

Observations on the nature, the use and abuse of the Cheltenham waters : including some conjectures and queries on different saline compositions / by J. Smith.

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OBSERVATIONS
ON THE
NATURE, THE USE AND ABUSE
OF THE
CHELTENHAM WATERS;
INCLUDING
SOME CONJECTURES AND QUERIES ON DIFFERENT
SALINE COMPOSITIONS.

THE SECOND EDITION:

In which several additional Remarks are occasionally interspersed.

By J. SMITH, M. D.

SAVILIAN PROFESSOR OF GEOMETRY IN THE UNIVERSITY
OF OXFORD.

Sold by S. HARWARD, CHELTENHAM; and at his Shops in
GLOUCESTER and TEWKESBURY; by MURRAY, ELMSLY,
CADELL and DAVIES, and F. and C. RIVINGTON,
in LONDON; and by the Booksellers
in OXFORD and BATH.

1796.

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OBSERVATIONS

OF THE

NATURE, THE CAUSE AND REMEDY

OF THE

CHOLERA ENTHAM WATER

BY

SOME OF THE MOST EMINENT PHYSICIANS

OF THE EAST INDIA COMPANY

AND

THE SECOND EDITION

IN WHICH IS CONTAINED A FULL ACCOUNT OF THE

BY

THE MEDICAL OFFICERS OF THE EAST INDIA COMPANY

AND

THE MEDICAL OFFICERS OF THE ARMY

AND THE MEDICAL OFFICERS OF THE NAVY

AND THE MEDICAL OFFICERS OF THE MARINE

AND THE MEDICAL OFFICERS OF THE ROYAL

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AND THE MEDICAL OFFICERS OF THE

ADVERTISEMENT

TO THE

FIRST EDITION.

THIS little publication was undertaken in consequence of some conversations held during the course of this last season with the proprietor of the Cheltenham waters ; not with any view of recommending them to the attention of the public ; their increasing reputation requiring no such aid ; but chiefly in order to correct some errors and abuses in the dispensation of the waters, that had been found to be injurious both to the proprietor, and to those who had occasion for them.

However, though that was my original intention, I was necessarily led, as will appear, into an examination of the waters themselves, and to explain those peculiarities in their composition, and that particular mode of operation, on which their medicinal efficacy principally depends.

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The same train of thinking carried me on to an examination of other saline compositions, which, notwithstanding they might not be immediately connected with the subject, appeared to be of so much importance as I hoped would sufficiently apologize for the deviation; especially as the few hints I had to throw out might probably induce others, who were more able, to proceed in an investigation that could not but prove highly instructive and entertaining.

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TO THE

SECOND EDITION.

SINCE the first publication of this Pamphlet, a new well has been discovered, containing much the same ingredients with the old one ; but as the company has been long accustomed to the latter, and consequently is more attached to it, the cautionary directions in the first Edition, to prevent any unnecessary waste of the waters, in case of occasion, are still continued.

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THE Cheltenham spring is supposed to yield about thirty-five pints of water in an hour, amounting to eight hundred and forty pints a day. A quantity, no doubt, inconsiderable when compared with that which issues from other medicinal springs. But small as it is, it would be found, by proper management, sufficient for nearly an equal number of drinkers. And yet though there is not at any time that number in the place who come on account of the waters, it frequently happens that there is not enough of water for the company. Nor does the mischief stop there; for the report of this scarcity is circulated abroad, and often with this addition, that the waters are sometimes adulterated, by pouring in common pump water into the reservoir over night, in order that there may be a sufficient supply for the company the next morning.

In consequence of these reports, those who come for the sake of the waters are discontented; and many who are at a distance, are discouraged from coming at all, however much occasion they may have for them: and indeed if they were to come, they would only add to the disappointment and distress of the whole, during the present mode of proceeding.

Now this great scarcity as I have mentioned, does not proceed from any scantiness of supply from the fountain, but from other causes that are totally disconnected, and which may be easily removed without any detriment to any one individual whatever, but greatly to the advantage of all.

A chief cause of the scarcity complained of is, an erroneous opinion which has been entertained, that the waters are not only endowed with a purgative quality, but that they also act as an alterative; meaning by that expression, that some of their ingredients penetrate into the different recesses of the body, correct vitiated juices, break through obstructions, drive before them the obstructing matter, and thus assist the purgative ingredients in purifying the constitution from all the peccant acrimony.

This is one great cause of the injurious waste and dissipation of the waters. For, in consequence of their being considered in the light of an alterative, they have been recommended, not only to be taken as an aperient in the morning, but to be drank, by single glasses, at different times of the day. The company therefore are not contented with their morning's draught, but continue sipping at noon, and at night, and sometimes oftener, after the morning's operation has long been over.

And yet I am clearly of opinion that there is no foundation for the theory upon which the practice
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has been recommended; but that the efficacy of the waters consists in their purgative quality alone, guarded as it is, by the other ingredients of their composition: and that those very ingredients to which their alterative virtue is ascribed, are intended for no other purpose than to prevent the debilitating effects of a continued evacuation.

If the constitution could sustain unruffled and unimpaired, a long daily perseverance in any other cathartics, equally with these waters, the same salutary effects would probably ensue from their operation. But the art of Pharmacy has never yet attained to that excellence of composition. For it is well known that the most mild and gentle purgatives, however judiciously guarded and corrected, seldom fail of discomposing the habit, in some degree, during their operation; and if repeated daily, but for a single week, they would be found not only to enfeeble the stoutest constitution, but to bring on a train of complaints often worse than those they were intended to remove.

Herein then consists the singular pre-eminence of the Cheltenham waters, over all other purgatives; that during a long continued uninterrupted perseverance in them, they very rarely occasion any discomposure or ruffling of the constitution, any sickness or griping, any diminution of strength, appetite or spirits, but rather a renovation and improvement of all, provided the waters are drank with discretion,

and a due attention to regimen is all along observed ; it is the sickness, griping, and other pains that debilitate the constitution, and render it incapable of bearing a continued perseverance in other purgatives ; for the discomposure they occasion weakens faster than the evacuation.

That the medicinal efficacy of these waters may be accounted for, from their purgative quality alone, so happily guarded, will evidently appear from the few following considerations :

We know that the chronical complaints, for which these waters are found to be most efficacious, generally proceed from obstructions situated in one part or another of the body, whether occasioned by irregularity of living, the vicissitudes of climate or of seasons, or acrimony either generated or introduced into the constitution, or by what other cause soever.

We farther know, that the most effectual means of resolving and removing obstructions is by diverting the obstructing matter into one of the great emunctories or outlets of the body, originally constructed for the purpose of unloading the constitution and ridding it of all redundancies, of all the feculent remains of the aliment, and all the recrements of the circulation. Of those principal outlets there are three in number ; the skin, the kidneys, and the intestinal canal. Could we then promote an increased discharge, for a proper continuance, from either of them, our purpose

purpose would probably be answered. But we have not so much the command over the kidneys or the skin, as to be able to excite a sufficient discharge by them on all occasions; nor have we the means of continuing it with impunity to the constitution in other respects: nor at all times so much the power of restraining it afterwards, but that a confirmed diabetes would probably be the consequence of a continued enforcement of the secretion, in the former; and a total dissolution of the whole animal system would ensue, from any such practices upon the latter.

The remaining outlet, on the contrary, the intestinal canal, is very much under our subjection. We can at any time excite a discharge from it, can increase the discharge, or continue or totally suppress it, as we see occasion. Here we seldom find any difficulty, especially as by the assistance of these most excellent waters, we can promote the discharge and continue it as long as the case requires, without endangering the constitution, provided the evacuation is never carried to excess.

It is on account of the command we have over this great emunctory, that recourse is so frequently had to it in a variety of disorders both chronical and acute; and even in cases where from the nature or situation of the disorder, the other outlets would seem to be more properly adapted; such, particularly, as accumulations of water in some of the cavities of the

body, or in troublesome obstructions in the common integuments.

