

A treatise upon gravel and upon gout : in which the sources of each are investigated, and effectual means of preventing, or removing these diseases recommended.

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L O N D O N :
P R I N T E D F O R T . C A D E L L , I N T H E S T R A N D .

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P R E F A C E.

TH E Author of the following
Treatise is aware that it will
appear essentially different from his
late publication on the same subjects.
A more accurate investigation of the
affections, concerning which he had
ventured to deliver his sentiments,
made him acquainted with an error
in his former opinion, and he held

it incumbent upon him to send forth an immediate correction of it.

THE mistake to which he alludes, is in regard to the matter of urinary concretions. This matter was almost universally supposed to be calcareous earth. It has been considered as such, by chemists even of eminence, who pretended to have examined it. The Author, never doubting the truth of their observations, attempted to account for the production of calculi, on principles that were suited to the idea of their being calcareous. He is ready to take blame to himself

self for having placed too much reliance upon authorities to which less confidence was due, and he has endeavoured to make atonement, by the introduction of experiments upon which his conclusions must rest.

THE Author continues to withhold his name from the world, not from the apprehensions of any difficulty in the defence of his opinions, but because he is desirous that they should be considered without any regard to the person from whom they have arisen. He has only to request, that the whole may be weighed with
caution,

caution, and reflected upon with impartiality, before judgment be pronounced.

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A TREA-

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T R E A T I S E

U P O N

G R A V E L, &c.

T H E I N T R O D U C T I O N .

TH E R E are few diseases from which greater sufferings are endured, than from urinary concretions ; yet, notwithstanding their frequency, very little has been known concerning the circumstances which produce them, or the means by which they may be prevented. As a

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proof

proof of this assertion, witness the very painful and dangerous operations that are daily put in practice for the extraction of stones.

THE affection which passes by the name of GOUT, has very much engaged the attention of medical men. It is, on account of the violence of its symptoms, and the numbers that labour under it, a malady of the most serious importance. Physicians have exerted themselves to find out a remedy for it, but their endeavours have not hitherto been crowned with success. Amidst modern discoveries, the improvements in Medicine are not the least considerable; yet it is remarkable, that no material advantage has been gained in the investigation of this Disease. Experience
has

has taught in what manner its violence may be mitigated, but no effectual means of cure have as yet been suggested. The most eminent of the profession have acknowledged themselves unacquainted with the cause of Gout, and for this reason it has emphatically been termed the *OPROBRIUM MEDICORUM*.

AN examination of the various theories that have been formed respecting these diseases, would be tedious and unenterprising. Many of them were plausible, while others have not had even ingenuity to recommend them. They are complaints with which the rich and the luxurious are very frequently afflicted, and the eagerness of such to be relieved, has exposed them to become the dupes of

unprincipled individuals, who levy immense contributions by the sale of their unavailing nostrums. While it is admitted that every other science is to be learnt by study and application alone, an opinion appears to prevail, that the medical art may be obtained upon easier terms, and the highest confidence is placed in the arrogant professions of designing and illiterate Quacks. It is amazing that any man of understanding should venture to commit the management of his dearest concerns, to the blind guidance of such pretenders. Too often the constitution has been sacrificed to the blunders of empirics, and their unhappy employers have lamented their credulity, when the melancholy consequences were irretrievable.

WITHOUT

WITHOUT entering into any minute investigation of the opinions of others, we shall endeavour to state our own sentiments concerning the diseases in question. After enquiring into the cause and progress of each, we shall proceed to consider of the means by which they may be prevented and removed.

PART I.

ON THE

CAUSE AND PROGRESS

OF

GRAVEL.

SECT. I.

On the Matter of Urinary Concretions.

THE concretions generated in the urinary passages are of various sizes and figures. They differ, likewise, from each other, in respect to colour, texture, and specific gravity. A considerable de-

gree of variety is frequently observable in the same concretion, for when cut into they are found of a laminated structure, and the several lamina are sometimes very different in appearance. An infinite number of opinions have been held respecting the matter of them, but it does not appear that many experiments have been made, by which any accurate knowledge of its properties could be obtained. The qualities ascribed to it had their foundation in conjecture merely. It was considered as acid by some, and as alkaline by others. Not unfrequently it was compared to the Tartar which is separated from wines during fermentation, and in treating of it, many authors were used to talk of earth, salts, air, oil, and sulphur, without appearing to have any precise ideas

ideas in regard to the meaning of these terms.

URINARY concretions, from having a considerable resemblance to chalk-stones, were frequently considered as calcareous earth. This opinion was so prevalent, that it has seldom been called in question. It originated from outward appearance, but it was supposed to have received confirmation from experiment, for it was maintained even in the medical theatres,

At length, an investigation of the properties of this matter was entered upon by Mr. Scheele and Sir T. Bergmann, these distinguished chemists, to whom the world is indebted for many important and valuable discoveries, with which science
has

has been enriched. From the result of their experiments it appears, that urinary concretions, however different in colour and texture, are essentially the same, and that they are formed of a peculiar substance, which, on account of some of its properties, they consider as an acid. If they contain any calcareous earth, it is in so small a proportion, that it was entirely overlooked by Mr. Scheele. Bergmann imagined that he discovered a very little of it, not amounting to a hundredth part of the whole mass. It is probable, however, that he was mistaken in this opinion, as the experiment upon which it is grounded, is by no means of a satisfactory nature. At any rate the quantity is too minute to require being taken notice of.

MR.

MR. SCHEELÉ has informed us, that the powdered calculus was dissolved by concentrated vitriolic acid with the assistance of heat; but that the muriatic acid had not the smallest effect upon it, even when boiled with it. These experiments alone afford sufficient proof that it is not made up of calcareous earth. It is a property of that earth to combine with vitriolic acid into an almost insoluble concrete, whereas it unites very readily with muriatic acid, into a compound so easy of solution, as to attract water from the atmosphere.

THE calculus was attacked by concentrated nitrous acid with great violence, and with the assistance of heat it was readily dissolved by the same acid when diluted.

diluted. The acid of sugar, which attracts calcareous earth from every other acid, and unites with it into a substance insoluble in water, did not produce any precipitation when mixed with this solution; neither was it materially affected by alkalis. The compound of the matter of calculi with the diluted nitrous acid, was of a yellow colour. When the saturation was complete, it discovered very little of the smell or taste of the acid, and it had a singular property of communicating red spots to the skin. On evaporating it to dryness, there remained a rose-coloured spongy mass, easily soluble in water, to a large quantity of which it gave a deep red colour.

THE powdered calculus was not in any manner affected by a solution of mild alkalis, either fixed or volatile, but it was entirely dissolved by such as were perfectly caustic. These solutions, likewise, were of a yellow colour, and the calculus was precipitated by every acid, and by fixed air.

THE matter of urinary concretions was dissolved by digestion in lime-water. Four ounces of the latter were required for twelve grains of the former, and the solution, like the alkaline ones, was decomposed by acids.

THE calculus was soluble in boiling water, in the proportion of about eight grains to five ounces, and the greatest part of it was deposited in fine crystals,

as

as the fluid became cold. The solution gave a red colour to paper stained with lacmus.

It appeared adviseable to relate thus much of the experiments of Mr. Scheele, as some of my readers may not have had an opportunity of perusing his ingenious essay. From the whole he concludes, that the matter of urinary concretions is not, as had generally been supposed, calcareous, but a peculiar acid salt, with which is blended a portion of animal gelatinous matter. Its solubility in boiling-water, and the chrystaline form which it afterwards assumed, induced him to consider it as a saline substance. The alteration of colour produced by the solution on lacmus, was the mark of its acidity.

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The observations of Bergmann were nearly to the same purpose.

NOTWITHSTANDING the deference that was due to the opinions of these gentlemen, many doubts have been entertained respecting the propriety of classing this matter among the acids. It does not betray any acidity to the taste. The colour of the syrup of violets is not affected by the solution of it in boiling-water. In its combination with alkalis and lime, there is something that makes against the opinion of its being an acid ; for, unlike to every other acid, it is precipitated from them by fixed air. In this respect, the compounds are analogous to soaps formed by the union of alkalis with oily and mucilaginous substances.

ON the other hand, the circumstance of its communicating a red colour to paper stained with lacmus, was a strong presumptive proof of its acidity. The lacmus is a nicer test than the juice of violets, and discovers more readily the smallest quantity of acid. The insipidity of this matter might be owing to water not being capable of taking up a quantity sufficient for producing any effect upon the tongue, as nothing can be tasted unless applied in a fluid form. The decomposition of its compounds with alkalis and with lime by fixed air, was a point from which no positive deduction could be drawn. That air has been proved to be itself an acid, and by many very eminent chemists, it is termed the aerial acid. It was not, therefore, improbable, that the
 matter

matter of calculi might be an acid, of which the attraction to alkalis and to earths is less powerful than that of the ærial acid to the same substances.

SINCE it came to be known that the calculus is not calcareous, many have been of opinion that it is of a mucilaginous or gelatinous nature. With a view of clearing up the uncertainty in regard to it, I examined with attention its compound with caustic fixed vegetable alkali, and my conclusions were in favour of its being an acid. These substances, when united, did not in taste or in appearance discover the least resemblance to the saponaceous compounds produced by the union of alkalis with the gelatinous parts of animals.

I determined next upon endeavouring to combine this matter with magnesia. It appeared probable, that if it was an acid it would admit, like other acids, of being united with the earth of that name. Having obtained a concretion of a reddish colour, of firm texture, and of great specific gravity, a few grains of it, with an equal quantity of calcined magnesia, after being rubbed together in a glass mortar, were put into a vial with three or four drachms of distilled water; they were made to boil for a few minutes by being suspended over the fire: the whole was then poured upon a filtering paper, and the fluid which immediately passed through was of a yellow colour, like the solution of calculus in caustic alkali. I was satisfied from the appearance of it that

a com-

a combination had taken place. It became turbid as it cooled, and there was deposited an ash-coloured powder, which upon examination proved to be neither magnesia nor calculus, but a compound of the two. This powder was immediately redissolved on making a second application of heat, and the whole became transparent again. To one part of the solution in this state, a drop or two of muriatic acid was added, and the matter of the calculus was precipitated ; a small quantity of caustic alkali was mixed with another part of it, and a deposition of magnesia took place. In the first instance, the muriatic acid united with the magnesia so as to separate the calculus ; in the second, the caustic alkali attached itself

to the matter of the calculus, and caused the magnesia to be precipitated.

THIS last experiment afforded the most perfect satisfaction, in regard to the point which it was intended to elucidate : it established, in the fullest manner, the acidity of the matter of urinary concretions. Caustic alkalis and lime are capable of being combined with the oily, the resinous, and the gelatinous parts of animals ; but magnesia, when thoroughly calcined, is not acted upon by boiling-water, and acids are the only substances with which it can be united into soluble compounds.

THE compound of the calculus with magnesia is dissolved by water in a much larger

larger proportion than the calculus alone. If a little muriatic acid be mixed with a saturated solution while hot, the matter of the calculus separated in the form of a white powder, will be in sufficient quantity to give to the whole the consistence of cream. After standing for some time, the particles of this powder, by getting together, become larger, and subside to the bottom. If an acid be added to a very diluted solution of the compound, and the whole permitted to remain at rest for a few hours, the precipitate appears in fine crystals adhering to the sides of the vial.

I obtained a further confirmation of the acidity of the calculus, by combining it with the pure earth of alum. I have

not made any trial of its effects upon the calces of the metals; but it is probable that, like other acids, it might be united with severals of them.

