eſſay to detail all the experiments from which we have deduced the following concluſions, we ſhall therefore give the reſult of the moſt important, in as concentrated a form, as the nature of the ſubject will admit of.

WE have already hinted at ſome of the formidable conſequences of this poiſon, and where its medical effects end, we may date the commencement of its deleterious qualities. This Stygian draught when taken into the ſtomach in quan-

tities disproportioned to the excitability of the system, is productive of nausea, vomiting, purging, hiccough, gastrodynia, convulsions, subsultties tendinum, increased flow of saliva, hematuria, thirst, gnashing of the teeth, syncope, asphyxia, and death, unless a speedy remedy is administered. As some peculiarities attend the operation of this poison, it may be useful to trace them to their remotest consequences. A gentleman whom I saw, and with whom I conversed, soon after he had been nearly deprived of his life by this poison, exhibited the following phenomena. From having been remarkable for his athletic powers, he became sallow, emaciated and enervated. Previous to this accident he had enjoyed an uninterrupted series of good health, for ten years. In the autumn after this misfortune, he was attacked by an obstruction of his liver, which left him in a state of paralysis, from which he with difficulty recovered, during the winter. He has been subject to jaundice four or five times every year since that memorable event, and his teeth before remarkable for their whiteness, became incrusted with a black scale, and some of them have decayed without pain. It has sometimes been observable that arsenic, even in small quantities, like the vegetable and other acids, has set the teeth on edge, and in some of the dogs who recovered from the poisonous effects of arsenic lost their teeth, an occurrence I apprehend to be very unusual in these animals.

Whether arſenic produces this effect by a general operation inducing a general debility in conſequence of which the teeth decay, or whether its peculiar acid acts ſpecifically upon the calcarious earth of the teeth, I ſhall not preſume to determine.

* Mr. William Lempriere, an intelligent Engliſh ſurgeon, has drawn the picture of a caſe from the poiſonous effects of arſenic, which is ſufficient to demonſtrate, that even in ſome caſes where a recovery is obtained, life is under ſuch circumſtances the moſt intolerable of human burdens. He obſerves, "I was deſired to viſit the emperor's favourite wife, who had been poiſoned by arſenic, conveyed into her food by the machinations of her rivals. After a tedious conflict between life and death the effects of the poiſon in part abated, but the unhappy lady was left in a dreadful ſtate of debility and irritation. Her beauty, the fatal cauſe of her misfortune, was completely deſtroyed, and her enemies, though diſappointed in their aim at deſtroying her life, yet enjoyed the malignant triumph of ſeeing thoſe charms which had excited their jealouſy, reduced below the ſtandard of other women. Her digeſtion was ſo weak, that every ſpecies of food, after remaining a few hours on her ſtomach, was returned perfectly crude and undigeſted. Her body was reduced to a ſhadow,

* Tour to Morocco.

and her ſtrength ſo far exhauſted that ſhe could not walk without aſſiſtance. Her ſkin, from being naturally clear and fair, was changed to a ſickly brown, which joined to a ruined ſet of teeth and ghaſtly countenance, effaced every trace of that beauty which ſhe might once have poſſeſt."

VARIOUS antidotes have been propoſed to counteract the poiſonous effects of arſenic. Oils and ſuch other ſubſtances as ſeemed beſt calculated to obtund the acrimony of the metallic particles, have been ſuppoſed adequate to the relief of the pernicious effects of all ſaline poiſons. Sceptical on this ſubject I inſtituted a ſeries of experiments upon dogs, the reſult of which clearly demonſtrated, that no oleaginous ſubſtance is equal to the prevention of evil from ſuch cauſes. In caſes where the portion of poiſon was inconſiderable, mucilaginous and oily matters ſeemed in ſome meaſure to protract and mitigate the ſymptoms, but never afforded entire relief; for ſuch as recovered had taken ſo ſmall a quantity as ſcarcely to be capable of doing miſchief if no remedy had been attempted. I uſed for theſe experiments the oil of almonds, train oil, linſeed and caſtor oils, all of which proved inſufficient. The caſtor oil, where it was given in quantities ſo large as to operate ſpeedily, ſeemed to procraſtinate life, by tranſlating the ſeat of the diſeaſe from the ſtomach to