The powerful operation of cathartics is frequently exemplified in dropfical cafes. For after all attempts upon the kidneys have proved unsuccessful, we find that by only stimulating the exhalent vessels of the intestines, an immense quantity of fluids, often amounting to several gallons, is solicited from the different cavities of the body, in which it happened to be accumulated, and turned into that great channel, and thence discharged. Here all alteratives are obviously out of the question.

Again, in cutaneous complaints, whether pimpley eruptions, or dry incrustations, or watery exsudations, or of whatever kind they may be, we frequently observe, that after they had baffled the efforts of the most powerful alteratives, and on that account have been generally ranked amongst the *opprobria medicorum*, they have at length given way to a perseverance in some such gentle cathartic as the Cheltenham waters: and, by proper attention to the original causes of their production, have been prevented from ever appearing again.

Seeing then that in dropfical disorders, the stimulus of the cathartic alone, is capable of deriving a large quantity of stagnant fluids, from the most distant cavities, into the intestinal canal; and that in those of the integuments, the eruptions are found to
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yield to the same mode of operation, after all the alterative tribe of medicines had proved ineffectual, have we not reason to exclude the assistance of alteratives in this latter case as well as in the former? especially as any return of the complaint may be generally prevented by due attention to regimen alone, and without any assistance whatever from medicine.

The analogy will appear still more conspicuously from the following consideration.

The medicinal effects of the cathartic have hitherto been confined in both cases solely to the discharge from the intestines; and in many instances, no farther assistance may be required. But in cases of a more obstinate nature, and where the cathartic alone is insufficient, it is frequently the means of bringing in some other of the emunctories, particularly the one which has the nearest affinity to the complaint, to co-operate with it.

As in the case of confirmed dropsy, after all attempts had been made separately upon the kidneys, which are the natural outlet for the redundant lymph, without effect, the cathartic has, by carrying off part of the accumulated fluid, relieved them from the load that before oppressed them. They have consequently recovered their usual function, and much of the fluid has been discharged by that channel also.

In like manner, we frequently find in cutaneous

complaints, that after the constitution has been unburthened by the operation of the Cheltenham purgative, and the powers of the circulation as it were liberated, they have been enabled to propel the unsettled acrimony more plentifully towards the skin, its usual outlet; and the secretory vessels there, being relaxed by the same operation, what the purgative alone could not carry off, has been transmitted and expelled by that emunctory.

The increase of the eruption for awhile, after drinking these waters, has been adduced by the favourers of the doctrine of alteratives, as a proof of their operation; not reflecting, that in many other instances of acrimony floating in the constitution, evacuation alone frequently determines its course to the parts where it had been used to flow; as is experienced, particularly in gouty habits, where by opening a vein, or administering a gentle cathartic, a paroxysm frequently ensues.

But farther, we know that many waters are more strongly impregnated with those very ingredients to which the alterative virtues of the Cheltenham waters are ascribed than they are; I mean the fixed air, or ærial acid, and the steel that are found in their composition: such as the cold chalybeates of Spaw, Pyrmont, Tunbridge, and others dispersed all over the globe. And yet those waters are not found to be endowed with the deobstruent qualities of the Cheltenham waters, excepting in a few cases, where
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the obstruction arises from langour in the circulation, and general debility of the whole habit. But in the many that gradually come on from some of the causes I before mentioned, and are rooted particularly in the glandular system, in one part or other of the body ; in all such obstructions, and the innumerable disorders they give birth to, those chalybeate waters, for want of the purgative, are totally unavailable. Nor are even *their* medicinal virtues so properly to be ascribed to any faculty of penetrating into the different recesses of the body, as to their immediate action upon the stomach itself, that great regulator of all the animal functions ; and to the corroborating assistance they give it, in elaborating the crude aliment, and preparing it for the restoration of the debilitated powers of the constitution at large.

What alterative effects are we then to expect from the Cheltenham waters, in which the ingredients of that denomination are comparatively so inconsiderable, and but just sufficient to correct the debilitating tendency of the purgative, as shall afterwards be explained ; and when even, on the supposition of their being capable of penetrating farther into the constitution by themselves, the purgative, by being joined with them, would repress them ?

Upon this occasion, I cannot help remarking in general, that the term *alterative*, and many others of a vague undetermined signification, together with the phrases *correctors of vitiated juices*, *sweetners of the blood*,

blood, &c. so often used in medical language, are commonly the mere substitutions of ignorance, and ought to be excluded from all sound physiological reasoning, as deservedly as that of *occult qualities* from a more enlightened philosophy.

Medicines seldom operate directly upon the fluids ; but upon the solids of the system, from whom the fluids derive their particular qualities : and their immediate action is in many instances confined to the alimentary canal, without penetrating farther into the constitution ; and especially to the stomach, whose wonderful influence alone over the whole animal œconomy, extends their efficacy to a much greater variety of cases than is commonly conceived ; though in a manner not easy to be comprehended.

But to return. We may observe the great relief that is frequently obtained by artificial discharges, externally produced ; such as those by blisters, issues, setons, &c. when no *alterative* or other medicine is administered, and when the discharge is inconsiderable, and from parts of the body too that were never intended for any such purpose. How much greater effects then may be reasonably expected, from opening for a continuance, one of the principal emunctories of the body, that was originally constructed by the hand of nature, for the great end of ridding the constitution of all redundancies, of all feculent noxious matter, in cases especially that arise from thence,
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and where the constitution is enabled to sustain the evacuation.

Upon the whole of this article then, it may be concluded, that the practice which has been recommended, and now prevails, of drinking the Cheltenham waters, by single glasses, at different times of the day, is nearly as absurd as that of sipping common physic, after the operation of the morning's dose is at an end; and can answer no purpose whatever, but that of preventing the quantity's being collected which is requisite for the company present, and at the same time discouraging others at a distance from having recourse to that fountain of health, however much they may stand in need of it. And it may be farther observed, that as, by that practice, the constitution becomes more and more familiarised to the waters, the greater must be the quantity necessary for the morning's operation. If indeed, the chalybeates above-mentioned, particularly those of Spaw and Pyrmont, were to be substituted for the Cheltenham waters, their strengthening and exhilarating ingredients unrestrained, would co-operate with those of the latter towards the support of the constitution, and therefore might be occasionally drank during the course with the greatest propriety.

Another cause of the scarcity complained of is this: many who come from a distance for the sake of these waters, being impatient under their complaints,

plaints, and desirous of making the best use of their time, drink them to excess; and by so doing, they make the very worst use of it they possibly can. For as the evacuation, by such a proceeding, is generally greater than the constitution can bear, however well guarded the purgative may be by the other ingredients, their appetite and strength must necessarily fail; their spirits flag, and not finding in other respects, during the little stay they make, all the benefit they expected, they go away disappointed and dissatisfied: not considering that an evil that has been long in establishing itself in the habit, will naturally require a long perseverance in the antidote for its removal; and that a regular adjustment of the antidote to the powers of the constitution, is indispensibly necessary in all cases whatsoever. Could they but be reconciled to diminish their daily proportion of the waters, and make up the deficiency by a longer perseverance, more would be reserved for the rest of the company, and greater benefit would accrue to themselves from the alteration.

A third cause of the scarcity is, that many accustom themselves to send in the morning for the waters; and though a pint is sufficient for the generality of drinkers, a quart is the smallest quantity that is ever carried away; and more frequently two or three quarts. For the servants, notwithstanding they may have no occasion for the waters, often choose to drink them as their betters do.

On this occasion I would beg leave to recommend to the consideration of the inhabitants of the place, whether, as they have all the waters to themselves for seven months of the year, and more than they can want for a much longer time, they might not be a little sparing in their draughts, during the very height of the season, out of respect for those who come from a distance, and to whom they are indebted on many accounts.

The pumper too might assist in this economical plan, by rinsing the glasses at the pump with common water, instead of that immediately drawn from the fountain.