THIS acid is not a simple element, but appears to be a compound body. When exposed to a certain degree of heat it is decomposed, and it yields nearly the same products as animal matter, leaving a coal convertible by the force of fire into earth. Its compounds with alkalis and with magnesia, when evaporated to dryness, began to emit vapours of volatile alkali in a degree of heat not very considerable.

THE most certain criterion for distinguishing the matter of calculi from every other species of matter, is the change of

colour to which its compound with nitrous acid is liable when applied to the skin, and when exsiccated. The yellow solution does not at first appear to produce any effect upon the surface of the body, but after an hour or two the part that was touched with it looks red, and at last it becomes of a blood red; the alteration takes place without any sense of burning, and the colour admits of being easily washed off. This experiment succeeds best when the nitrous acid is saturated with the calculus; but for the appearance of the red mass after exsiccation, no great nicety in this respect is requisite, as the superfluous acid is carried off by evaporation.

THE acidity of this matter having been demonstrated, it ought hereafter in che-

mical arrangements to have a place among the acids; and, as forming the basis of urinary concretions, it may be termed *the concreting acid*, or *the acid of calculi*.

S E C T. II.

On the State in which this Matter is contained in the Fluids.

MR. Scheele has observed, that the matter of calculi is always present in the body. When a quantity of fresh urine had been made to boil until much diminished by evaporation, he found that there was deposited as it became cold a white powder, which in part adhered to the sides of the glass. This powder appeared to be similar in its properties to the substance of urinary concretions, and he was of opinion that the lateritious sediment

ment of the urine is the same species of matter.

I have discovered an easier process by which the concreting acid may be demonstrated. It may be precipitated from the urine at any time, by the addition of a different acid. If twenty or thirty drops of muriatic acid be mixed with half a pint of clear urine, no immediate decomposition appears to take place, for in general the whole continues transparent; but, after remaining at rest during twenty-four hours, a great number of beautiful crystals, of a reddish brown colour, will be discovered on the inside and at the bottom of the vial. I have repeated this experiment with several other acids, and with the same effect. A deposition

fiction invariably took place of a matter which most frequently appeared in the form of distinct and transparent chrystals, but sometimes in that of a fine powder, by which the urine was rendered turbid, in the same manner as by the common lateritious sediment.

I have collected a considerable quantity of this matter, by filling every morning a bottle holding about a quart with recent urine, into which was agitated a drachm or two of muriatic acid. On the succeeding day, when the crySTALLIZATION was compleated, I caused the fluid to be poured off, with care that none of the chrystals were lost. The bottle was then filled as before, and the process was continued until the inner surface had acquired

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ed a thick crust of the adhering matter. By violent agitation with a few ounces of cold water, a great number of the crystals were detached from the glass and fell to the bottom; the others were separated by means of a feather, and the whole was poured upon a strainer of fine linen, in which, after the water had passed through, there remained about two drachms of a matter in appearance like red sand. This matter, when chemically examined, turned out to be of the nature of urinary concretions. Like the calculus, it was soluble with the assistance of heat in concentrated vitriolic acid. Like the calculus, it united with diluted nitrous acid into a yellow solution, which discovered the characteristic properties of communicating red spots to
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the skin, and of leaving, when evaporated to dryness, a rose-coloured spongy substance. Like the calculus, it was capable of being combined with caustic alkalis both fixed and volatile, with lime, with magnesia, and with the pure earth of alum; from all of which it was precipitated by every other acid. Like the calculus, it was dissolved by being boiled in distilled water, and in like manner it was deposited on cooling. It would have been difficult for the most accurate chemist to distinguish, by the nicest experiments, between the matter of these chrystals and that of a real concretion from the kidneys or bladder. The chrystals are the specific matter of calculi, the pure concreting acid which forms the basis of urinary concretions. For investigating the properties

perties of that acid they are to be preferred to the calculus itself, because it is probable, that to a stone in the body a little of any adventitious matter happening to be contained in the urine may frequently adhere.

CONSIDERING how much the urine has engrossed the attention of medical men, and the numbers of experiments that have been made upon it, it is astonishing that the precipitation of this matter by acids should never have been taken notice of. Perhaps the time * that is requisite before the

* In the urine of some people, the proportion of concreting acid is so considerable as to cause an immediate loss of transparency when any other acid has been added; and, in this case, the precipitate does not appear in the form of chrystals, but most commonly in that of an ash-coloured powder, producing a kind of sediment frequently alluded to in the course of this treatise.

the chryftals make their appearance, has occasioned them to be overlooked. The discovery throws a new light upon a species of matter from which very important effects will be found to arise.

A chemical examination of the blood itself is attended with great difficulty, on account of the gelatinous matter that enters so largely into its composition; but the best investigators have been of opinion, that it is impregnated with saline substances, of the same kind as these contained in the urine. The proportion, however, is not so considerable. The solution of salts in the circulation is diffused through the other constituent parts, the lymph, the serum, and the red particles. The urine is that solution separated by filtration

tion in the kidneys. Upon mixing a few drachms of distilled vinegar with five or six ounces of serum, I have frequently observed, that after a day or two there were deposited some solid particles, which appeared in part to be the concreting acid; but the visciduity of the fluid is extremely unfavourable to the formation of crystals.

It is probable that the precipitation of the concreting acid, when any acid of a different kind has been added to the urine, takes place in consequence of its being separated from some other matter, with which till then it was combined. This matter may be volatile alkali, or lime, as there is in the fluids a quantity of each in conjunction with acids; or it may be
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the earthy substance formed by the union of phosphoric acid with lime, and to which the name of animal earth has commonly been applied. I have succeeded in combining the concreting acid with animal earth obtained from the urine by precipitation with caustic volatile alkali. The process was the same as that by which it was made to unite with magnesia, and the compound is more easy of solution in water than the pure acid.

FOR ascertaining whether the matter with which the concreting acid appears to be combined is lime, animal earth, or volatile alkali, a train of accurate experiments would be requisite, as a table of the general order of elective attractions is not always sufficient for explaining the

action of bodies upon each other when in a compounded state. From the effects of acids upon the urine, it may be presumed that the greatest part of it is naturally united with one or other of the three, but I think that there is besides a small quantity simply dissolved in the fluids. When the urine is left to itself, we do not find any appearance of chrystals as when an acid has been mixed with it, but there takes place a spontaneous separation of a peculiar matter, forming what has been called the cloud. There is much difficulty in collecting this matter in sufficient quantity for making any accurate experiments; but I suspect that it arises from an inconsiderable redundancy of the concreting acid in conjunction with something mucilaginous. When diseases, during
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the continuance of which there was not any vestige of the cloud, have subsided, the separating matter of the urine is frequently in an unusual proportion, and in such cases it appears to consist principally of the concreting acid, of which the chrySTALLIZATION has been prevented by a gelatinous matter that is blended with it. It is probable that the composition is the same as that of the natural cloud, and that the increase in the quantity, is the consequence of a previous accumulation.

WHEN any of the common acids have been added to the urine for the purpose of reproducing a precipitation of the acid of calculi, the matter of the cloud appears sometimes to have united with the chrySTALS: at other times they are entangled

in it and prevented from sinking to the bottom. When, after the urine has become cold, the cloud is separated by filtration before an acid be applied, the chrystals are in general more perfect than if it had remained. If, when the cloud has subsided, the transparent urine be poured off, and an acid mixed with the other part, the precipitate, instead of forming itself into regular chrystals, appears to join with the numerous particles of the cloud, and the whole is rendered turbid by a flaky substance, so very light that a large space at the bottom of the glass will be occupied by a very inconsiderable quantity.

A redundancy of the concreting acid producing any other separation in the
urine.

urine than the common cloud, is to be considered as preternatural. It is frequently met with, however, under particular states of the system, and it is sometimes so great, that a deposition of the particles takes place in the urinary passages, giving occasion to gravel and calculi. We are now to enquire into the sources of this unusual redundancy.

SECT. III.

On a preternatural Redundancy of this Matter, and on the Concretion of it in the Urinary Passages.

AS in the subsequent part of this treatise we shall have frequent occasion to speak of a *preternatural redundancy* of the concreting acid, it is necessary to be explicit in regard to the meaning of that expression. In the last section it appeared probable, that the greatest part of this acid is united either with lime, with animal earth, or with volatile alkali, but that there is besides, a little super-abundance

dance producing the cloud. By a preternatural redundancy, we mean an increase of the superabundant quantity. The term is to be understood as applying, not to the proportion that might be precipitated from a given quantity of urine, but to that already in a separate state, or in the form of an acid.

IN the fluids of the body there are various salts, with the uses of which we are unacquainted. It has not been ascertained, whether they be applied to specific purposes in the œconomy, or be a form under which the animal particles are carried off, when they cease to be of service in the system. The greater proportion of them, however, in the urine, an excrementitious fluid than in the blood itself,

renders it probable that they are excrementitious. Unless we consider them as such, the separation of them from the circulation by the emunctories, must appear an unnecessary waste. In the natural state of an animal there is a balance kept up among the several emunctories. The secretion by particular glands is retarded or promoted by a variety of circumstances, and a diminution of it in one is generally attended with an increase of it in another. Now it may happen, either from an affection of the vessels of the kidneys predisposing to a greater secretion by them, or from a check being given to the secretion by the emunctories in other parts, that a preternatural quantity of the excrementitious matter of the blood shall be carried off with the urine. In such cases,

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instead of the usual cloud from a small superfluity of acid, there would be that kind of sediment by which a considerable redundancy is indicated.

ANOTHER cause of redundancy has already been alluded to. From an universal tendency to contraction in the excretories the acid may be retained in the vessels so as to accumulate, and when at last they are relaxed, it will appear preternaturally redundant in the urine.

IN some cases there may be an actual production in the system of a greater quantity than usual of the concreting acid. The proportions of the various constituent parts of our fluids are different under different circumstances ; they depend
upon

upon the state of the body at the time, and are liable to alter with it. In consequence, therefore, of particular affections, there may be an increased production of this acid. An excess likewise in the quantity of the other acids which have been considered by chemists as entering into the composition of the animal salts, would cause a preternatural redundancy of the concreting acid. Its attraction to alkalis and to earths being the weakest, it would give place to the more powerful ones.

FROM these circumstances occurring separately or together, there will be in the urine a redundancy of concreting acid, shewing itself by a preternatural sediment, and perhaps in certain cases it may be in
a suf-

a sufficient degree for the production of calculi and gravel. These, however, are seldom met with. The phenomena of urinary concretions will be accounted for with less difficulty in the greatest number of instances upon a principle which is now to be considered, the introduction into the vessels of a foreign acid.

If any other acid of which the attraction to alkalis and earths is stronger than that of the concreting acid, should be received from the stomach or intestines into the circulation, it will be secreted by the kidneys, and mingling with the urine, it will produce the same effects upon it as when they are mixed together in a vial. To a separation of the acid from this cause, and a consequent deposition of it

in

in the kidneys and in the bladder, we shall find that gravel and calculi are in general to be ascribed.

KNOWING the nature of the concreting matter, the precipitation of it from the absorption of any other acid, must appear as obvious as any chemical proposition. It will be admitted, that acids may be taken up by the lacteals, as well as many substances which are discovered in the urine soon after they have been received into the stomach ; and if they be in like manner absorbed, a separation of the concreting acid is inevitable. If medical men had entered at a more early period upon a correct examination of the matter of urinary calculi, they could not have remained so long in ignorance of the sources

sources from which they originate. But although they were unacquainted with the nature of these concretions, observation had pointed out the mischievous tendency of acids in the affections which proceed from them; and accordingly acid wines, and acid or acescent vegetables, have usually been enumerated among the most active causes of gravel.