a leſs vital part, the lower inteſtines. When the arſenic was given mixt with the oils its virulent effects were not obviated, unleſs the quantity of the poiſon was ſo ſmall as to remain ſuſpended, and not to come in contact with the ſtomach and inteſtines. Conformable to this idea of the inſufficiency of oils to prevent the effects of arſenic on the ſtomach, we may regard a cuſtom authoriſed by the ſuperſtition of the Hindoos. * One of the nine modes of trial by the ordeal conſiſts in compelling the accuſed to eat from the hand of a Brahman a preparation compoſed of ſixty-four parts of clarified butter, mixt with two parts and an half of pure arſenic; if the poiſon produce no viſible effect, he is abſolved, otherwiſe condemned.

Milk has been propoſed as an antidote againſt arſenic and other poiſons, but proved inert in every inſtance, although I gave it the faireſt trials, and never produced the ſmalleſt benefit, only in proportion as it diluted or waſhed off the poiſon concentrated in the ſtomach. Whoever will obſerve the ſpecific gravity of arſenic, muſt readily conceive the difficulty of defending the ſtomach againſt its corroſive qualities: The impracticability of ſuch an hypotheſis is farther augmented by reflecting, that the arſenic is always in actual contact with the ſtomach before the antidote can poſſibly be adminiſtered, and that

* Hiſtory of Indoſtan.

all attempts for relief muſt be ſuperfluous, unleſs the poiſon be inſtantaneouſly removed. The premature exhibition of viſcid ſubſtances may moreover interfere with the operation of that remedy which we ſhall ſay hereafter affords the only rational proſpect of relief. Where the poiſon has been evacuated, and a ſlight inflammation ſtill remains, oils may prove uſeful by their lubricating quality.

I ATTEMPTED the relief of thoſe devoted victims by a variety of diluents, given copiouſly immediately after the poiſon; but they all proved futile, and their ſynchronous exhibition was attended with the ſame fate.

CHYMISTRY has furniſhed a variety of ſubſtances which have been thought equal to the neutralization of arſenic. Vinegar has been extolled by Mr. Sage; but whatever appearances the combination of theſe agents may exhibit to the eye, I can aſſert, from repeated experiments, that when they meet in the ſtomach they do not reſcue the body from deſtruction.

MR. NAVIER, an ingenious French phyſician and chymiſt, has propoſed to decompoſe arſenic by a direct combination of the liver of ſulphur. We know that orpiment, although it contains a large proportion of arſenic united to ſulphur, may be taken into the ſtomach in a conſiderable quantity with impunity. This would at firſt

ſight ſeem to favour the idea that ſulphur alone might neutralize arſenic, but from a variety of experiments we can aſſert the contrary. The hepar ſulphuris is a moſt rapacious ſolvent of ſome metals, and might therefore aptly obtrude itſelf upon the prolific imagination of a ſpeculative chymiſt. Whoever will be at the trouble of mixing arſenic and the liver of ſulphur, will be amply ſatisfied of their ſlow and feeble influence upon each other. Their action is ſo ſlow (even out of the body) that a man might die a thouſand deaths before a ſingle particle of arſenic could be neutralized. Every experiment tended to confirm me in the opinion, that chymiſtry has yet invented no power capable of neutralizing arſenic. The animals upon which the experiments were made individually died, although in many caſes a few grains only had been taken, and the proportion of hepar mentioned by the fanciful Mr. Navier immediately adminiſtered. The proportions of each were varied, and the experiments repeated, with a reſult equally unpropitious. Whatever effect the alkali may have in the formation of the hepar, I am ſatisfied that ſulphur alone will do as much towards effecting a cure as in their combined ſtate; for death will ever be the inevitable conſequence of the arſenic, although they may both be uſed with ever ſo much liberality and expedition. No remedy can ever alleviate theſe melancholy preludes of death, unleſs it operate