I have now pointed out what occurred to me to be the principal causes of the scarcity complained of; and doubt not but if they were removed, there would be a sufficiency for the company, at all times. And it is become the more an object of consideration on account of the increasing reputation of the waters; as the demand must increase accordingly, while the supply from the fountain probably never will.

Having then finished what I had originally in view in this publication, I shall proceed to make a few observations upon the waters themselves, tending to confirm more strongly, the opinion I have advanced concerning their medicinal mode of operation; and at the same time, to set those peculiarities in their composition, on which their principal virtues depend,
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in a clearer light than I conceive has hitherto been attempted.

The chief ingredients in the composition of the Cheltenham waters, are, fixed air or the ærial acid, steel, and a native glauber salt. As to the other ingredients mentioned in the publications of those who have analysed them, and particularly in the last by Dr. Fothergill of Bath, whose account comes nearest the truth; they are so trifling in quantity, and of a nature so inert, that they are very little to be regarded.

It is to the three I have particularly mentioned, that the peculiar excellence of these waters is chiefly to be ascribed, and an elegant and valuable composition do they form. For by the first of those ingredients, the *ærial acid*, the second or *chalybeate principle* is dissolved and suspended in the water; and by the strengthening and enlivening influence of the first and second, the debilitating and ruffling effects of the third, the *purgative salt*, are prevented.

There is moreover a circumstance peculiar to the ingredients of these waters, which never has been noticed, and which must highly improve their respective virtues, and enhance considerably the merit of the whole composition, as I shall presently explain. The circumstance I mean is their extraordinary degree of attenuation in the water.

The sudden evolution of the ærial acid, on exposure
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sure to the common atmosphere, and the nearly as sudden subsidence of the chalybeate principle that was dissolved and suspended, as I mentioned, in the water by it, shew the wonderful tenuity and mutual penetration of the particles of each of these ingredients. While they at the same time clearly prove, what is of no small importance, that no part of the chalybeate was at all united with any other acid of a less volatile nature, as is frequently the case in other waters impregnated with that principle: And as the purgative ingredient is found, by experiment, to contain more water in its crystals, and to be soluble in a much less quantity of that fluid than any other purgative salt we are acquainted with, we have sufficient reason to infer the great tenuity of its constituent parts also.

To what particular causes so singular an attenuation of the ingredients of these waters is to be ascribed, may be a question not easily to be resolved. We have, however, reason to suppose that *heat*, which is the great agent of resolution in the whole material world, excited in their origin, and accompanying them and heightening their agitation, in their progress through the channels of the earth, must have had a principal concern in the operation: especially as we know that wherever the ingredients of steel and sulphur are united with water, there heat will be generated. And that both are contained in the Cheltenham waters, is evident; the former being clearly ascertained by all the usual tests; and the particular
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hepatic fetor perceivable at the pump, and during the operation of the waters afterwards, as clearly indicating the latter.

The presence and assistance then of that great agent from the beginning, with its attenuating operation through all the ingredients, may reasonably be supposed. But what may more especially contribute to the attenuation and solubility of the purgative, is its having a small portion of the Epsom salt intimately blended with the glauber salt, in its composition. For by the commixture of those two salts, the original attraction between the constituent parts of each, may possibly be weakened, and the solvent power of the water over the whole, consequently increased.

Granting, then, the extraordinary attenuation of the ingredients of these waters, many of their most essential virtues may be very plausibly accounted for; particularly their lightness upon the stomach, their sudden exhilarating effect upon the spirits, their expeditious and easy operation downwards, without sickness, or griping, or disagreeable sensation of any kind, and their invigorating influence over the whole constitution.

For from their tenuity and uniform diffusion through the water, there cannot be any perceivable weight or oppression in any particular place; especially as the quantity of all the ingredients taken together is very inconsiderable.

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While, from the same cause, the strengthening and exhilarating ingredients must operate universally and at once on all the sensible parts of the stomach and intestines. In which operation it is not impossible but the more sluggish ingredients may assist; as we know that the most inert matter is capable of being converted, by attenuation, into the most active and stimulating. Of this we have a convincing proof from the viscid substance of common grain, which, by that alone, may be transformed into the purest alcohol.

Their mode of operation upon the intestines, producing an easy, sudden, and copious discharge, is equally explainable upon the same principle. For the water, after having performed its strengthening and exhilarating office upon the stomach, passes quickly into the intestines as fluids do, carrying along with it more or less of all its ingredients, but particularly its purgative. When there, the purgative, by its great dilution and consequent dispersion all over the internal surface of the canal, vellicates the innumerable little exhalent vessels, with which that cavity is crowded, into a plentiful secretion: and notwithstanding the stimulus may be but slight on any particular part, on account of the minuteness of the particles of the salt, yet as they are universally diffused, and act upon the whole system of exhalents at once, a more copious and expeditious evacuation is produced, than what is often attainable from a much larger quantity of any of the other more stimulating

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purgatives

purgatives less attenuated; attended at the same time with these important advantages, that as the stimulus is gentle, no griping pain is likely to be excited, and as it is superficial, the particles must soon be washed off in the general current, without leaving behind them any of those disagreeable feelings that usually hang in the rear of other cathartics.

That the Cheltenham purgative owes its great superiority in the particular circumstances I have here described, chiefly to the principle of attenuation, will appear still more evidently from comparing it with other purgatives of that class: as we find that according to the quantity of water they retain in their crystallization, and their consequent degree of solubility, the nearer and more remote in general is their resemblance to it in their mode of operation.

Authors seem to differ widely in their accounts of the quantity of water contained in the different purgative salts, and also concerning their different degrees of solubility; owing probably to a variety of little circumstances that affect their experiments at the time they are made: such as the condition of the salt, and of its original constituent parts; the state of the atmosphere, the degree of heat, the quantity, if any, of the other contents separated along with the water, in the evaporation; the temperature and purity of the water used in the solution, with other particulars not easy to be attended to or accurately ascertained. But on comparing the different accounts,
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the following arrangement may, in a great measure, be depended on.

First, the Cheltenham salt may be placed at the head of all the usual purgatives of that class; its crystals being found to contain considerably above sixty parts out of an hundred, of pure water; and to be soluble in about an equal weight of that fluid. Next to the Cheltenham, may stand the pure glauber salt; as the water in its crystals is found to amount to more than fifty out of the hundred; and to be soluble in a little more than double their weight. Near the glauber, may rank the Epsom salt; its crystals containing somewhat under fifty of water. As to the solubility, it is said, by some authors, that its crystals are more susceptible of solution than the glauber salt, notwithstanding they contain less water in their composition. When so, the variation may be owing to a small commixture of other ingredients besides the magnesia earth and the vitriolic acid of which they are composed, as is not unusual in the native salts, conjoined with the feeble attraction that is known to subsist between its original constituent parts. After the Epsom comes the sea salt, sed magno intervallo; as it is found to contain of water in its crystals, but sixteen parts out of the hundred; and requires above three times its weight for solution. Lastly, at the bottom of the scale, may be placed the vitriolated tartar; its crystals containing but six out of the hundred, and not being soluble in less than sixteen times their weight of water. As to the other artificial pur-

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gatives,

gatives, composed of the different acids united with the different alkalies, such as soluble tartar, diuretic salt, Rochelle salt, and the digestive salt of Sylvius; their places in the above scale vary according to the various circumstances of their preparation.

Now we find by experience, that the operation of these different salts, when compared with that of the Cheltenham salt, generally accords with the place in which they stand in the above arrangement. For example, if we take the second in the scale, the *glauber salt*, and compare its mode of operation with that of the last, the *vitriolated tartar*, we find it approaches much nearer to the Cheltenham salt in all the recommendable circumstances before enumerated; notwithstanding it differs from the other, only in its having the fossil alkali, instead of the vegetable, united with the vitriolic acid in its composition. But as its crystals contain a much greater proportion of water, and are much more susceptible of solution, its operation as a cathartic is gentle and expeditious, while that of the vitriolated tartar is rough and sluggish.