EMINENT physiologists have been unwilling to introduce chemistry into the processes of the animal œconomy. We agree with them, that the natural operations of the system are not to be accounted for on the principles of that science; but the matter of the body is liable to be chemically acted upon by the application of matter from without. The salts in the
fluids

fluids of animals are subject to the same attractions as in any other situation, and they are capable of being decomposed by the introduction of foreign matter. When caustics are applied, we find that the actions even of life are obliged to yield to the irresistible influence of chemical attraction. How much stronger must that influence be upon a matter appearing to be excrementitious, and therefore not vested with the powers of life.

AN acid conveyed into the bladder by the urethra, would cause a precipitation in the urine, and the concreting acid would be found preternaturally redundant. It is evident that the action of an acid brought to the urinary passages by the course of the circulation, must be in
every

every respect similar. The effect is so very obvious that there would be difficulty in suggesting any circumstances by which it could be prevented. In short, all who are not prepared to deny the possibility of acids being absorbed, and afterwards secreted by the kidneys, must give their assent to it.

A separation of the concreting matter may be occasioned by the absorption of an acid that has been received into the stomach, or of an acid generated in the *primæ viæ*. We are in the habit of using acids on many occasions; they are a principal ingredient in the liquors to which we are most partial, and the symptoms of gravel very often attend upon an unlimited indulgence in these liquors. The pro-
duction

duction of acid in the alimentary canal, is a frequent consequence of a weakness in the digestive powers. When the tone of the stomach is deficient, the vegetable part of the diet, instead of being converted into chyle, is permitted to run into the vinous and acetous fermentations. From these proceed flatulency, heartburn, and a variety of unpleasant symptoms frequently attributed to an excess of bile. In consequence of such fermentation, there is generated an acid of the nature of vinegar and ærial acid. The vinegar will be absorbed, and a precipitation of the concreting matter occasioned by it. It may be doubted, whether or not the ærial acid in the form of vapour can be taken up by the lacteals; but by uniting with the aqueous fluids in the stomach

and

and intestines, it may perhaps be conveyed into the circulation.

I suspect that a portion of the animal earth in the fluids is naturally united with ærial acid. When transparent urine in a vial is suspended over a fire, there appears, as the heat increases, a froth upon the surface, and before it has began to boil, or immediately after, the whole is rendered turbid by a white powder, soluble in acids, and agreeing in its other properties with animal earth. It is probable that this alteration must take place in consequence of the acid with which the earth was combined having been expelled; and we conclude that it must have been the ærial acid, because the degree of heat does not appear to have been sufficient for the ex-

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pulsion of the others that have been discovered in the urine. When water, in which magnesia is suspended by means of this acid, is treated in the same manner, the effect is nearly similar. The acid is carried off by evaporation, and the magnesia subsides.

If the proportion of ærial acid can be increased by its passing from the alimentary canal into the circulation, a preternatural redundancy of the concreting acid would be produced by it. When fluids fully saturated with it are received into the stomach, we can conceive that it may be carried along with them in sufficient quantity to cause a considerable precipitation. In the liquors, however, in which it is employed, it is in general accompanied

nied with other acids; and the generation of it in the primæ viæ is very often attended upon by that of acetous acid. For these reasons there is some difficulty in determining, whether or not Gravel can be derived from the introduction into the vessels of ærial acid by itself.

GRAVEL is one of these diseases which have the appearance of being transmitted by parents to their offspring. This circumstance may be advanced as an argument against the opinion of its proceeding from the introduction of acids. If it be hereditary, how can it be considered as arising from a redundancy of acid, when all are exposed to the effects of acids?

THE occasional absorption of a small quantity of acid is not sufficient for producing any considerable alteration in the urine. The precipitation arising from it, when diluted by the great mass of the circulating fluids, will not appear of consequence. For the formation of Gravel, and of calculi, there is requisite an excessive, or an habitual influx, to which a tendency will be found to be hereditary.

IN the first place, the habit of drinking is in some degree hereditary. Propensities to particular passions appear frequently to depend upon peculiarities in the system, and are observed to run in families. We are likewise to remember, that from the influence of example, an inclination to this vice is apt to be acquired by the children

dren of those who have been addicted to it. It is evident then, that the diseases attending upon it, might, without much impropriety, be considered as hereditary.

BUT the acids in wine, or in punch, are not more active in producing Gravel than these generated by fermentation in the stomach; and a tendency to acidity from a weakness in the digestive powers, is in the most pointed degree hereditary. A want of tone in the stomach has always been considered as constitutional, and it is the great hereditary source of urinary concretions.

A constant practice of using acids in quantities, or a perpetual tendency to acidity from fermentation in the primæ viæ,

are seldom unaccompanied by some degree of nephritic affection. Under particular circumstances, however, their influence in producing it is greater than under others. The evacuation of the redundant acid from the system will take place differently in different habits, as the tendency to contraction or relaxation in particular emunctories is different. In one, the greatest part of it will be carried off by the glands of the intestinal canal; in another, by the surface of the body; and in a third, by the kidneys. Supposing then, that there is a given quantity of acid in the circulation, the tendency to Gravel, *cæteris paribus*, will be greater in the last case than in either of the others. There may, in this respect, be a difference between the kidneys themselves,

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or in the same kidney at different periods.

ANOTHER circumstance productive of much variation, is the exercise that is employed. The chrySTALLIZATION of the concreting matter in the urine, is promoted by a state of rest, and therefore the sedentary are peculiarly liable to have nephritic affection. It arises in them from a redundancy of acid that would not produce any uneasiness in a labouring man.

IF Gravel may be derived, in some instances, from the production in the system of a preternatural quantity of the concreting acid unconnected with the absorption of acids, the tendency to it will be much increased when these sources may

happen to be conjoined. For the deposition of this acid in the kidneys and in the bladder, the redundancy must be to such a degree as that the urine shall be insufficient for retaining the whole in solution while in the body. A lesser redundancy, although it may appear as a preternatural sediment when the urine shall have become cold, cannot produce concretions. These then, in whom the proportion of this acid is naturally greatest, will be most liable to suffer from other acids when introduced into the circulation.

IN the urine, during nephritic affection, there is frequently discovered a fabulous matter as soon as it is evacuated, especially when it has been at rest for a considerable time in the bladder. Not

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uncommonly, however, the concreting acid, although detached, is yet in solution, but it is deposited after standing for an hour or two; and very often as a latitious sediment, destroying the transparency of the urine, and sometimes giving to it the colour of a strong decoction of Peruvian bark.

THE urine with a sediment from a preternatural redundancy of the concreting acid, is frequently distinguished by a pellicle on the surface reflecting the rays of light in the same manner as oil when poured upon water. The vessel in which it has stood has the appearance of being lined with a fine membrane, sometimes white, and at other times of a reddish cast. Upon the application of a proper degree

degree of heat, the acid is redissolved, and it is deposited when the urine has become cold a second time, in the same form as before. The tendency of the acid to produce chrystals, must be obviated by its being mechanically blended, or chemically combined with a small portion of some other matter, in regard to the nature of which we cannot be positive, but we have conceived it to be mucilagenous.

It is probable that the chrystallization of the concreting matter in the urinary passages takes place principally during the night, when the urine that has been secreted is free from agitation. If a chrystal should not be discharged soon after it has been formed, it must, by the addition of fresh matter, increase in size; and by
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affording a dead surface for the particles to shoot upon, it will tend very much to forward the future chrySTALLIZATION. After some time it will become too large to be passed along the ureters or the urethra. It is a fortunate circumstance, however, that they are generally carried away with the current of the urine before they have arrived at this magnitude ; as the smallest chrystal remaining in the kidneys or in the bladder must become a nucleus, upon which the redundant acid will accumulate until a stone is produced. The violence done to the passages in the evacuation of Gravel is a trifling evil when compared with the complicated miseries attending upon a confirmed calculus.

THE growth of a stone is not always equally rapid, but will be in proportion to the redundancy of acid, the degree of agitation in the urine, and the length of time that it shall be retained after it has been secreted. The varieties in the colours of the lamina may proceed from any adventitious matter attaching itself to the redundant acid. The texture will be firmest when the chrySTALLIZATION has not been much interrupted by the motion of the body, or by the viscosity of the urine from mucus or any other cause. It may be concluded, that the concreting acid is in the greatest purity in such concretions as have in appearance the nearest resemblance to the red chrySTALS.

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THE shape of a stone will depend upon its situation, and upon the form of the nucleus. A concretion in the kidney will adapt itself to the figure of the pelvis of that gland. When two or three small chrystals have been united together in the bladder so as to form an irregular nucleus, the surface will continue to be irregular, and when cut into, the lamina will be found to run in an uneven direction. The irritation from a concretion of this kind must be greater than from a smooth one.

WE shall conclude our remarks on the cause and progress of urinary concretions, with observing, that the irritability of the urinary passages in some is much greater than in others. The urine of many who
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are not much affected with the symptoms of Gravel, will be found to contain in common a considerable redundancy of the concreting acid. There are instances of calculi even having been endured for a length of time without much uneasiness.

PART II.
ON THE
CAUSE AND PROGRESS
OF
GOUT.

SECT. I.

On the Production of Gout.

A PRECIPITATION of the concreting acid in the fluids is attended with prejudice to other parts of the system, as well as to the urinary passages. As soon as the acid has been detached from the substance with which it was combined, it

it becomes a species of matter to the action of which the body is unaccustomed, and when the redundancy is very considerable, a deposition of the particles will take place in the blood-vessels, so as to give an interruption to the freedom of the circulation. In consequence of this interruption, there frequently arises a peculiar affection of the inflammatory kind, and that affection is GOUT.

THERE is sometimes in the kidneys an appearance which sufficiently evinces the possibility of an obstruction in the vessels from a preternatural redundancy of the concreting acid. A quantity of fabulous matter has been found in the *tubuli uriniferi* within the very substance of these glands : a deposition, therefore, of the
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same kind may take place in the vessels of other parts. If the redundant acid be in such quantity that the fluids are insufficient for keeping the whole of it in solution; the particles must inevitably get into a solid form. An obstruction from this cause is as obvious as any that can take place from spasm, and an obstruction from spasm has been considered as a principal source of disease.

OF the affections attributed to spasm, one of the most considerable is Rheumatism, and the production of Gout may be illustrated by a reference to it. An impediment to the circulation is the proximate cause of each, but the circumstances producing that impediment are different. In the first, it arises from the diminished size

of the vessels themselves : in the second, from the presence of an uncommon matter. In both, however, it has the effect of occasioning an increased impetus of the blood, by which the obstruction is at length overcome, and the circulation restored.

In different parts of the body there is a tendency to admit of obstruction of the one kind more readily than of the other. An obstruction from an unusual contraction in the vessels, will be most apt to take place in parts that have in themselves a principle of motion. It cannot, indeed, be conceived to happen without supposing a power of action. An obstruction, however, from an alteration of the fluids will principally be felt in parts where the
vessels

vessels are naturally small, their size stationary, and the circulation in them least rapid. Accordingly we find, that the muscles and the skin are most frequently affected with rheumatism; the tendons, ligaments, and membranes with Gout.

THE capillary vessels of a muscle are larger than these of tendinous and ligamentous parts. When free from spasm, they are capable, likewise, of a much greater degree of distention, so as to be adapted to the nature of their contents; while, by the inherent power of action in the fibres, the particles of any obstructing matter are propelled.