with the velocity of light as a ſolvent, or evacuate the poiſon from its contact with the ſtomach. I defy the imagination to conceive of a poiſon more irreſiſtible in its operation than a large doſe of arſenic; it will therefore be irrational to indulge a hope of averting its inſtantaneous effects, unleſs a remedy can be invented that ſhall equal it in the rapidity of its operation. I will not dogmatically affirm that chymiſtry does not poſſeſs a ſubſtance adequate to the inſtantaneous neutralization of arſenic, but can ſafely ſay, that none of the great variety upon which I have ſo repeatedly experimented, is equal to this important indication. Hiſtory has recorded an antidote for this Herculean poiſon, which we are *ſeriouſly* informed is infallible. * "The beſt antidote againſt the poiſonous effects of arſenic are the ſcrapings of leather reduced to aſhes: if the quantity taken be accurately known, four times as much of theſe aſhes mixt with water, and drunk by the patient, will ſheathe and counteract the poiſon."

Baffled in every attempt to prevent the fatal effects of arſenic taken into the body, I attempted it by the uſe of the moſt powerful emetics that could be obtained. In every caſe where the quantity was not ſo great as to deſtroy life ſuddenly, or to render the ſtomach altogether in-

* Hiſtory of Indoſtan, page 481.

ſenſible, an effectual relief was obtained. If the length of time between the taking the poiſon and the exhibition of the emetic ſhall be conſiderable, all attempts for relief will be in vain. The ſtrongeſt emetics that can be obtained ſhould be adminiſtered as ſoon as the accident ſhall be diſcovered, and however copious their effects may be, large quantities of warm water ſhould be immediately taken, and perſiſted in, until it may be ſuppoſed that the whole be evacuated. The warm water not only waſhes off the acrimonious particles of the poiſon, but accelerates the operation of the emetic. Amongſt the variety of emetics of which I made trial, I found the vitriol of Zinc the moſt certain: indeed I can ſay with certainty that it afforded complete relief in all caſes where the excitability was not nearly extinguiſhed. After a partial evacuation of the ſtomach, I endeavoured to finiſh the cure by ſuch ſubſtances as might be judged moſt powerful on account of their inviſcating qualities; the uniform conſequence of which was, to retain the poiſonous particles in cloſer contact with the ſtomach, and to expedite the approach of death.

Teſts for diſcovering the preſence of Arſenic.

IT may often be a deſirable thing to determine ſatisfactorily what poiſon has been the cauſe of ſuch diſtreſſing ſymptoms. The preſence of

arſenic may be detected in two ways.—1. If the leaſt particle can be perceived and burnt, it will emit white fumes, and an evident ſmell of garlic. 2. Confine a ſmall quantity of arſenic between two plates of copper, and ſubject them to a ſtrong heat, a white appearance will be communicated to the copper. Theſe methods are ſufficient to detect the preſence of arſenic, even where it may be diffuſed among the contents of the ſtomach, or preſent in a very minute proportion; but whoever ſhall feel himſelf diſſatisfied on this point, may uſe a method communicated by Mr. Bergman. Infuſe a ſmall portion of the powder in a ſolution of vegetable alkali in water, after ſtanding an hour or two, pour upon it a ſolution of the ſulphate of copper in water, the colour of the vitriol will be immediately converted into an elegant green, and will ſoon be precipitated. The ſame experiment may be uſed to detect its preſence in water.

Arsenic is a ſubſtance which is copiouſly diffuſed through the bowels of the earth; it is a component part of many metallic products, and may, by its latent diſtribution among them, become the unſuſpected cauſe of the moſt ſerious calamities. Tin (as we have already obſerved) contains a conſiderable portion of arſenic; we ought therefore to be cautious in admitting it into the compoſition of culinary utenſils, eſpecially ſuch as may be intended to contain acids, or to be much expoſed to great heat.

PEWTER likewiſe ſometimes contains a ſmall portion of arſenic, but the quantity is ſo inſignificant as not to be juſtly an object of terror: It is nevertheleſs, a duty incumbent on the manufacturers of theſe metals, to aſcertain with preciſion what proportion of arſenic their materials contain. If we diſſolve tin which contains this ſubſtance, in the muriatic acid, the ſolution will exhibit a black powder, which conſiſts of the arſenic ſeparated from the tin. This experiment renders the ſmalleſt particle conſpicuous.