Upon the whole then, we may conclude, that the principle will extend to the saline purgatives universally, and may be applied as the criterion by which we may judge before-hand concerning their different modes of operation; their action being merely mechanical, and all the varieties of their operation to be accounted for from their different degrees of stimulus upon the fibres of the living subject.

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Could any principles be found out that would apply to the vegetable and animal kingdoms, so as to explain in the same mechanical manner, the effects of their operation; such a discovery would be of the utmost importance, as it would lay open the whole material world at once to the intelligent physician. He might then be truly styled the *minister naturæ*, as all her stores would be subject to his direction; and from that inexhaustible magazine he would be able to select on all occasions what was best adapted to his purpose, and to determine with precision what operation and what effects were to be expected in general from every medicine he administered.

But those curiously organized productions of nature are so very complicated in their construction, and the ingredients of which they are composed are so numerous, and so intimately and inextricably blended together, and at the same time acquire so many new properties from the manner of their arrangement, which on the slightest efforts to separate them are totally lost, that no just analysis of them has ever yet been made, or is ever to be expected; and without that, their mode of operation upon the living subject must ever remain in obscurity. Neither can the medicinal store be very copious while it continues to derive its supply from mere accident, and the result of vague undirected experiment.

Whereas in the fossil kingdom in general, the compositions are comparatively simple, and the ingre-

dients few and permanent. Their structure can therefore be easily unfolded, and their parts subjected to the various methods of examination without undergoing any considerable change by the process. We are consequently capable of obtaining an absolute command over that class of bodies ; so as to be able not only to de-compose them, but to re-compose and restore many of the most useful among them to their original forms as by the hand of nature, according to our occasions. From thence we are enabled to acquire a competent knowledge of their properties, both in their separate and their conjoined state, and to ascertain and regulate their different modes of action, in all cases whatever.

In order to illustrate the distinction between those different classes of natural bodies, we need not go beyond the present subject of evacuation for an example.

The operation of the saline purgatives has been shewn to proceed from mere mechanical stimulus upon the sensible parts of the living body. But by what mode of action jalap operates as a cathartic, or ipecacuanha, as an emetic, no satisfactory account has been given. Much less is any to be attempted for that extraordinary sympathy which confines the operation of each principally to its respective organ, whatever may be the channel by which it is introduced into the constitution. How for instance an infusion of jalap, when injected by a vein into the
course

course of the circulation, and consequently conveyed to every individual spot of the body, affects no one particular part till it is secreted and discharged into the alimentary canal; and that there its operation should commence, acting ultimately as a cathartic. Or how an infusion of ipecacuanha, when injected in the same manner, suspends its action till it arrives at the same place, and when there should operate invariably as an emetic.

These wonderful facts seem totally inexplicable: and yet they are established upon the firm basis of experiment, as will appear from the following account communicated to me by my friend Mr. John Hunter, whose singular talents for investigation have thrown a light upon the physiology of animals, and indeed of most parts of organised nature, that has shone through all Europe. The experiments were these.

He infused one scruple of jalap root in two ounces of water, and let it stand in infusion for about two hours. He then injected one half of the clear liquor into the crural vein of a dog. In less than a minute the dog puked a little, and then seemed to be quite well. Thinking therefore there would be no farther effect from that injection, he threw in the remainder, but no more puking ensued. However, by degrees, the dog grew dull and feeble in his legs, so as to be induced to lie down. After lying a little time he got up again, and in about a couple of hours after the last injection, he had a motion downwards; the first part

of which was of the usual consistence : but the remainder was loose ; and in about two hours more he had a very loose purging stool. He then gradually recovered, and seemed to continue pretty much as usual.

He in like manner infused one scruple of ipecacuanha root in two ounces of water, and then injected about one half into the same vein of a dog. The infusion was no sooner injected than the dog grew very sick, and before his mouth was untied he began to vomit ; and the moment after, he threw up every thing that was in his stomach, and continued sick, so as not to be disposed to eat for above a day afterwards.

These experiments clearly demonstrate our total ignorance of that class of bodies, their qualities and mode of operation ; and that we must be indebted for our medicinal knowledge and application of them, to accident alone.

Mr. Hunter made similar experiments also upon some of the neutral salts most commonly used in medicine ; of which he communicated to me the following.

He dissolved two drachms of nitre in six ounces of water, and injected the solution into the crural vein of a dog. The injection killed him in a moment.

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He also dissolved two drachms of glauber salt in the same quantity of water, and injected it in like manner, but without any visible effect whatever ; as the dog eat and drank, and had stools as usual.

Now on comparing these different experiments together, we may observe, that however inscrutable the two former with the vegetable infusions may be, yet the latter with the saline solutions, come within the reach of conjecture, and their different effects may be pretty clearly accounted for on the principles before mentioned.

For with respect to the fatal effects of the nitrous solution, it is to be remarked, that nitre is one of those salts that contain very little water in their crystals, and that when compared with the glauber salt particularly, which is the most aqueous of any, excepting the Cheltenham salt, the proportion of real saline matter is as eight to one. When therefore equal weights of these two salts are dissolved in the same quantity of water, the water must be charged with eight times more saline matter in the nitrous solution than in the other ; and that to bring those two solutions to the same degree of strength, there ought to be forty-eight ounces of water, instead of six ounces in the former.

We may thence readily suppose that the effects of these two solutions, when injected into the course of the circulation, would be very different ; and that the water, loaded with so great a quantity of saline matter

ter in the nitrous solution, might occasion such obstructions, and excite such spasms by the stimulus of its saline particles, as to disturb and suspend every vital function, and death consequently ensue. While on the other hand, in the solution of the glauber salt, the particles being few and minutely attenuated, the whole being first dissolved in a quantity of water that is nearly twelve times greater than is necessary for its complete solution, and afterwards thinly scattered among the innumerable ramifications of the arterial system, it does not appear at all surprising that they should pass off without producing any sensible effect whatever.

Perhaps the refrigerating quality peculiar to the nitrous salt may a little contribute to its deleterious effects, by coagulating the fluids and so rendering them less capable of circulation, or by benumbing and weakening the activity of the circulating powers; which refrigerating quality, by the by, may be owing to the great quantity of saline matter in the nitre, which being of a lower temperature than that of the blood, probably absorbs part of its heat.

Seeing then from the above view it appears that we are capable of acquiring so competent a knowledge of the subjects of the fossil kingdom, while we are likely to remain in total ignorance of the others, it is much to be regretted, that, in this age so eminent for analytical investigation, the connection between their properties, and the nature and proportional quantity of their ingredients, should not have been more attended

attended to in the manner I have here attempted ; as every discovery of that kind would probably forward the improvement of the arts in general, and particularly the art of healing, more expeditiously than is to be expected from the flow scanty gleanings of experience alone. The truth of this observation might be confirmed by a great variety of instances taken from the saline class of bodies, and especially the salt now under consideration ; it being a salt of very extensive application, and frequently used for a great variety of purposes, both in the arts and in medicine.

I have already endeavoured to account for its deleterious effects when injected into the course of the circulation, as proceeding chiefly from the circumstance of its containing so large a proportion of real saline matter in its crystals ; and it is highly probable that several of the most remarkable of its other qualities originate from the same source. Of these I shall on this occasion mention the two following, as they are most generally known, though I believe they never have been attempted to be accounted for.

The first is its being more apt to disagree with the stomach than the generality of the other neutral salts. For few stomachs can bear, without nausea being excited, a single scruple of nitre when administered in a draught of the usual form. Now may not this effect proceed from the very circumstance of its being charged with so great a proportion of saline matter

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ter in its crystals; which, when assisted by the sudden solubility of which it is particularly susceptible, acts with a concentrated force all at once on the very sensible coats of the stomach, and thus excites the disagreeable nausea complained of? especially as we find that when nitre is sufficiently diluted so that its particles become more attenuated and dispersed, and the whole brought upon a level in point of strength with other neutral salts, it may be then administered in equal doses with any of them, and with equal impunity.