A tendon, on the other hand, is a passive instrument, of which the vessels are

too fine to admit even the red particles of the blood, and at the same time they are so very tense, that they cannot, without considerable violence, allow of any increase in their dimensions. From their state of indolence, they are without the means of applying any additional force when it may be requisite for maintaining the freedom of the circulation. The redundant acid yet in solution in the thinner fluids, the serum and the water of the blood, may insinuate itself into the vessels of such parts, and ere it can escape from them, a portion of it may have been deposited. The particles already in a solid form being too large to gain admittance, will be arrested upon the surface, where they may accumulate until little calculi are formed.

IN this manner, from a difference between these affections, the greater susceptibility of rheumatism in some parts, and of Gout in others, is easily accounted for. The diseases are distinct in their origin, but there is some degree of affinity in their progress, and in many cases they appear to run into each other. Obstruction from the concreting acid may take place in the substance of a muscle, especially when under a state of spasm. It may be affected, likewise, sympathetically from an obstruction in its tendon; or *vice versa*, a tendon from spasm in the vessels of the muscle to which it belongs. There would then be Gout assuming the appearance of rheumatism, or rheumatism having a resemblance to Gout. The instances in which they are thus blended,

appear frequently to occur. A contraction from cold producing reaction has been considered by men of the first reputation as the essence of rheumatism; but a complaint of a similar kind is very often derived from a redundancy of acid. It is probable that the tendency to rheumatic spasm may be increased by the presence of the redundant acid, and the affection may be rheumatism, although the greater disposition should have arisen from the other circumstance.

A want of freedom in the circulation is so much indicated by several appearances in Gout, that the disease has, by many before this time, been considered as proceeding from obstruction in the vessels of the part affected, and the obstruction

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was frequently attributed to something that was termed Gouty matter. In books of medicine we are perpetually reading of this matter, yet there is not in physic any other expression of which the meaning is less determined. The ideas concerning it were so vague, and the opinions so very different, that of late it has been entirely rejected by the most eminent of the profession. They are unwilling to admit the influence of a matter resting upon supposition merely, for it is contended that no proof has been adduced of its existence; and they have combated the doctrine, by opposing to each other the contradictory sentiments of these who supported it. The objections were undoubtedly of weight, but they are now removed. The concreting acid to which we have ascribed
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the obstruction is not a visionary matter. From requiring a large quantity of water for its solution, and from its tendency to be deposited in a chrystalline form, it is of all others the species of matter best adapted for producing obstruction in the vessels of a living animal. It is an obstructing matter, not springing from hypothesis like many supposed causes of obstruction, but of such a nature as to admit of being demonstrated in the most satisfactory manner.

IF any man be unwilling to give his assent to obstruction from the cause that we have assigned, I would ask him, upon what principle his refusal is grounded. When the redundant acid shall be more than sufficient for the saturation of the fluids,

fluids, by what means can its concreting tendency be counteracted, or in what manner shall it be disposed of until evacuated? Can it be supposed to continue in the circulation without interrupting the course of it? When we consider the indolent condition of many parts, and the extreme minuteness of their vessels, it will appear impossible that a matter of this kind should be received into them without producing obstruction: and if the obstruction be granted, we cannot wonder that it should occasion that peculiar alteration in the actions of the body constituting Gout. In attributing this disease to a redundancy of acid, we have been enabled to establish the operation of its cause upon the system, and I am persuaded that hereafter the production of it will
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be looked upon as less intricate than that of the greatest number of morbid affections.

A confirmation of our theory may be obtained from the practical observations of the medical authors in highest repute. They appear, in general, to have suspected a connection of some kind between Gravel and Gout. The children of nephritic and of gouty parents were observed to inherit sometimes the one, and sometimes the other. Concretions not unlike to these from the urinary passages were often found in the joints, and in other parts of the body, after the paroxysms of Gout. The two diseases were frequently united in the same person, and the same remedies

remedies have been found beneficial in both.

THE supposed causes, likewise, were nearly similar. Gout as well as gravel has been attributed in many cases to an excessive use of acids; and it has been considered as intimately connected with that state of the stomach in which there is an almost perpetual generation of acid. At the same time, however, a variety of circumstances of a different kind have been enumerated as sources of it. If we examine with attention the condition of many in whom Gout makes its appearance, we shall find that these other circumstances have only been productive of it when they have had the previous effect, by impairing the digestive faculties, of

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causing a tendency to the generation of acid in the primæ viæ. Of this nature are infobriety, luxury, indolence, and voluptuousness. The disease frequently attends upon a habit of drinking, on account of the acids conveyed into the body by means of it: but when spirits without acid have been employed, it has not, in general, taken place while the stomach retained its tone. The tendency of different liquors to produce it is not so much in proportion to their strength, as to the quantity of acid in their composition. This observation is warranted by the experience of ages, the liquors in which acid predominates having been invariably considered as peculiarly predisposing to gouty affection. By intoxicating compounds of any kind, when used with too much

much freedom, by a life of luxury, by a state of indolence, and by an inordinate pursuit of pleasures, the powers requisite for the process of digestion are at last brought into disorder, and the vegetable part of the diet is permitted to run into the acetous fermentation. These and other such circumstances, as tending to vitiate the action of the stomach, and of consequence conducing to the formation of acid, may be looked upon as remote causes both of Gout and of Gravel.

AN imperfection in the digestive faculties when connected with the use of acedcent aliment is a most fertile source of these diseases, and Gout for the same reasons

sons as Gravel may be considered as an hereditary affection.

VAN HELMONT, and others, who have been of opinion that Gout proceeded from acidity in the vessels, were unacquainted with the concreting acid, and the consequent precipitation of it from the introduction of any other acid. This peculiar substance is a constituent part of our fluids, concerning which nothing was understood. The proportion of it when greatest is minute, but by a knowledge of its properties it is raised to very high importance in the animal œconomy, and two diseases, of which the production has hitherto been considered as mysterious, are clearly accounted for. It is a species of
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matter, by which the attention of physiologists and of pathologists will in future be engaged in a very peculiar manner.

SECT.

S E C T. II.

*On the State of the Body most favourable
to Gout.*

A Redundancy of the concreting acid, giving occasion to obstructions in particular parts of the body, is in general to be ascribed to the introduction of a foreign acid. It has, however, already been observed, that a redundancy may sometimes arise from other causes, and one of these is the actual production of a preternatural quantity either of this acid, or of the other native acids. The proportions of the saline matters in the circulation, are

are liable to variations from sources with which we are unacquainted; therefore we would not go the length of asserting that Gout is never derived from an inequality in this respect, unconnected with the absorption of acid. But the latter circumstance is so frequently conjoined with this disease, as well as with Gravel, that in by much the greatest number of cases, both may be attributed to it. It is not likely that a redundancy from an increased production of the acids essential to the system, should often be of sufficient permanence for causing obstruction.

WE admitted, likewise, of a redundancy in some instances from a mere accumulation of this matter, when it is prevented from being freely discharged

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by a tendency to contraction in the emunctories. I have doubts whether or not a redundancy from simple accumulation is ever of itself the occasion of Gout, but when at the same time there is an habitual precipitation from an influx of acid, the redundancy becomes greater than under any other circumstances. It continues to increase until the fluids are overloaded, so that a deposition of the particles must inevitably take place. An accumulation, therefore, is extremely conducive to the production of this affection.

WHEN the secretion by the various glands is easy and rapid, there never can be any considerable redundancy, as the acid will be evacuated from the circulation as fast as it is detached. But, on the
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other hand, when there is a disposition to contraction in the secretory vessels throughout the body, the redundancy may become great from a very gradual introduction of acid. The effects from a constant influx of a given quantity of acid, are, for these reasons, very different in different constitutions. In one, the concreting acid, when precipitated, will immediately be got rid of: in another, it will be retained in the vessels until the course of the circulation be interrupted by it. In the first instance, there might be an excessive use of acids, or a frequent generation of acid, without a symptom of Gout; in the second, that disease would be apt to arise although the other circumstances were in a much less degree.

IN Gouty patients there is, in general, a very evident tendency to accumulation in the vessels. They are usually of a costive habit, their urine is in small quantity, and for some time preceding the fit, there is a diminution of the secretion from the surface of the body. The evacuations not being in proportion to the supplies, they are frequently affected with plethoric symptoms. There is an apparent contraction in all the emunctories. A deficiency of secretion, therefore, may be considered as predisposing to Gout. It seldom takes place, except when there has been an accumulation of the redundant acid; and, on this account, it has very often the appearance of alternating with Gravel. When, from the contracted state of the vessels in the kidneys, the

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creting matter is prevented from passing freely with the urine, it accumulates until arthritic symptoms are produced. As soon, however, as a relaxation has taken place, the uneasiness in the joints is succeeded by nephritic affection.

IN warm climates, notwithstanding the practice of consuming great quantities of acid, the inhabitants are not much affected with Gout, because there is always a very profuse evacuation from the surface of the body, and not uncommonly from the intestinal canal. The efficacy of exercise in preventing this disease, is owing in a great measure to its producing an increase of secretion, by which any accumulation of the redundant acid is guarded against.

It is evident then, that the redundancy of acid, and the obstruction arising from it, must depend very much upon the state of the emunctories. But supposing that there should be a given redundancy, and a certain degree of obstruction, the influence of these in producing Gout, will not always be the same. In Mr. Hunter's most excellent Treatise upon the Venereal Disease, a principle of great importance in the animal œconomy is clearly established, of diseased actions being incompatible with each other. The specific causes of disease produce their specific effects, with the greatest regularity, upon these in whom there was no previous tendency to any one disease; for in peculiar habits, in which there is a propensity natural or acquired to go into peculiar

cular modes of action, every cause of disease will frequently give occasion to that particular affection to which the system was of itself inclined. Diseased actions of a different kind being incompatible, a prevailing disposition to any other disease will prove a hindrance to the taking place of Gout, and the redundant acid, when accumulated, may have the effect of aggravating merely some habitual disorder.

THIS very extensive principle will assist in accounting for the greater or less influence of acids under particular ages, climates, and situations, because to the varieties of these, there are annexed natural propensities in the system to peculiar affections. The action, for instance,

of Gout, and that of an ague, or of a dysentery, could not exist together in the body, but that one to which the disposition happened to be least powerful must yield to the other.

ALTHOUGH Gout and Gravel are both derived from a redundancy of acid, it does not follow that they ought always to go together ; but, on the contrary, from the circumstances pointed out, it is clear, that one or both may be absent, even when the redundancy is considerable. Accordingly we find, that in many instances Gout makes its appearance without being attended upon by Gravel ; and still more frequently Gravel without any symptoms of Gout. They spring from the same source, but from a difference in
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the parts affected, the means by which their production is promoted or obviated are in some respects different. For the proof of this remark, we may recur to the observation so lately made, of an easy secretion by the kidneys, while it predisposes to the formation of urinary concretions, tending to prevent Gout by removing the redundant acid as fast as it is detached; or, *vice versa*, of a deficiency in the evacuation by these glands being favourable to obstruction, as causing the acid to be retained.

It has, in general, been remarked that the most robust are peculiarly liable to be affected with Gout. It might be expected that strength in other parts would be accompanied with a proportionate vigour in the digestive powers.

powers. But this does not always appear to be the case; for, on the contrary, men of robust habits are very often subject to disorder in the stomach. In these of large bodies and of great apparent strength, there is, not uncommonly, a natural tendency to indigestion. It is, likewise, to be considered, that such men, from entertaining too high an opinion of their own constitution, are peculiarly apt to fall into the various irregularities so prejudicial to the tone of the stomach. From this circumstance, the great sources of Gout, an excessive use of acids and acidity from fermentation in the primæ viæ, are frequently conjoined. When, at the same time, there is a deficiency of secretion, the disease must infallibly be produced.