THE property which arſenic poſſeſſes of being ſoluble in water, multiplies and facilitates its deſtructive powers; ſprings and rivulets are ſometimes impregnated by flowing over this noxious mineral, and thoſe who inhabit their vicinity may fall victims to their inſidious influence before a ſuſpicion of the fatal cauſe ſhall ariſe. Beſides the method we have already deſcribed, for diſcovering the preſence of arſenic in water, it may be accompliſhed with more ſimplicity and equal certainty, by evaporating the water in a clean iron veſſel: a portion of the arſenic will be depoſited on the ſides and bottom of the veſſel, and when thrown upon burning coals, will emit the well known garlic-like odor. If a copper veſſel be uſed, the inſide of the veſſel will become white.

THE ſame end may be attained more expeditiouſly by evaporating the water rapidly from

an ignited iron; but this method is liable to a deception, for no odor will be emitted unleſs the water be ſtrongly impregnated by the ſemi-metal. Theſe methods may however, prove leſs accurate than others deviſed by the ingenuity of chymiſts. The moſt infallible with which we are acquainted are the following.

1. If a ſolution of the hepar ſulphuris be poured into water adulterated with arſenic, a colour more or leſs yellow will be produced, and if the ſulphur ſuperabound orpiment will be depoſited.

2. *If boiling lime-water be poured upon water holding arſenic in ſolution, a white precipitate of difficult ſolubility in water, will fall down. This precipitate is ſoluble in the acetous acid, and in a ſolution of arſenic: when mixt with oil and laid upon the fire, it yields the garlic-like ſmell peculiar to arſenic.

3. Cuprum Ammoniacum affords an excellent means of detecting the preſence of arſenic in any liquid; it produces with it a yellowiſh green precipitate, which if ſeparated from the ſuperincumbent liquor, dried and put upon ignited coals, manifeſts the ſame garlic-like odour.

Other teſts might be deviſed to aſcertain the preſence of arſenic by different reagents, but it

* Chymical teſts, invented by J. F. A. Gotling, Profeſſor of Chymiſtry at Jena, in Saxony.

would be a work of ſupererrogation, as thoſe already deſcribed are deemed amply ſufficient to detect it in its almoſt infinite variety of combinations.

It has been the object of the preceding eſſay to collect ſuch information as could in any wiſe tend to illuſtrate a ſubject as yet in its infancy. As an impartial inveſtigator, the author has, unbiaſſed by prepoſſeſſion or prejudice, extolled or condemned it agreeably to the ſuggeſtions of his own judgment. It may perhaps be obſerved, by thoſe who have experienced the difficulties of adapting medicines to particular exigencies and to the various conditions of diſeaſe, that more minuteneſs and preciſion are neceſſary in the uſe of ſo active a medicine: but whoever will attend to the principles that govern the operations of this medicine, as they are laid down in the progreſs of the ſubject, will find its management both practicable and eaſy. It would have been eaſy to have decorated every page with the tinſel phantoms of the imagination, but as the theory which has been contemplated is the inevitable conſequence of the phenomena of diſeaſes, or the obvious operation of the medicine, the author ought in juſtice to be reſcued from the implication of vanity or preſumption. Should any thing have eſcaped him which ſhall be hereafter found erroneous, it ſhall be retracted with unſpeakable pleaſure; for, whether his efforts

ſhould lead to truth directly or indirectly, through the medium of error, they will afford a gratification not to be conceived by any but thoſe who have felt the pleaſure of doing good.

If we take a retroſpective view of the agency of this mineral as a medicine, we ſhall ſee that nature hath made nothing in vain, or, to ſpeak more philoſophically, that the Author of nature has acted moſt benevolently in its formation; for if we view impartially even its moſt deſtructive attributes, we ſhall ſee, that they are no more than deviations from that order, which was impoſed upon the univerſe from the beginning, affording us additional reaſon to exult with the poet,

"All partial evils univerſal good,
"All diſcord harmony miſunderſtood."

THE END.