There are some however of the neutral salts which at first view would appear to be an exception to the principle. Among these may be mentioned the vitriolated tartar; as it certainly contains more real saline matter in its crystals than nitre itself; and yet may be taken in much larger doses in a draught of the usual form, without exciting any nausea or discomposure of the stomach in any manner whatever. But that may be clearly accounted for from the known circumstance of its greater difficulty of solution, by which its particles are prevented from acting upon the coats of the stomach with their united stimulus altogether, as those of the nitrous salt do. It is therefore to be considered upon that occasion as being on the same footing with the other weaker salts, which, though more soluble, have a less proportion of saline matter in their composition.

The other quality I shall here mention, is that of its being capable of exciting a very extraordinary degree

gree of cold during its solution. This quality, which nitre so eminently possesses, and which has been applied to many useful purposes both in philosophy and the arts, seems to originate from the same principle with the others. But for the better illustration of this, it will be necessary to enter a little into the subject of cooling and heating mixtures.

The subject is of great extent, and by proper application is capable of throwing a light upon many of the most obscure operations in the natural world. For the present, it will be sufficient to point out a few of the most leading principles; particularly the following:

First, That bodies, during their solution in their proper menstrua, generate cold.

Secondly, That bodies, during their mutual attraction and incorporation, generate heat.

Salts therefore, while they are dissolving in water, generate cold.

But salts while, by their mutual attraction and mutual penetration of each other, they are forming a compound endowed with properties different from what either possessed before, and become what the logicians would call a *tertium quid*; all such salts, during the continuance of that process of mutual incorporation, generate heat.

Thirdly,

Thirdly, In the production of either cold or heat, the greater the quantity of matter, either dissolved or incorporated in a given time, and the less the quantity of the fluid necessary for solution or mutual incorporation, the greater will be the sensible effect, or the cold or heat generated.

If therefore, in the case of solution, a salt containing a greater quantity of real saline matter in its crystals than another, is dissolved in an equal quantity of any common menstruum, during the same time, the degree of cold that is generated will be proportionably greater.

Now nitre is possessed of those very requisites for the greater production of cold above most of the other neutral salts; as it contains more real saline matter in its crystals, and is remarkably quick of solution.

Vitriolated tartar has, it is true, more saline matter than nitre; but it is so slow of solution, and requires so great a quantity of water to dissolve it, that partly by the cold's being generated by little and little, as it dissolves, and partly by that little's being dispersed through the large quantity of the menstruum that is necessary for its solution, the sensible effect or cold produced at any time during the process, must be very inconsiderable. For it is here to be observed, that in these processes neither cold nor heat ever remains to accumulate, but both of them vanish almost

as soon as generated ; so that the mean temperature is immediately restored, either by the influx of heat from the surrounding medium or atmosphere, when it becomes deficient in the case of solution ; or by its efflux, when, in the case of mutual incorporation, it becomes redundant.

The generation of cold during solution, and of heat during incorporation, are phænomena that I conceive have never yet been clearly accounted for. Perhaps the following observations may contribute to throw some light upon the subject.

In the case of solution, the volume of the body dissolved is enlarged ; its surfaces are consequently unfolded ; and as it is proved by a variety of experiments that heat is particularly attracted by surfaces (adhering to them or hovering over them latent and inactive), the menstruum by means of that attraction is robbed of the quantity of heat with which it was before impregnated, in proportion to the increase of superficial expansion during the process, and therefore becomes colder.

On the other hand, in the composition or mutual incorporation of bodies, the volume of the whole is contracted, the quantity of superficial expansion is diminished, and consequently much of the heat that before adhered to surfaces is then thrown out into the surrounding fluid, which therefore becomes sensibly hotter.

And

And here it is to be observed in general, that these phænomena are not confined solely to the commixture of different bodies, but seem to prevail universally in all cases of expansion or rarefaction on the one hand, and contraction or condensation on the other; even when the experiments are made upon single bodies, without the intervention of any other.

We may take for example the common atmosphere; as we find that when the air within the receiver of an air pump, is rarefied by a few strokes of the piston, cold is instantaneously generated; and on the other hand, when, on the immision of the air again, the former state of condensation is restored, the heat as instantaneously returns with it; and if the air is still farther condensed, an additional increase of heat will accordingly be produced.

I have now given some examples, taken from the neutral salts, of the method of inquiry here recommended. My subject naturally led me into it as being the most proper for explaining those peculiarities in the composition of the Cheltenham waters, to which they owe their superior excellence above other purgatives of that kind. And as the method appeared to be but too much neglected, considering how much the analytical philosophy has been cultivated, I could not help enlarging upon it, and illustrating its importance by a similar examination of other salts of the neutral class, whose properties, though universally known, had never been accounted for in that manner.

Many

Many beautiful discoveries have been made in the course of this century, and much light has, as it were, spontaneously sprung up, and been reflected from them upon some of the most obscure operations of nature. But if the method of induction had been strictly adhered to, by which the connection between the known properties of bodies (especially their mode of operation on the living subject) and the nature and proportional quantity of their ingredients had been regularly observed, instead of accumulating volumes of experiments without application, much greater improvements would have probably been made in every branch of both speculative and practical knowledge; and the medical profession particularly would have been rescued out of the hands of ignorance and imposture, into which it seems to be sinking, and restored to its proper scientific dignity.

Nothing would more effectually contribute to that end than to extend the inquiry to the different metallic compositions; especially those of mercury and antimony, which have been all along the strong holds of empiricism, on account of the powerfulness of their operation, the facility by which they may be compounded, disguised and preserved, and the small portable compass within which they may be comprehended.

For the philosophical chymist and physiologist, from his knowledge of the various matters, whether salts, sulphurs, or the different kinds of air with
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which those metals are usually united, would not only be enabled to direct, heighten, repress, and every way improve their respective operations more safely, successfully, and extensively than the blind empiric could ever attain to ; but by reducing the whole under a few general principles, the utmost limits of empirical pretensions would be clearly pointed out, and the materia medica purged of an infinity of useless preparations which, through ignorance and artifice, have been multiplying ever since the introduction of those metals into it.

To all which might be added the great pleasure attending a practice so scientifically conducted, in which both the diseases, and the operation of the medicines administered for their removal, would be viewed in the light of so many natural processes ; and every step, gained by that mode of investigation, considered as so much advancement in true philosophy.

In order, however, to the making any progress in so extensive a field, in which we may say with the poet,

“ The night’s so dark, so deep the way,”

it would be necessary to set out with all the light, all the information that can be collected from the writings of the most eminent analytical experimentalists of this and other countries. Among whom I would recommend to the young physiologist those of the following :

following: Hales, Black, Priestley, Canton, Cavendish, Kirvan, Hunter, Margraaff, Pot, Sheele, Bergman, Rouelle, Macquer, Morveau, Lavoisier, Methe-rie, Cavallo, Fontana, Spalanzani.

At present I shall but barely venture to touch upon the subject, only by way of example; and that too rather in the form of query than positive assertion.

Among the general principles alluded to, may not the following be adopted?

That the metals are devoid of activity while they continue in their metallic uncombined state? and that in order to their acquiring any degree of active exertion, it is necessary they should be previously converted into the condition of a salt, by their union particularly with an acid, either in the laboratory or the body; as without that conversion, they would be incapable of solution and uniform diffusion in the fluids, or of impinging with any degree of stimulus upon the solids? but would either remain in the first passages totally inactive; or, if capable of circulating, like mercury uncongealed, from the smoothness and divisibility of their particles, would glide along without making any sensible impression whatever.

For we know that mercury (to which I shall chiefly confine my observations on this occasion), when taken inwardly in its crude undivided state, is found to be

totally inactive, however large the quantity that is administered.