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ACIDS introduced into the circulation, and secreted by the kidneys, may produce Gravel at any time. Urinary concretions are frequently met with at a very early period, especially in the children of the poor, whose stomachs have been loaded with sour fruits and aced vegetables. Gout seldom takes place till after the prime of life. In youth there is a freedom of secretion, and a natural disposition to the use of exercise, by which any accumulation of the redundant acid is prevented.

FROM the customary moderation of women in eating and drinking, they come, in a much less degree than men, within the influence of the circumstances from which Gout is derived. In the female habit,

habit, likewise, there is a greater tendency to relaxation in the emunctories, so that any redundant acid will be discharged without accumulating, but if it passes off by the kidneys, their sedentary manner of living is extremely favourable to the production of Gravel.

SECT.

S E C T. III.

On a Paroxysm of Gout.

WHEN the freedom of the circulation is interrupted by the redundant acid, the taking place of the consequent inflammatory affection may be forwarded by a variety of circumstances. The injury to the system from the obstruction will be augmented by every thing producing an increase of action, or by an uncommon exertion of any kind. It frequently happens, that a fit of the Gout is suddenly brought on by unusual repletion, by the use of stimulants, or by a greater

greater degree of exercise than the body has been accustomed to. These, and other such circumstances, have been termed the occasional causes of this disease.

GOUT, in like manner as other inflammatory disorders, is most apt to occur in the vernal and autumnal seasons. The heart and the principal arteries, stimulated by the increase of heat in the spring, propel the blood with unusual force ; but the extreme vessels having acquired a habit of contraction, are with difficulty distended, so that resistance is given, and plethora takes place. By a continuance of warm weather relaxation upon the surface is at last produced, and the plethoric symptoms disappear, until the external

nal circulation is checked by the returning cold in autumn. The blood is then thrown in greater quantity upon the interior parts so as to cause a reaction, giving a tendency to inflammatory complaints. Thus the heat in the spring, and the cold in the autumn, are attended with consequences in some respects similar, and Gout is most frequent at these seasons. The obstruction may continue longer at any other time of the year without producing inflammation.

THE circumstances already mentioned, as predisposing the tendons and ligaments to admit of obstruction from the redundant acid, are strongest in the lower extremities. The feet being farthest removed from the centre of the circulation, the
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force of the heart must be in a great measure spent before the blood can get to so great a distance, and the perpendicular situation of the body is unfavourable to its return by the veins. The fluids, therefore, in them are nearer to a state of stagnation than in other parts, and there is less of that power by which any thing tending to produce disease is resisted and counteracted. For these very obvious reasons, the tendons and ligaments about the toes and the metatarsal bones, are more liable to be affected with Gout than parts of the same kind in other situations.

A paroxysm of Gout is usually preceded for some weeks by flatulency, want of appetite, and other symptoms of disorder

disorder in the stomach. During the continuance of these, the acetous fermentation is taking place in the primæ viæ, so that there is a constant influx of acid from the intestinal canal. The concreting acid is detached by this foreign acid, and if at the same time there be a deficiency of secretion, it accumulates in the fluids. When the redundancy has got to a certain pitch, obstruction from a deposition of the particles commences, and it is indicated by a variety of symptoms, such as an unusual languor, coldness in the extremities, an uneasy sensation frequently compared to that of pricking in the feet and legs, with numbness and spasmodic affections of the muscles. Under these circumstances, the gouty inflammation

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will sometimes be excited by very slight stimuli, and it arises in the ligaments about the feet. If the appetite should return in consequence of any abatement of the disorder in the stomach, the greater quantity of food that is employed, not uncommonly, gives occasion to an immediate paroxysm. From this circumstance probably, an observation frequently made by medical authors, of the appetite having been unusually great on the day preceding the fit, may have originated.

WHEN Gout has been derived from acids received into the stomach, the paroxysm sometimes makes its appearance without any considerable warning from disorder in the digestive faculties. It is preceded, however, by the symptoms which point out

out an impediment to the circulation, and in consequence of these the stomach may be sympathetically affected.

It is not our intention to enter minutely into the description of a paroxysm, or into the progress of Gout. For information in regard to these, application may be made to the Treatise of Dr. Sydenham, from which the accounts of many succeeding authors have been extracted. We shall touch upon the leading features only of this peculiar affection.

THE circumstance constituting the disease, is an inflammation in parts of which the functions have been interrupted by the redundant acid; and it is most frequently excited in the tendons and li-

gaments about the feet, because in them the interruption is greatest. There arises from it a very acute pain, and the increase of action is communicated, not only to the vessels of the surrounding parts producing swelling and redness, but in a greater or less degree to the heart, and to the whole arterial system. By means of the augmented impetus of the blood the obstruction is in a short time overcome, and the tendency to contraction in the various emunctories removed. The secretion from the surface of the body becomes very often profuse, and the redundant acid, which till then had been prevented from passing off by the kidneys, appears in the urine as a lateritious sediment. When the relaxation has continued for some days, the whole of the accumulated acid

acid is discharged, the increased action subsides, and every thing returns to its natural condition. The fit is then said to be over.

When a regular paroxysm has had its course, the patient, for the most part, is left in more perfect health than he had enjoyed for some time before. This effect has led many to consider Gout as having a peculiar property of restoring the vigour of the system. That, however, was an unfair conclusion. Of itself it causes a diminution of strength; but by removing every morbid affection, it puts the system into a disposition for acquiring vigour. From the incompatibility of diseased actions with each other, it proves a very universal remedy for
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chronic complaints that were the source of permanent debility, and the temporary weakness occasioned by it is soon recovered. Upon the same principle a fever might be said to have the property of giving strength.

THE tendency to disorder in the stomach, and a multitude of ailments proceeding from it, are corrected by a paroxysm of Gout. We cannot sufficiently admire the excellent contrivance of nature, by which many diseases become the instruments of removing the circumstances that produced them. The digestion is often perfect for some time after, and the secretions in their natural state. At length, however, a proneness to acidity, with nausea, want of appetite, and flatulency, begin

begin to be perceived ; the concreting acid accumulates again, and much inconvenience is endured from a variety of irregular symptoms. Under these circumstances, it has frequently been thought adviseable to employ stimulants for the purpose of exciting the inflammation, that the other complaints might be relieved by it.

THE inflammation of Gout has a disposition to confine itself to the part where it has commenced, as an action so acute cannot well take place in many parts at the same time : if it be resisted, however, by any circumstance, it will in general be produced in some other situation. When it has been counteracted in the lower extremities, it frequently discovers

itself in the joints of the fingers, in the elbow, in the coats of the stomach and intestines, in the viscera of the thorax, in the integuments of the head, in the brain or its membranes; and as often as it is checked in one part it makes its appearance in another. These sudden removals have been accounted for, by supposing that the matter which had been deposited was taken back into the circulation and conveyed to the part next affected. But an instantaneous translation of this kind cannot readily be assented to, nor would much assistance be received from it. We are to consider, that there must be actual obstruction from the redundant acid in many different parts, although not equally great in all; a translation, therefore, of matter is unnecessary for explaining the

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the changes from place to place. If the disease be counteracted in these parts which are most inclined to fall into it, the occasional cause will operate so as to excite it in a situation where the original tendency was less considerable. In like manner in rheumatism, removals are nearly as frequent, although any translocation of matter has seldom been suspected. This disease, when resisted in one part very often arises in some other, to which a previous disposition to spasm had been communicated.

IN Gout, the inflammation is always most acute when within narrow compass; and when very acute, its term of duration is shortest, and its operation upon the system most complete. When it subsists

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in some degree, in many situations, the symptoms are less violent, but the progress more tedious, and the conclusion less satisfactory. For the perfection of a regular paroxysm, a certain degree of power in the system is requisite. In constitutions very much debilitated, the affection is not confined to the feet, but it appears in other parts of the body, and hangs about the patient, producing chronic weakness. The disorder in the stomach continues without much alleviation, the redundancy of acid remains undiminished, and the functions of the whole system are impaired. During a regular fit the obstructing matter appears to be removed when the influx of acid has been stopped, the secretories relaxed, and the redundant acid already in the circulation

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discharged; for the tendons and ligaments recover their former flexibility. But, in the other case, the deposition goes on until they are rendered rigid and incapable of motion: or, the concreting matter, accumulating upon their surfaces with a mixture perhaps of coagulable lymph, produces calculi. The condition of the unhappy patient is now truly deplorable; as the state of rest to which he is condemned conduces likewise to the chrySTALLIZATION of the redundant acid in the urinary passages. Nephritic affection becomes more than usually troublesome, and he has difficulty in determining, whether his sufferings are greatest from Gravel or from Gout. Such is the melancholy termination to which this disease

ease is perpetually inclining, as by frequent attacks a state of debility is at last brought on in habits originally the most robust.

P A R T I I I .

O N T H E

P R E V E N T I O N A N D C U R E

O F

G R A V E L A N D O F G O U T .

S E C T . I .

*That these Diseases may be prevented and
cured by guarding against a Redundanc
of Acid.*

FROM an uncertainty in regard to the
causes of Gravel and of Gout, the en-
deavours at prevention have seldom been
suc-

successful, and in some cases prejudicial. When any doubt is entertained as to the source of a disease, the principal reliance ought to be placed in experience and observation. The most sensible of the profession, acting under the guidance of these, have cautioned their nephritic and gouty patients against acids and acedcent vegetables. The practice, however, of others less discerning, has been accommodated to opinions conceived from very inaccurate experiments, and their regulations have been pointed against a supposed alkalescency in the fluids. For the prevention of these diseases, and for the solution even of calculi, a regimen consisting almost entirely of acids and of substances tending strongly to the acetous fermentation, was recommended by Dr. Lobb.

Lobb. Acidity with him was the test of a solvent.

THE circumstances producing Gravel and Gout, had for so long a time eluded every effort of ingenuity that was made to investigate them, that many have despaired of their being discovered. In attributing these affections, however, to a redundancy of acid, the phenomena of each are so consonant with reasoning deduced from chemical facts, that we may consider their remote causes as clearly established, and in guarding against these the system of prevention must consist. It is indeed the only method of preventing diseases that can be pursued with advantage.

IN treating of the cure a distinction is to be made between the management during the fits, and the means of securing against future attacks. Having nothing new to offer upon the first of these objects, it is unnecessary to enter into it at any length, but an idea of the general practice may be communicated in a few words.

THE nature of the symptoms arising from a concretion, or from Gravel in the urinary passages, are easily comprehended. The violence of them is often so great, that the most powerful means of obtaining temporary relief become necessary, and the remedies of greatest efficacy, are the warm bath, occasional bleeding, opiates, glysters, gentle laxatives, and the medicines

cines tending to diminish pain, and to take off irritation. Aqueous fluids, with which it has been customary to join gummy and mucilagenous substances, have been found of service. They have the effect of increasing the quantity of urine, so that a portion of the redundant acid, which otherwise would have been deposited, is retained in solution. By such methods the urgency of the symptoms may be alleviated ; but for procuring permanent relief, the same regulations are to be followed as for the prevention of the disease.

IF the inflammation of Gout be counteracted in any part by artificial means, there is danger of its being transferred to some other part of greater consequence to

the system. When it has taken place in the feet, or in any situation where it cannot be attended with alarming symptoms, every circumstance by which it might be checked must be cautiously avoided : but if an attack be made upon an organ, of which the functions are essential to life, it becomes necessary to employ methods of moderating its violence, and of fixing it, if possible, in some part of less general importance. Under these intentions is comprehended nearly the whole treatment during a paroxysm, and the means of carrying them into effect, are so generally understood that it is unnecessary to go into the detail of them.