Its inactivity, however, has been solely ascribed to the strong attraction between its particles preventing their separate exertion on the stomach, or absorption farther into the constitution. For when the attraction is previously destroyed by the interposition of another substance, the mercury no longer continues in that inactive state.

This objection has at first view much seeming solidity in it; but when more attentively considered, I presume it will be found to be more specious than solid. For if the mere separation of its particles was alone sufficient, activity would be the never failing effect. And the more perfect the separation, and consequent removal of the impediment arising from their attraction, the higher its activity would be raised.

That however is by no means found to be the case. For when the particles are separated, by a substance that resists the acid, and at the same time is insoluble in the fluids of the stomach, as in the mixture of mercury and sulphur in the formation of cinnabar and æthiops, the mercury still continues, notwithstanding the separation, in a great measure inactive. And farther, the more complete the separation, the less operative is the mercury; its particles being then more thoroughly protected from the
acid,

acid, by the universal interposition of those of the sulphur.

We find also that other substances, when mixed with mercury, have the same debilitating effect upon it, according to their influence upon the acid of the stomach. Even the common testacea, when blended with mercury, are found, by their absorbing the acid, greatly to impede its action; as in the preparation of hydrargyrus cum creta. And we may observe in general, that the different mercurial preparations of the sulphureous or testaceous or alcalescent tribes, are now in a great measure exploded, on account of their experienced inefficacy; though the cause of that inefficacy has never, I believe, been clearly assigned*.

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* That an acid is to be found in the stomachs of even the most carnivorous animals, has been proved by a variety of experiments. Mr. Hunter particularly fed dogs that had been half starved, with raw flesh only, that was kept until it was verging towards a state of putrefaction; and though that was their only food for some weeks, he always found the gastric liquor strongly impregnated with an acid. And it is not only universally acknowledged, that different acids may be extracted from both the fluids and solids of animals; but, in consequence of some late experiments, it has been asserted, that even all the fossil acids are generable by the vital powers either of vegetables or animals; the acid of arsenic only excepted.

May not that circumstance, by the by, throw a kind of glimmering light upon the source of the incorrigibility of that acid, and

From these considerations does it not appear highly probable, that the principal advantages gained by the separation of the particles of mercury are, partly by destroying their mutual attraction, and partly by enlarging or unfolding their surfaces, (while the whole mass is by the same means prevented from escaping too hastily) to give the acids of the stomach, or constitution at large, a power over them sufficient for their conversion to a saline state; and that from thence their activity is derived?

Is not the probability farther heightened by the practice of the Spanish physicians, who administer the absorbent medicines as the most efficacious for relieving those who are injured by the mercury in the mines?

And is it not raised almost to a certainty by the well known circumstance of the mercury's acquiring so great a degree of activity, from its conversion into a saline state by its union with an acid in the laboratory, that the very trifling portion of the metal con-

its being so particularly hostile to the animal system? for as the organical powers were originally unequal to its production, might it not be supposed they would be the less equal on that account to the subduing of it afterwards? while on the other hand, iron, which is said to be producible by those powers, is particularly congenial, and beneficial to the constitution, in almost every form in which it can be administered.

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tained in a single grain of the compound, carries its specific virtue along with it, and diffuses it so effectually all over the body, that if administered only once a day for a few weeks, it is generally found to be capable of clearing the constitution of all its poison, however universally it may have been inquired.

Granting then that mercury derives its activity from its union with an acid, either in the laboratory or the body, and that so very inconsiderable a portion of it, when prepared in the laboratory, is found to be sufficient for the total extirpation of the poison; may it not be asked, why the practice of loading the constitution daily with so great a quantity, by unction, should be continued?

May not a redundancy of that heavy mineral introduced into the constitution, and circulating all over it, be productive of consequences highly injurious to it?

May it not tend to unhinge the whole system, partly by the pressure proceeding from its own gravity, and partly by its particles attracting the acids every where, and robbing both fluids and solids of an essential ingredient of their composition? and is not this confirmed by the enervating effects it is known to have on those who work on it?

May not the perpetual absorption of the acids and consequent conversion of the mercury to a saline state,

while there is a single particle of it remaining in the constitution, be the means of keeping up an unnecessary ptyalism, long after the poison had been extirpated? or by falling on the bowels, of bringing on a violent catharsis, when the constitution had been so far reduced as to be unable to bear any such evacuations?

Does not the ptyalism, in consequence of that method, rise sometimes to an alarming height, in spite of the most careful attention; so as to call for every means of suppression, by opiates, intestinal and other evacuations? while the poor patient is all the time labouring under such a multiplicity of distresses, that life itself is scarcely a sufficient compensation? especially as, when protracted, it often brings along with it a train of calamities, the concomitants of a broken constitution, that, like so many harpies, imbitter all its comforts?

Upon the whole, then, can any reason less than that of absolute indispensable necessity, justify the continuance of a practice that so often gives rise to such a series of calamities?

It has indeed been objected to the other method, that the saline preparations are apt, in many constitutions, to operate with too great violence upon the stomach and bowels.

But

But that violence may generally be prevented or suppressed either by plentiful dilution, in the manner mentioned of the nitrous salt, or by combining the preparation with such ingredients as are proper for allaying irritation, and at the same time determining its action to some of the principal emunctories of the body. Of this I have had more frequent experience than usually falls to the lot of the regular bred physician; occasioned by my reading public lectures annually for many years in the university on anatomy and chemistry; and at times, for the sake of those who had chosen the medical line, on the theory and practice. And I can truly aver, that I do not recollect my ever being obliged to have recourse to the too frequently injurious method of unction, in any one instance whatever.

That method may be convenient within the walls of an hospital, or when the patient is no otherwise to be regulated than by disabling him from becoming irregular; or finally for those who, totally ignorant of the animal œconomy and the first elements of science, only know that mercury is the antidote, and that if but enough is thrown in to raise the ptyalism up to a certain daily measure, for a certain time, (in which, however, the practitioners are often divided; some making a pint, some a quart, and some more, the standard) a cure will surely be effected. Not foreseeing or regarding the ruinous consequences to the constitution, which might have been prevented; and the
cure

cure as surely effected, by the thousandth part of the antidote administered in another and more judicious manner.

But farther, it is to be remarked that the mercurial salts are not likely to be so violent or so refractory in their operation, as most others of the metallic class; on account of the mercury's being always in a fluid state, or above its point of congelation: and consequently adding nothing more than its own weight to the stimulus occasioned by the particles of the acid, with which it is united. For I do not conceive that, by mere commixture with other substances, the smooth globular particles of simple fluids change their form. It is probably by congelation only that such a change is produced. And then the particles of water, mercury, and all the metals, become spiculated. And as all the other metals are ever in their congealed state, their spicula, when attenuated and sharpened by the acid, cannot fail co-operating with it in such a manner as to render the stimulus both more violent, and more difficult of suppression.

There is an elegant experiment of Dr. Blagden's, mentioned in the Philosophical Transactions, to prove the transition from the globular to the spiculated form, in the particles of metals, by congelation alone. The doctor melted a large mass of metal, and then suddenly cooled or congealed the outer surface of the mass, and poured out the fluid uncongealed part that
was

was in the middle ; and when all was cold, he found the inner hollow surface crowded all over with fine metallic spicula.

Upon the whole, mercury appears to be a simple homogeneous fluid, as insipid and inodorous, and as devoid of any stimulating agency, as the element of water itself. And though it may be occasionally blended with other matters, and seemingly lost ; yet, like water, it probably continues unaltered ; as on mere separation it always re-appears, in the same manner with water, in its own original form.

Viewing then mercury in the light in which it has been here represented, the question arises, what are the qualities to which its specific virtue is to be ascribed ?

If, on a subject involved in so much obscurity, I might hazard a conjecture, I should be inclined to ascribe its virtue to its great specific gravity, and its endless divisibility, operating together. As of all the productions in nature, a substance so eminently endowed with those qualities, and rendered diffusible in the animal fluids, by its union with an acid, appears to be the best calculated for clearing the constitution of all extraneous noxious matters ; provided they are to be eradicated, either by decomposition or expulsion.

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For in consequence of its gravity, the saline compound must circulate with a considerable degree of momentum; and by its divisibility, the mercury must accompany all the particles of the acid, however minutely it is dissolved, into the remotest recesses of the system, and so assist them in the removal of any obstructions that may have been formed in their way.

The mercury therefore is to be considered rather as an auxiliary than a principal; and as merely an assistant in carrying the particles of the acid forward, with an impetus sufficient for preventing their being dissipated, or retarded in the course of the circulation; and for enabling their spicula, like so many wedges, to break through and destroy the texture of the poison, or open a passage for its total extirpation.

But notwithstanding this seeming degradation of the mercury, it must still maintain its pretensions to the rank of a specific; as it is the only substance we are acquainted with, whose properties are accommodated to the purposes I have been describing.

In conformity with the hypothesis I have now ventured to advance, and as a strong confirmation of its truth, we find that the comparative efficacy of the mercurial preparations does not depend on the quantity of mercury, but on that of the acid, in their composition.

Corrosive

Corrosive sublimate, for example, has considerably less mercury in a given quantity of the saline compound, than calomel. But as it has much more of the acid, it is accordingly found to be the more powerful antidote. And it appears from what we experience of the mercurial preparations, in general, to be highly probable that, according to their being more or less charged with the acid, they would be found to prove more or less efficacious; provided, always, the constitution was enabled to bear the stimulus, and but enough of the metal was left in the preparation, to answer the propulsive purposes above-mentioned.

Next to the mercurial preparations, those of antimony are justly entitled to the attention of the physiologist. Not only as being the second great hinge of empiricism; which is ever obtruding them upon the public in a multiplicity of different disguises and pretensions, that, by proper investigation, might easily be exposed, and the whole reduced to a few simple forms: but also on account of their own intrinsic merit. For if we except the specific virtue peculiar to mercury, which may, in the present state of the world, be considered as the necessary instrument for preserving the human species from annihilation, the antimonials ought to stand uppermost in the scale of utility; as their salutary operation extends to a greater variety of complaints, both chronical and acute, than any other metallic composition whatever.

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In this inquiry into the principles of action of the antimonial preparations, the above doctrine will appear to be strongly confirmed by its being circumstantially illustrative of all the particulars of their operation.

For in the first place, whatever substance is known to weaken the union of the metal with an acid, is found to impair the action of the compound; and the calx that is insoluble in the acid of the stomach, is found to have no action at all.

Secondly, As the antimony is always in a state of congelation, and its particles, consequently, spiculated; the action is accordingly more sudden and violent. And as they are but little capable of absorption and circulation, on account of their form, it is chiefly confined to the alimentary canal.

Thirdly, As both parts of the compound stimulate together, the quantity required of either is found to be inconsiderable. This last circumstance is very particularly illustrated by the antimonial pill and cup; as, after they have been used for years, their original weight has hardly been diminished.

After the antimonials, the same mode of inquiry may be extended to the other metallic compositions, with great advantage. But as the nature of this inquiry has been, I hope, sufficiently illustrated, by the examples I have produced from the two principal orders

ders of saline compounds (the neutral and metallic salts), I do not propose to carry it any farther at present. The subject would require fuller elucidation to prevent or obviate the many seemingly plausible objections arising from the operations of other metallic bodies, when united with the different acids. It has been indeed observed by some, that the whole theory on which these queries and conjectures are founded, is in a manner obsolete: but this the author does not perceive, notwithstanding he is not unacquainted with the later improvements in chemical physiology; and as the subject is both curious and important, it surely is not undeserving farther discussion by those who are more enlightened. I now return to the subject of this undertaking, the Cheltenham waters.

As water percolates through the bowels of the earth, it cannot fail being impregnated with those fossil matters it happens to meet with in its course, that are at all soluble or suspendible in it; and therefore it is seldom found in its pure elementary state any where. In some places, however, it is less pure than in others, though while it answers the common purposes of life, and its impurity is not readily discoverable by our senses, the difference is not so much regarded as it deserves; considering that many anomalous complaints must originate from that source, and are no otherwise to be accounted for.

But when the water happens to be impregnated with such ingredients as cannot easily escape our observation

fervation, it then begins to be an object of attention ; and we are induced to apply it to the different ailments for which its most predominant ingredient appears to be adapted.

Of these ingredients the most common are, iron, sulphur, calcareous earth, and a neutral purgative salt. And there is hardly any quarter of the globe, of the same extent, that is more plentifully supplied with the waters of those different denominations, than the island we inhabit.

With regard to the chalybeate, the sulphurous, and calcareous waters, such as those of Bath and Tunbridge, Harrowgate, Bristol, &c. the indication of the complaints for which they are adapted is generally pretty obvious. But that is by no means the case with the purgative waters. They do not point so obviously to the different states of the constitution, and that great variety of disorders, for which the Cheltenham waters have been found to be highly beneficial.

It appeared therefore to be the more necessary to trace out some general principle that might account for the nature and extent of their medicinal operation, and consequently prove a much surer guide to the use of those waters, than all the vague information that could be collected from the farrago of cases, without seeming connection, that is commonly published on these occasions ; and which, as I have re-
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sided at Cheltenham every season since the year 1778, I could have readily produced.

I shall therefore select only a few that I judge to be chiefly proper to illustrate the principle itself, and to shew the extensiveness of its medicinal operation, even in cases, for which one or other of the waters I have mentioned, are commonly recommended. Such, particularly, as those affections of the nervous system, for which the chalybeates either of Bath or Tunbridge are deservedly celebrated, according to the particular state of the complaint; or those of the common integuments, that are often found to yield to the sulphurous waters of Harrowgate, and many other parts of the island.

Their efficacy in nervous complaints is very strongly exemplified by the following account, which I received from the patient himself, the first summer that I came to Cheltenham.

He belonged to the band that performs at the pump-room at Bath, when he had the misfortune to be struck with a palsy on one side, that totally disabled him; and for which all the usual means of relief that the place afforded were repeatedly applied, but without effect. He then was brought to Cheltenham; and after drinking the water for some time, he was able to resume his fiddle, and join the band at the well, where I remember he continued to perform every season, till he was carried off by another disorder.

In this case, we may observe, by the by, that the notion of any alterative assistance from the waters is entirely out of the question.

Other cases also have come under my own inspection, of an incipient palsy happening to appear, by a numbness and feebleness on one side, which was effectually removed by these waters; and many more might have occurred, had the practice of evacuation been sufficiently regarded in paralytic seizures; as, no doubt, recourse would have been had to a fountain where the evacuation could have been continued, without any risque of impairing the constitution farther by it. For it is by evacuation, revulsion, and absorption, that relief is principally to be expected, in such cases; and the stimulating method, without them, is not likely to avail much, in any stage of that disorder.

How far the efficacy of the Cheltenham waters extends in cutaneous cases, will appear from the following narrative.

A physician of my acquaintance had been afflicted for many years with what is commonly called a scorbutic eruption, which gradually increased, and was accompanied with an intolerable itching. The eruption at length ran into large blotches, which began to inflame, crack, and to ooze in different places.