THE danger of counteracting a paroxysm by internal remedies or external applications,

plications, is rendered very evident by a knowledge of the cause. If the inflammation be resisted, more serious consequences may be apprehended. But when a paroxysm has produced its full effect upon the system, we may guard against future returns, by removing every circumstance from which they might be derived. In this manner the disease may be radically cured without any risk being incurred.

As a preternatural redundancy of the concreting acid giving occasion to Gravel and Gout, appears in most cases to have arisen from the introduction of foreign acids, the means of prevention must be pointed against the latter circumstance,

and they may come under three divisions,
viz.

1st, Abstinence from acids.

2dly, The prevention of acidity from
fermentation.

3dly, The destruction of the acid.

S E C T. II.

On Abstinence from Acids.

THE acids produced by fermentation, and the native acid of fruits and vegetables, are more frequently conveyed into the stomach than any others. They are the acids which we are apt to use in greatest quantity, because the compositions in which they abound are very grateful to the palate.

IN liquors that have undergone the vinous fermentation, there is, in general, more or less of the acid of tartar and of

ærial acid. In another part of this treatise we have expressed a doubt whether or not the latter can be conveyed into the circulation in sufficient quantity for producing any considerable effect, but the wines in which the proportion of the former is greatest, have been found exceedingly conducive to the taking place of arthritic and nephritic complaints. A total abstinence from wine is scarcely to be expected, as a man mingling with society must be at perpetual variance with his inclinations if he refrains from it entirely. There cannot, however, be much hardship in suffering some restriction in the choice of wines, especially as these which are most proper, will not be found to be the least agreeable.

THE liquors in which ærial acid predominates are easily distinguished by their peculiar briskness, but there is some difficulty in ascertaining the quantity of tartar. It may be observed, however, as a pretty general rule, that these in which the proportion of spirit is greatest, appear to contain least of it. Being insoluble in spirit it is deposited in the cask.

IN considering of wines, their age is of great importance to be attended to. In new wines, there is commonly a quantity of the native acid of the grape, which, after a length of time, is destroyed by fermentation. The small bodied wines require, in general, to be consumed before the fermentation is compleated, and on this account, likewise, they are liable

to the greatest objections. Any fermented liquor in which acidity is sensible to the taste must be pernicious. The best wines are Madeira, Sherry, and Port. These, when arrived at a proper age, may be used in moderation ; but Claret, Champagne, and other small wines in which the proportion of acid is very considerable, must be entirely rejected. They never can be indulged in with impunity. It has always been remarked, that the proportion of calculous patients in Paris is infinitely greater than in London. Gout, likewise, or a rheumatic affection having a resemblance to it, is said to be very common in many of the French provinces, where wines of a most dangerous tendency are consumed.

THE fermented juice of apples is exceedingly conducive to the production of arthritic and nephritic affection. Perry, likewise, and hard ales are very prejudicial. They must be altogether prohibited.

NEUMANN, whose experiments are, in general, sufficiently accurate, has remarked, that there is a portion of acid in malt liquors of every kind. In many the quantity is not very considerable, yet when Gout or Gravel are apprehended, it will be better to abstain from them entirely. In that state of the stomach which frequently accompanies these diseases, they are extremely apt to be converted into an acid, by running into fermentation. This is an objection to which the weaker

weaker wines and small fermented liquors of every description are liable.

PURE water, or toast and water, may be substituted for table beer. Water with just enough of rum or brandy to give a flavour to it, might be allowed of, but for the fear that the proportions of these might be increased by degrees until the stomach would be injured by them. The habit of employing spirits is apt to steal upon men by imperceptible advances, until it gets so deeply rooted that they have it not in their power to relinquish it. Infusions of herbs, or of woods containing aromatic oils, are grateful to the stomach, and may be drank with propriety at meal times.

By a continuance of fermentation, vinous liquors are converted into vinegar. This acid is seldom used in such quantity as to produce of itself a preternatural redundancy of the concreting acid; but when there is already a redundancy, a small portion even of any acid must be detrimental; vinegar, therefore, should be rejected.

IN the juices of many fruits, and of certain vegetable, there is a quantity of native vegetable acid. It is generally believed, that this substance is capable of undergoing the process of digestion, by which it will be deprived of its acidity. Fruits are scattered so liberally upon the earth, and the passion for them so natural
to

to man, that we cannot doubt of their having been intended as a part of his food. In the common state of the body they afford nourishment, and appear to be conducive to health; but if the digestive powers be deficient, they are inadmissible on account of their tendency to fermentation. In such cases they occasion flatulency, and become sour in the *primæ viæ*.

A very diluted solution of any substance is most apt to run into the common fermentations in the stomach. The objections to fruits may be greatly diminished by joining sugar with them, but a mixture of their juices with water can seldom be endured by any stomach. When
the

the solution of sugar is concentrated they are least offensive.

THE greatest quantities of native vegetable acid are apt to be employed in punch, and the diseases of which we are treating frequently proceed from it when used under this form. Mixtures of spirits and water are less injurious than when four fruits are conjoined with them.

WE have now touched upon the several methods in which acids are habitually employed. It may admit of dispute, whether or not any of this class of substances, the native vegetable acid excepted,

cepted, were intended to be conveyed into the stomach, as the effects arising from them are frequently of the most serious nature.

WHEN Gout and Gravel have originated from an excessive use of acids, unconnected with disorder in the stomach, a cure may be effected by strict attention to the regulations laid down. When the use of acid has co-operated with the generation of acid in producing these diseases, considerable advantage will be received from a diminution of the cause. A moderate quantity of proper wine having been allowed, there cannot be any hardship or inconvenience in abstaining from acids under every other form ;

form ; any man, therefore, who is deficient in this part of the system, must forfeit his claim to success.

SECT.

S E C T. III.

On the Prevention of Acidity from Fermentation.

TH E process by which the food is converted into chyle, has sometimes been compared to these fermentations which commonly take place in the matter of animals and vegetables when deprived of life ; and endeavours have been made to produce a fluid similar to chyle, by exposing the usual articles of diet to the influence of warmth and moisture. It does not appear, however, that such experiments have ever been successful.

ful. The action of a living stomach is essentially requisite for digestion ; and when that action is compleat, putrefaction and acidity are resisted, even in the substances that have the strongest tendency to these changes.

THE production of acid in the elementary canal, must be considered as a mark of imperfection in the digestive powers. It proceeds from a fermentation of the same nature as that by which vegetable matter is converted into vinegar ; and a method of preventing it, that will naturally occur to every one, is to take care that nothing inclining to the acetous fermentation be received into the stomach.

THE matter of animals is incapable of becoming acid; therefore it appears to be best adapted for the prevention of diseases that spring from a redundancy of acid. Animal substances, however, although not susceptible of the acetous fermentation, have been found to increase the tendency of vegetable matter to acidity; and from this cause it has happened, that a disposition to the formation of acid in the primæ viæ, has sometimes been corrected by abstinence from animal food. If a mixture of animal and vegetable matter be employed at a time when the powers of the stomach are deficient, acidity will frequently take place when the vegetable portion by itself would have been digested. This is a fact which has

been

been attended to by very accurate observers.

MILK, and the farinaceous matter in the seeds of the *gramina* are more easily digested than any other substances by which equal nourishment is conveyed. On this account, they are peculiarly applicable to nephritic and gouty patients, in whom the tendency to disorder in the stomach is very often excessive. The best effects might be expected from these as the principal articles of diet, when there is a great degree of constitutional weakness, or when from long habits of irregularity, the digestive powers have been very much impaired. They may be used in conjunction, and under different forms, so as to counterfeit variety. The tendency

of milk to acidity, from which inconvenience would arise, will be corrected by the addition of solid matter, such as bread, rice, or oatmeal : and when it is employed by itself, the same intention may frequently be answered, by mixing with it two or three tea spoonfuls of rum or brandy.

It is not to be expected that many should have resolution to abide by a regimen from which the greatest luxuries of the table are excluded : nor does it appear necessary to enjoin it in every case. When the digestive faculties are not so entirely exhausted, the diet may consist of animal food, with the farinaceous feeds. The looser vegetables must be rejected, on account

account of their disposition to produce flatulency.

Of animal substances, these distinguished by a high flavour are most disagreeable to the stomach. Rich savoury dishes cannot be endured in that state of the digestive powers which is usually met with in Gravel and in Gout. They never fail to do mischief, by increasing the disorder, from which the tendency to acidity arises. In the same manner the acetous fermentation is forwarded by fat meats, by oily substances, and by butter, altho' they themselves are incapable of entering into it. It may be observed as a pretty general rule, that if two substances, of which the one only is suited to the action of the stomach, be employed as food,

the digestive will be interrupted by the presence of the other, for which the powers are inadequate, and the common fermentations will arise in both. From this circumstance it happens, that acidity in the vegetable part of the diet is frequently promoted by articles not of themselves acedcent; and such articles are to be avoided, as being exceedingly prejudicial. The lean of beef, mutton, or veal, and any kind of fish, or fowl, that is light and easy of digestion, may be used in moderation.

THE effects of many substances upon different stomachs, are so various that it is not an easy matter to give particular directions concerning diet. In a point of this kind, experience is the surest guide, and

and every man must be regulated by his own feelings. - Whatever has been found to disagree, should not afterwards be ventured upon ; whereas most things which are digested without producing disorder may be employed without any fear of ill consequences.

THE people of this country are so much attached to tea at breakfast, that there is difficulty in substituting for it any thing that would afford equal satisfaction. It is most apt to become prejudicial, on account of the disposition which it has, in common with every diluted solution of sugar, to run into the acetous fermentation. This objection may be diminished, by joining with it a considerable quantity of biscuit unfermented, or bread, of which

the tendency to fermentation has been corrected by toasting it. The greater the proportion of solid matter, there will be less fear of acidity. If, however, notwithstanding these precautions, the symptoms of flatulency be perceived in an hour or two after it has been drank, the use of it must be abstained from, and something more substantial may be substituted in the room of it. Eggs, and many articles frequently put down to supper, might be introduced with less offence in the morning. A heavy supper prevents sound sleep, upon which the tone of the stomach, and of the whole body, so much depends. Lobsters, ducks, and other rich foods, are peculiarly improper at this meal; but milk, with bread or rice, may be employed. Sago, likewise, and other
fari-

farinaceous solutions, are very well suited for supper:

At dinner, care must be taken to keep the appetite within bounds. The use of a greater quantity of food than is requisite for the nourishment of the body, conduces very much to disorder and debility. It has frequently been recommended to eat but of one substance; and the regulation is of service, because a variety of articles, furnished with all the allurements of taste, lead in general to excess. When there is a tendency to disorder in the primæ viæ, circumspection is requisite, as much in regard to the quantity as to the quality of the food. The proper quantity cannot be defined by weight or by

mea-

measure, but must be regulated by the circumstances of each particular case.

It is necessary, likewise, to give cautions against fasting for too long a time. A medium is to be kept up between emptiness and repletion, as the consequences of each are alike pernicious. If the interval from breakfast to dinner be protracted beyond a moderate period, something solid should be employed about two or three o'clock.

A conformity to rule in regard to eating and drinking, is essentially requisite for giving success to the measures that are pursued. By proper attention to diet, a disposition to acidity may frequently be corrected, but negligence in this respect, will

will render every other remedy of no avail.