For this most harassing and offensive complaint, he had recourse to metallic and other alteratives, such
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as mercurials, antimonials, diet drinks, &c. with the approbation of the most eminent physicians of his acquaintance in London, but without any other success than that of mitigating the violence of the eruption, only during the course of their operation; and that too at the expence of his health in other respects. For it was at length so much impaired, and his constitution, in general, so shattered by them, that he was obliged to lay them all aside, and his business also, and retire into the country for the preservation of his life. By a continuance in the country for several weeks, released from the fatigue of business, drinking asses milk, living chiefly on a milk diet, taking the decoction of the bark, daily exercise abroad in his carriage, and, as soon as he could bear it, on horseback, he was so far recovered as to be able to return, and to pick up the broken threads of business again. However, as the eruption had never been subdued, but rather began to spread as before, he went the summer following to Weymouth, where, by frequent bathing and constant exercise, it was so far mitigated, and his constitution mended, that he returned once more to his business, for the ensuing winter. But as the spring came on, his old complaint began to spread afresh with more rapidity and virulence than ever. He then tried sulphur baths, and various other means, (the alteratives excepted, as he had suffered too much from them before) but all to no purpose. After this he was totally at a loss, as not knowing what course he should pursue, when a gentleman came from the country to consult him on account of some other complaints;

plaints; and then happened to mention that he had a scorbutic eruption, for which he had had much advice and many medicines, without any lasting relief; and that the only benefit he ever received was from the Cheltenham waters, which he therefore had recourse to every summer; and firmly believed that if his other engagements would permit him to persevere in drinking them on the spot, for a full season or two, they would remove the complaint entirely.

This account coming in the height of my friend's despondency, struck him like an immediate revelation from heaven. He had heard and read of the Cheltenham among other mineral waters; but as they had, by some strange misconduct, sunk into general disuse, he expected nothing from them, till he was roused by an authority upon which he could rely, and therefore was determined to give them a fair trial.

He accordingly set out for Cheltenham the 15th of May, 1778, and after drinking the waters at the fountain, almost daily, for three months, or till near the end of August, he left Cheltenham and all his eruptions behind him; and from that time to the present he has scarcely ever had enough of the complaint, to remind him of his former sufferings.

Innumerable other instances of their salutary effects in cutaneous cases might be produced, even when the eruption had been attended with large ichorous discharges;

discharges ; and after the repeated trial of the Harrowgate waters had entirely failed.

Here again it is to be observed, that the salutary effect of the waters is to be ascribed, solely, to the continued evacuation, by which the ichorous humour was diverted into another channel, while the secreting vessels of the integuments were released, and left to recover their wonted tone. And the same principle will account for their experienced efficacy, in other discharges ; whether proceeding from local ulceration, or weakness in either sex.

As to their salutary effect in disorders that indicate the use of the calcareous waters ; I fear that none is to be expected.

The disorders I particularly mean, are those scrofulous obstructions in the glands of the lymphatic system, which frequently terminate in external or pulmonary abscess or ulceration,

For as they generally proceed from staminal debility (whether hereditary or acquired by diet or certain sedentary occupations) occasioning an imperfect assimilation of the aliment, a languid circulation and secretion through the vessels of that system, the absorbent and strengthening, or warm and stimulating method (according to the situation and different stages of the disorder) appear to be more properly adapted than that of continued evacuation ; especially by the neutral purgatives *.

In

* The truth of this has been confirmed since, by several melancholy

In complaints within the cavity of the abdomen ; such as those arising from foulness of the alimentary canal, obstruction or redundancy in the bilious secretions, enlargement of the spleen or other viscus, in consequence often of fevers, especially intermittents, and therefore commonly called ague cakes ; as all those complaints may be literally said to lie in the way of the waters, no confirmation of their efficacy seems to be required : or if it did, a cloud of witnesses from both Indies, together with those high livers of the times, whose diet is not duly balanced by their exercise, might be produced every season.

In obstructions seated in the parietes of the abdomen, I had remarkable proofs of their efficacy in two middle-aged ladies, who consulted me in the course of my winter's residence at Bath. The complaint was a very large hard swelling that lay across the hypogastric region, and for which calomel and other internal deobstruents, also fomentations, liniments and every means of discussion or resolution, were repeatedly tried, by the direction of another physician, before I was called, without any kind of effect. I therefore attempted nothing ; but advised them to go to Cheltenham. One of them went early in the spring of the year 1781, and the other the year following ; and by drinking the waters, they both got rid intirely of

choly instances.—Alcalescents, chalybeates, sea bathing, frictions, animal diet, with frequent exercise, are the most proper rectifiers in such complaints.

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their complaints, without the help of any other medicine.

For it is to be remarked, in general, among the many excellencies peculiar to these waters, that there is seldom occasion for any medicinal assistance, from the beginning to the end of the course, except where the case is particularly complicated : as the waters themselves are the best preparatives to their own use, as well as that of other waters ; and are, on most occasions, equal to the complaints for which they are indicated.

What is principally wanted as an auxiliary during the course, especially in those vagrant complaints that are usually ascribed to rheumatism, gout or scurvy ; and above all in every species of cutaneous eruption, is frequent immersion in warm water. It is therefore to be hoped that suitable accommodations for that purpose will soon be provided * ; and it is the more necessary, as the waters cannot be drank to so much advantage any where, as at the fountain itself.

For though they and the rest of the neutral purgatives are found, when the salt is plentifully diluted,

* Accommodations for both warm and cold bathing are now provided, equal to any in the kingdom, by Mr. Freeman, who has the management of Mr. Nero's baths in King Street, St. James's Square, which are reckoned to be as complete as any in London, and most frequented by people of the highest fashion.

not to ruffle the constitution so much as other physic administered in a draught of the usual form, (as has been already explained) yet it may justly be supposed that the chalybeate, and aerial acid, which are lost on exportation of the waters, must essentially contribute to the invigoration of the habit, and the improvement of all their other virtues. And those who have experienced the difference may be safely appealed to for the justice of the supposition.

Of this a proof was mentioned to me, a day or two before my return to Bath, in a clergyman who had been accustomed to drink the waters, for several seasons, at his lodgings; but this year went regularly to the well, and acknowledged that he found them not only more pleasant and more enlivening, but also more efficacious in all respects than he had ever experienced before.

I shall now conclude with a few plain directions to be observed during the course of drinking these waters.

In the first place, I would recommend the repairing to the well early in the morning; as the waters are likely to be more strongly impregnated with all their ingredients at that time, than when the day is more advanced.

Secondly, The drinker ought to begin with a quarter, or half a pint of the water, according to the age or strength

strength of the constitution, and in a quarter of an hour, or a little more, to repeat the same quantity. A longer delay would be improper, as the water is not then so likely to operate. If either of the above quantities is found to be insufficient to move the bowels, they ought to be increased the next morning; and so on from day to day, as far as a pint or pint and an half, till they at least operate once in the twenty-four hours. And if the waters are not sufficient of themselves, a little of the Cheltenham salts, from a dram to half an ounce, may be divided among the draughts. Should the salts also fail, half a scruple of Rufus's or the aromatic pill, or the usual known quantity of some liquid purgative, may be taken the night before, and repeated till the bowels become more moveable, as will probably be the case in a few days. And here I would observe, that one daily operation, or two at most, are as much as the generality of cases require, or constitutions can sustain for any continuance. But the course ought to be prolonged accordingly, in order to the water's producing the desired effect.

Thirdly, Should the water be found at first too cold for the stomach, notwithstanding its being divided into different draughts (though that is seldom the case, if drank instantaneously from the pump) a small quantity of warm water, or a tea spoonful of some warm aromatic tincture, may be added to each draught, till the stomach is better reconciled to it.

Fourthly,

Fourthly, The diet ought to be plain, and easy of digestion, and not liable to produce acidity or flatulency. Much of vegetable food or fruit, especially undressed or unripe, are therefore highly improper, as they would be in a course of any other physic.

Fifthly, Daily exercise, and all those amusements that may contribute to divert the mind from every species of solicitude or intense application (as these are known of themselves often to give rise to a variety of chronical complaints) ought to be pursued.

Sixthly, Light suppers, or rather none at all, and early hours for going to rest, are circumstances strictly to be attended to; especially in complaints that generally owe their beginnings to too much indulgence and irregularity.

Seventhly, The use of the warm bath, tempered from 85 to 94 of Fahrenheit's scale, or sometimes higher, according to circumstances, and continuing in it from ten to twenty minutes, once or twice a week, is not only grateful and salutary to most constitutions, but essentially requisite in many of the disorders for which the Cheltenham waters are particularly appropriated.