THE proportion of concreting acid produced in the body, appearing, as has been already observed, to be different under different circumstances, it is probable that alterations in the system, proceeding from alterations in the diet, may be attended with an increase or a diminution of it. At present, we are speaking not of the quantity merely in a redundant state, but of the whole that may be precipitated by other acids ; and we are uncertain whether it is greatest in the fluids of a man following a vegetable regimen, or of one subsisting upon animal food. Observation alone can ascertain the species of aliment most conducive to the production

duction of this acid. As yet, knowing nothing of the means by which it is generated, we have only regarded the precipitation of it.

WHEN the digestive faculties are constitutionally bad, or have been impaired by irregularities, there are various methods by which they may be brought into better condition. A man in the full and perfect enjoyment of these faculties, is not obliged to observe any nicety in regard to the articles of his diet, but when they happen to be deficient, there is often difficulty in finding any thing that will suit. The choice of food is not always in our own power; as the occurrences of life may reduce us to the necessity of occasionally employing substances most adverse

verse to our constitutions, and repugnant to our wishes. If the digestive powers can be increased, the mischief from any that is improper, when used through necessity or inattention, will be lessened. It is of the utmost consequence to get a habit of indigestion corrected, for it is apt to produce in the other functions a general derangement, which becomes a cause of its continuance after the circumstances that gave occasion to it have ceased to operate.

There is not any thing of greater efficacy in restoring the digestive faculties, than proper exercise. The action of the stomach is intimately connected with the demand that is made by the system for a supply of nourishment. Exercise, by occasioning

caſioning a waſte of fluids, increaſes the demand, and of conſequence the powers by which digeſtion is carried on, are exerted for the purpoſe of anſwering it; while, at the ſame time, the functions of every part are kept in order. The labouring claſſes of people are ſecured by their occupations from a loſs of tone in the ſtomach. If much exerciſe be employed, a conſiderable latitude may be allowed in regard to the quantity of food; but the ſedentary ought always to put ſome reſtraint upon their appetites. They cannot with impunity indulge them to their full extent.

THE action of the ſtomach appears to be very much under the influence of the mind. Anxiety, grief, rage, and other
violent

violent passions, have frequently the effect of causing an immediate suspension of the digestive process. Cheerfulness and good humour contribute exceedingly to the preservation of health; but the peevish and the melancholy are peculiarly liable to have disorder in the alimentary canal. For the prevention and removal of the diseases under consideration, it will be of much importance to avoid weighty cares, and every thing that might agitate and disturb. It is to be lamented, however, that an irritability of temper, and a gloominess of mind, are with difficulty got the better of. When much indulged, the endeavours at the restoration of the digestive powers will seldom prove successful.

When

WHEN an improper fermentation has arisen in the primæ viæ, it is apt to be communicated to other substances, mingling with the matter already in a fermenting state. The continuance of it from this cause may be obviated by the occasional use of emetics. Ipecacuanha, exhibited in doses sufficient for evacuating the offending matter, has frequently been of service. Vomiting, if judiciously employed, may be rendered of considerable advantage.

A tendency to disorder in the stomach is very often accompanied with an habitual costiveness; but at intervals the acid becomes a purgative, and occasions looseness with griping. The last of these states is the least prejudicial. It is much better
that

that a part of it should be carried off in this way, than that the whole should be received into the circulation. For the removal of costiveness, recourse must be had to aloes, sulphur, senna, or any other purgative that may appear better suited to the situation of the patient. A looseness, when inconvenience arises from it, may be restrained by absorbents, with rhubarb and mild restringents.

A variety of medicines have been employed for the purpose of increasing the tone of the stomach. The substances most frequently recommended with this intention, are certain vegetables distinguished by a bitter juice. Camomile, gentian, columbo-root, orange-peel, and many others, are of considerable efficacy.

By correcting a tendency to the formation of acid, they have often proved of service in arthritic and nephritic affection. It is generally admitted, however, that such medicines, although *occasionally* useful, ought not to be persevered in for any great length of time without intermission. In some cases very pernicious effects have appeared to proceed from a long-continued exhibition of them in large doses, and diseases more alarming than these against which they were levelled have been produced.

THE greatest number of bitters act more or less as astringents upon the system, and it is perhaps from this circumstance in a great measure that the danger of using them for a constancy arises in particular habits.

habits. In people of a melancholic temperament, the natural tendency to accumulation in the vessels will be increased by astringents, and from this cause affections of the brain and of the viscera may spring. The means by which secretion is promoted accord better with such constitutions.

WHEN it is wished that the effects of bitters may be confined to the stomach, small doses are sufficient, and these which have least astringency should be preferred. The infusions in water, with the addition of a few grains of ginger or of cardamom seeds, may be employed; or a tea-spoonful or two of the spirituous tinctures may be taken at any time in a glass of water. An infusion of Peruvian bark in cold water is

a very slight but agreeable bitter, and has sometimes been used with advantage.

IN many cases, the decoctions, or infusions in boiling water, of guaiacum, saffrafras, and other woods abounding with a resinous matter and essential oil, have proved excellent remedies ; and having a tendency rather to increase the secretions, they are not liable to the same objections as the astringent medicines.

THE mineral acids are frequently of service in giving tone to the stomach, but we would not recommend them for the prevention or cure of diseases proceeding from a redundancy of acid. Every good effect that can be expected from them, may

may be obtained by the use of remedies less precarious.

CHALYBEATES have been employed with advantage for increasing the digestive powers. In the cases to which they are adapted, they appear to be very efficacious, but from their astringency they are not equally suited to every habit.

MINERAL waters of different kinds are very often of service in correcting indigestion. These at Bath, at Cheltenham, at Harrowgate, and at many other places, have been much resorted to with this intention, and great advantage has been experienced from the use of them. The relaxation from care, that commonly

takes place while they are employed; contributes, likewise, to the benefit received.

THE formation of acid in the stomach may sometimes be prevented, by the exhibition of something that has a tendency to check the progress of fermentation. Of all the substances with which we are acquainted, there is not any one better suited to this purpose than camphor. It is so active in stopping the common fermentations, that the julep deriving its name from it, although a diluted solution of sugar, in which the proportion of camphor is too minute to be detected by any other means than the taste and smell which it communicates, will endure the heat

heat of summer even for a very considerable time without becoming acid. The influence of the bitter medicines in preventing acidity, may be owing in some measure to their antifermentative powers.

THE remedies by which the action of the stomach may be promoted are numerous, and it will be adviseable to change them occasionally. If the use of them be judiciously combined with proper attention to diet, acidity from fermentation may, in general, be avoided. When, however, the tendency to disorder is excessive, or has been of long standing, there will sometimes be a generation of acid in spite of every endeavour to prevent it. In such cases it becomes necessary
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to guard against the effects of the acid
by destroying it ; and we are to con-
sider of the means in the following
section.

S E C T. IV.

On the Destruction of the Acid.

THE destruction of any acid that has been generated in the stomach, may be effected by employing a quantity of an alkali, or of an absorbent earth, sufficient for the saturation of it. The alkali, or earth, will enter into chemical union with the acid, so as to form compounds in which the characteristic properties of each element are lost. When thus neutralized, its influence upon the fluids will be compleatly obviated.

Or

OF alkalis there are only three with which chemists are as yet acquainted, and they have equally the property of destroying acidity. The volatile alkali may in some instances appear unfit, on account of its stimulating powers ; but whenever any stimulus of the kind is wanted in the system, it may be used with advantage. It is very well calculated for removing the faintness and squeamishness with which an imperfection in the digestive powers is frequently accompanied. Between the fixed alkalis, viz. the vegetable and the fossile, there is not much difference either in taste or in their effects ; therefore they may be employed indiscriminately.

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THE pure alkalis, having a strong disposition to unite with the mucilaginous matter of animals and vegetables, are termed caustic; and they have been considered as too acrimonious for internal exhibition. On this account they have most frequently been used in combination with ærial acid, with which they form compounds commonly called *mild alkalis*. These compounds have in many cases produced very good effects, but there are objections to them which it is necessary to state. It is not improbable that a part of the ærial acid that is detached when they have been encountered by any other acid in the alimentary canal, may find its way into the circulation. Until it has been ascertained whether or not the ærial acid can be conveyed from the stomach

or

or intestines, in such quantity as to occasion any considerable precipitation of the concreting acid, there will be prudence in avoiding it. But it is liable to an inconvenience independent of its acidity. Being a vapour, it sometimes causes distension in the bowels, with all the unpleasant symptoms of flatulency.

THE caustic alkalis, when dissolved in pure water merely, cannot be received into the stomach with safety, as they would unite with the coats even of that viscus; but they have, in general, been previously combined with expressed oils. The acid in the primæ viæ will be corrected by means of saponaceous compounds, as the attraction of alkalis to acids is stronger than to oils. Care should

should be taken to obtain soap in the greatest degree of purity. Of the common soaps, these from Spain are to be preferred ; but the *Sapo amygdalinus* of the dispensatory is better adapted for internal use.

SOAPS prepared with expressed oils are not free from objections, for they very often disagree with the stomach. In such cases, the acrimony of the caustic alkali may be corrected by diffusing it through any mucilaginous fluid. It will unite with the mucilaginous matter into a species of soap sufficiently mild without being offensive. The *lexivium saponarium* may be added to a basin of veal or mutton broth, at any time when there is occasion for it ; and if they be boiled together

gether for a minute or two, the combination will be rendered very complete.

THE earthy substances usually employed for the correction of acidity in the stomach, are calcareous earth and magnesia. Like the alkalis, they are best suited to this purpose when free from ærial acid; therefore lime-water and calcined magnesia are to be preferred to chalk and common magnesia.

It has been apprehended, that a long continued use of alkalis or of lime, might produce a dangerous alteration in the state of the fluids. When they are used in quantity, an alteration will undoubtedly take place; for if they be received
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into the circulation, there must be a decomposition to a certain degree among the native salts of the body. The earth, which is kept in solution by acids, will be precipitated, and we can conceive that it may be deposited in particular parts so as to produce concretions ; or that the freedom of the circulation may be impeded by it. It does not appear, however, that any disease has been occasioned by the use of alkalis. On the contrary, by correcting disorder in the stomach, they have frequently had the very best effects upon the system, and the vigour of the whole has been augmented by them. If the earth, when detached, should be permitted to accumulate, it is probable that disorder would arise from it. But the alkalis themselves have so great a tendency to
cause

cause an increase of the various secretions, that they afford a security against any accumulation. The emunctories are, in general, so much relaxed by them, that the superfluous earth is very soon discharged, and it appears in the urine as soon as it has been evacuated, in the form of a white powder.

THE doses of alkalis and of earths must be in proportion to the degree of acidity, and it is much better to use them frequently during the day, than to give a great quantity at once. They may be employed before or after each meal, and the bitter infusions, or any thing else, appearing better adapted to the state of the stomach, may be occasionally exhibited

bited along with them. If they be used with judgment, every particle of acid generated in the primæ viæ, and likewise any that has been received into the stomach, will be deprived of these properties by which acids are rendered prejudicial.

The Conclusion.

BY the means which have been recommended, the introduction of any acid from the stomach or intestines will be effectually guarded against, and as soon as the redundant acid already in the vessels has been discharged, the fluids will return to their natural condition. The matter from which the petrefying quality of the urine in Gravel, and the interrupted state of the circulation in Gout, appear to proceed, having been removed, these affections will be eradicated. They cannot subsist independent of the sources from which they spring.

THE uneasiness from the formation of the small chrystals that constitute Gravel will soon be at an end ; and, knowing the nature of calculi, we are led to imagine, that by a due perseverance, stones likewise will at last be got the better of. The urine, not now containing any preternatural redundancy of acid, will itself become a menstruum for the calculus. The solution indeed will be very gradual, as the proportion of concreting acid that water in the heat of the body can unite with, is extremely minute : but if it looses a grain or two a-day, it must continue to diminish until the whole is carried off. In this manner it is probable that a concretion may in time be removed by the urine, without any other assistance ; but if that fluid can be impregnated with al-

kali, or with lime, the solution will be accelerated.

WHEN urinary concretions were considered as calcareous earth, of which the particles were cemented together by mucus, it has been supposed that caustic alkalis might unite with the mucus, leaving the earth to fall to pieces. Many, however, have been of opinion, that an alkali exhibited by the mouth, could not arrive at the kidneys in a state to act upon a calculus, for that, before it can be secreted with the urine, it must have saturated itself with mucilaginous matter, so as to be incapable of dissolving any part of the cementing mucus of the stone. From this kind of reasoning they were so much satisfied as to the inefficacy of solvents,

vents, that they have feldom thought it worth while to make any trial of them ; and the cafes in which they were faid to have fucceeded, have very often been difregarded as fictitious.

It muft be admitted, that the cauftic alkali, before it can come to be contained in the urine, will have taken up from the inteftinal canal, and from the blood veffels, nearly as much mucilaginous matter as it is capable of combining with ; but it being now certain that calculi are a peculiar acid, the queftion of their folubility will turn upon the comparative attractions of alkalis to that acid, and to oily or mucilaginous fubftances. The compound of an alkali with any matter to which it has not fo ftrong an attraction as

to concreting acid, will form a menstruum, by which, if conveyed to the urinary passages, a stone in the bladder will be dissolved.

WITH a view of ascertaining the degrees of attraction to alkalis between expressed oils and concreting acid, I made the following experiment. A solution of soap was prepared by boiling twenty grains of the *Sapo Amygdolinus* in two ounces of rose-water, and as soon as it had been removed from the fire, five grains of the crystals of pure concreting acid were added to it. Upon agitating the vial, I observed that there was an evident decomposition of the soap, for the fluid, which till then had been nearly transparent, became in appearance like cream. The

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precipitation of the oil was not so complete as it would have been if any of the common acids had been employed, for it neither arose to the surface, or subsided to the bottom. The mixture, in which the ingredients remained blended together, had a strong resemblance to the milky compounds produced by agitating expressed oil with a solution of soap, or of an alkali impregnated with ærial acid. The alteration, however, was sufficient to point out some chemical change, and in a short time the concreting acid was entirely dissolved. If the urine, therefore, can be rendered a saponaceous fluid, it will become a menstruum for a calculus.

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WHEN an alkali, either by itself or in conjunction with any other matter to which it has not so strong an attraction as to the native acids of the body, has been received into the fluids, the first effect from it is a decomposition of the earthy salts, as mentioned in the last section. A portion of it will be expended in uniting with the acids from which the earths have been detached, but if the quantity exhibited be more than sufficient for the saturation of these, the other part will remain unaltered, and it may be secreted by the kidneys. Thus, from theory, we might conclude, that the urine may be impregnated with substances of this kind; but when the effects of any particular matter upon the body are to be ascertained, experiment alone can afford
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entire satisfaction. It is the only species of proof with which the mind can feel contented. Let us, therefore, attend to the effects that are actually produced by alkalis or soaps.

It appears, from the observations of many authors, that during a course of these medicines, the urine, as it passes from the bladder, has been found to contain a white powder, of which great quantities have sometimes been collected. This powder has usually been considered as part of a concretion, or as Gravel that had been lodged in the passages until brought away by the alkali. It is, however, very different in properties from the concreting acid, and agrees in every respect with the earth that may be precipitated

tated from the urine, by adding an alkali to it when discharged. Here, then, is indisputable evidence of the influence of alkalis being extended to the urine.

THE quantity of alkali requisite for producing this appearance is not very considerable. I have observed, that half a drachm of salt of wormwood exhibited in a glass of water every two hours, until two or three drachms have been employed, will cause an alteration in the urine. In some cases, the whole of the earth appeared to be precipitated; and, besides, there was a redundancy of alkali sufficient for giving a green colour to the syrup of violets. Upon mixing a few drops of muriatic acid with urine in this state, the earth was dissolved, and the whole became

came transparent ; but upon adding a little more, it was again rendered turbid by the precipitation of the concreting acid. The sediment now was the real matter of calculi, the substance of which Gravel * and urinary concretions are composed.

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* In the course of this treatise we have always considered gravel as consisting of concreting acid. The earth, however, precipitated from the urine in the bladder by alkalis, may be looked upon as a species of Gravel ; and it is probable that there may sometimes be, from other causes, a redundancy of such earth ; but not having any disposition to chrySTALLIZE, it would be less pernicious in its tendency, than a preternatural redundancy of acid. I lately met with a man who frequently discharged with his urine, a powdry substance of a whitish colour, and readily soluble in acids. It appeared to be either animal or calcareous earth ; for, upon adding a small quantity of acid of sugar to the solution of it in any other acid, the compound which has been called saccharated lime, was precipitated.

THE urine, in this last case, was impregnated with mild alkali ; but it would not have had much effect upon a calculus, the attraction of the alkali to the ærial acid already united with it being greater than to concreting acid. When a stone is to be dissolved, the caustic alkali must be employed in combination with oily or mucilaginous substances. Large doses of the soap lees diluted with mucilaginous fluids may be frequently repeated ; or pure soap may be conjoined with a solution of lime in the manner formerly recommended by Dr. White. Lime-water requires to be drank in great quantity when it is intended to produce any considerable effect, as the proportion of lime contained in it does not amount to more than a few grains in a pint. It
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may be used in the room of every other fluid at meal times, and if it be impregnated with any thing aromatic in the manner of the compound lime-waters, it will be rendered an agreeable substitute, conducive to the proper action of the stomach, and admirably adapted to all in whom there is any tendency to acidity.

THERE are cases well authenticated, in which stones have been removed by the use of alkalis and lime. In others, where they have appeared to fail, it is probable they were exhibited in an improper manner, and without sufficient care to avoid any circumstances by which their effects would be counteracted. It is to be lamented that medicines of this kind have been neglected by the regular practitioners.

ers, because their mistaken ideas of calculi led them to distrust the power of solvents. The employment of them has rested with empirics, who were so very ignorant of every principle upon which they ought to be administered, that sour rhenish and other acids, have sometimes been joined with the alkaline lixivia. It is not surprising that valuable remedies, when thus abused, should have fallen into disrepute.

A calculus may sometimes be precluded, by its situation in the body, from being acted upon by solvents. A stone in the substance of the kidneys, or in a bag formed by the protrusion of the inner coat of the bladder, would be, in a great measure, defended from any menstruum. But
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when no such impediments are in the way, their operation, being chemical, may be considered as more certain than that of medicines in general. The utmost attention, however, to every method of preventing a redundancy of acid will be necessary. If so great an object as the solution of a stone be held in view, acids, acescent vegetables, and every kind of fermented liquor must be abstained from with the greatest strictness. At the same time, as much exercise as the patient's situation will admit of should be employed. By causing an agitation in the urine, it will tend to promote the solution; whereas, if the whole be at rest, the part in contact with the surface of the stone will soon be saturated, and the remainder kept at a distance.

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Considerable relief is frequently obtained long before the solution is completed ; for when the medicines have began to take effect, the surface of the concretion becomes softer, and less liable to irritate. Patients have frequently been induced, by this temporary abatement of the symptoms, to desist from the use of them, and of consequence they have, in a short time, felt as much uneasiness as at first. The affections that spring from calculi in the urinary passages are so very alarming, on account of the pain which they occasion, and of the danger with which they are attended, that the greatest inconveniences ought to be endured for the prospect of being relieved from them. The remedies should be continued with steadiness, until the whole be removed ;

removed ; and the sooner that intention has been answered the better, for stones, by remaining in the body, very often produce in the surrounding parts, alterations which can never be recovered.

WHEN we are aiming merely at the correction of a redundancy of acid, from which Gravel or Gout are apprehended, the alkalis and lime do not require to be employed in so great quantities as for the solution of a stone. They need only be given in sufficient proportion for the regular correction of any acidity in the canal. Our view, in this case, is to prevent the future introduction of any foreign acid, and for this purpose, nothing can be better adapted than magnesia. It may be used for the destruction of acids in

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the primæ viæ, with as much advantage as alkalis themselves, and it is free from every objection. Excepting, therefore, when there is a calculus to be dissolved, we would give it the preference for general use. The alteration occasioned in the fluids by alkalis, although it does not appear that any disorder has ever arisen from it, is such as no man would choose to produce without necessity. Small doses of from ten to twenty grains of magnesia, may be exhibited three or four times a-day, so that it may always be in readiness to unite with any acid. At the same time, a few glasses of wine after dinner may be allowed. The strong wines were mentioned as the most proper, because they usually contain least acid. If they were to be diluted at the time of using them,

them, with about a third part of lime-water, they would be rendered more safe, without being impaired in taste.

FOR correcting the disposition to a contracted state of the secretory vessels, so extremely conducive to an accumulation of the redundant acid, antimonials, and other medicines, exhibited in such a manner as to produce relaxation on the surface, have frequently been of service in gouty habits. The application to the body of water in the form of vapour, and the warm Bath, have likewise been used with very good effect: but a regular habit of keeping the moving powers in proper action, is of the greatest efficacy. We have had occasion to speak of the advantages resulting from exercise, on various

accounts. Those who would wish to be secured from Gravel and Gout, must avoid a life of indolence.

It has repeatedly been observed, that the introduction of acids from the intestinal canal, appears to be the most frequent source of a preternatural redundancy of concreting acid. If, however, a redundancy from any other cause, be ever sufficient for producing Gravel or Gout, the means of prevention and cure must be nearly the same. Alkaline medicines, and the circumstances by which accumulation is guarded against, would prove effectual remedies.

WHEN calculi have been formed on the joints, they are out of the course of the fluids ;

fluids; therefore, medicines cannot be expected to take much effect upon them. If the growth, however, be entirely put a stop to, it is probable that a gradual diminution of them will take place from absorption.

Of the regulations that have been laid down, all are not equally adapted to every constitution: the application, therefore, to particular cases, must be made under the direction of any medical adviser to whose care a patient has been used to submit himself. To give tone to the stomach is one of the leading intentions in almost every thing that has been prescribed. When the tendency to disorder is constitutional, it cannot be eradicated, and in such cases, the regulations must
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be persevered in during life. But when the health has been re-established, it may afterwards be secured by means of regimen, without much assistance from medicine.

IN habits very much debilitated from excessive irregularity, or other causes, there will be much difficulty in effecting a restoration of the digestive powers. If flatulency, nausea, pain in the forehead, and other symptoms of indigestion be occasionally perceived, it may be concluded that the proper action of the stomach is yet deficient. For succeeding in such cases, an unwearied attention to the various regulations will be requisite; but very little advantage will be obtained from a partial adherence to them. It will be
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in vain to aim at the prevention of disorder in the primæ viæ, if an unlimited indulgence be given to a luxurious appetite.

ALTHOUGH no part of the system can be attended with much inconvenience, very few will have resolution to persevere in it with an exactness that shall entitle them to success. From obstinacy in some, and a want of determination in others, the rules for the prevention and cure of diseases, are usually complied with but in part only; and reproach is often thrown upon the means, when the blame ought to rest entirely with the individual, for having misapplied them.

By pursuing the plan recommended, not only the diseases against which it is peculiarly levelled may be kept at a distance, but a multitude of others proceeding from disorder in the digestive faculties will be mitigated or cured. Strength of body and sound health will succeed to infirmity and pain.

F I N I S.