On diseases which affect corresponding parts of the body in a symmetrical manner / by William Budd.

Dr. Percy from the Friend the Author.

ON

DISEASES WHICH AFFECT CORRESPONDING PARTS OF THE BODY

IN A SYMMETRICAL MANNER.

By WILLIAM BUDD, M.D.,

BRISTOL.

FROM THE TWENTY-FIFTH VOLUME OF THE MEDICO-CHIRURGICAL TRANSACTIONS, PUBLISHED BY THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY OF LONDON.

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Communicated by GEORGE BUDD, M.D., F.R.S.

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In 1836, when attending the medical practice of the Middlesex Hospital, my attention was arrested by several cases of rheumatism, in which, as the disease passed into a chronic state, corresponding parts of the limbs of the two sides became affected in pairs, in perfectly symmetrical order. In one or two cases, this symmetry was so exact, and was manifested in such minute particulars, that the affection of one limb repeated itself in the fellow limb, not merely with a general correspondence of situation, but joint for joint,—bursa for bursa,—sheath for sheath.

I was, at once, struck with the importance of a fact, having, in itself, so much the form and complexion of a law, and bearing such close analogy, and, probably, near relation to the process of assimilation;—that process, namely, in the exercise of which, fellow parts separate from the blood, and appropriate matters of identical composition, and thus maintain through life their original likeness, in form, composition, and structure.

Soon after this, I saw M. Bizot's announcement of the same fact, as almost constantly exhibited, in the distribution of atheromatous deposits in arteries; and from that time, I kept on the look out for instances of it in other diseases.*

These soon came before me in great number and variety, and, in the course of some time, I was enabled to ascertain, that, in the greater number of diseases of the skin, in many diseases of the joints, in the disease of the arteries just alluded to, in diseases of the eyes, and various other structures;— in short, that in a great number and variety of diseases, of constitutional origin, the lesions constituting the local character of each, exhibit, in their situation and form, a degree of symmetry, which is, often, of the most singular exactness.

Numerous examples of the fact, taken from some variety of diseases, affecting each of the several structures just enumerated, are exhibited in the drawings, preparations, and casts, which I now have the honour of laying before the Society.

In all these examples a very remarkable degree of symmetry may be observed, and, in some, it is almost absolute.

* In my Inaugural Thesis on Rheumatism, which, in the summer of 1838, the University of Edinburgh honoured with one of its gold medals, these facts were brought forward, and their importance shown. The analogy referred to in the text was suggested, and the general occurrence of symmetry in constitutional disease was distinctly surmised. In an Article on Rheumatism which I wrote for Dr. Tweedie's Library, the frequent occurrence of the fact in that disease was mentioned, but without comment, as I had then resolved to make it the subject of a special communication.

Since, then, this fact is common to such a large number of diseases,—and diseases, varying so widely in the aspect of their lesions, in the nature of the textures involved, and in many other important respects,—it must necessarily be a fact of high order, and one which is justly entitled to the rank of a *law*.

But in order to arrive at the true interpretation of this law, it is, first, necessary to inquire into the nature of the cases in which it is observed.

After much consideration, I have been led to divide them into two principal groups: 1st, cases in which the morbid changes depend on fault, originating in the solids affected; and 2nd, those in which the lesions originate in morbid states of the blood.

That disseminated lesions of identical kind may arise from original fault in the solids affected, will be readily granted, and that such fault may affect corresponding parts of the body exactly alike, we have ocular proof in those extreme cases, in which, from some misdirection of the formative "nisus," the defect takes the shape of permanent monstrosity, displaying itself in corresponding parts, with the most exact symmetry.

A case of this kind which has lately fallen under my own notice, and another like it from Cruveilhier,* are delineated in the accompanying drawings,† and

* Anat. Pathol., liv. xxxviii. Pl. I.

† A great number of casts, preparations and drawings, illustrative of the paper, were exhibited to the Society; engravings from a few of which will be found in the plates to this volume. —Ed.

are both highly interesting, whether as regards the repetition of the *same* deformities in the limbs of the two sides, or, still more, that of *similar* deformities in corresponding parts of the *upper* and *lower* extremities; thus giving, in deviations from the natural form, curious and undeniable sanction for those speculative views of organic analogies, which have long been entertained by a certain class of anatomists.* Symmetrical anomalies of the muscles and blood-vessels, are facts of the same order. As distinct instances of *secondary* morbid changes, belonging to this group, I may mention emphysema of the lungs, which almost always affects both lungs in a symmetrical manner; the arborescent fatty growths (*lipoma arborescens*) which are sometimes found in

* In apposition with these drawings, I have placed one of monstrosity in the common anemone, in which *all* the sepals and petals were transformed into *similar* tripartite leaves. It is only when viewed in connection with monstrosities in plants, that facts, like those recorded in the text, are seen in their true character.

For the rest, these monstrosities affect the body symmetrically, in subjection to the same law, which presides over the symmetrical development of parts in their normal type, a law, which has lately been enunciated by an eminent philosopher in the following words:—

"We have an idea of symmetry, and an axiom involved in this idea is, that in a symmetrical natural body, if there be a tendency to modify any member in any manner, there is a tendency to modify corresponding members in the same manner."—*Whewell, Philosophy of Induct. Sc. Aphoris.* LXXX.

But what is most remarkable is, that this tendency being so strikingly exemplified in some cases, as in those, for instance, now exhibited, should, in others, be entirely wanting.

joints, more especially in the knees ;* and, perhaps, certain forms of decay in teeth.

In other cases, as in ichthyosis, and in the cartilaginous growths to which the bones of the hands and feet are liable, the limit between this group and the other is less distinct, and cases of this kind and those of humoral origin, run eventually into one another.

In the latter disease, the symmetrical arrangement of the tumours often takes a very interesting form.

Speaking of its tendency to affect a considerable number of joints, Professor Müller says :—

" One of the most important cases in this respect, is that which came under the notice of Professor Pockels, and of which a representation will be given in the second part of this work. Here, the tumours of the metacarpal bones and phalanges had formed, not on one hand only, but there was a commencement of the disease in the other hand, and the most singular fact of all was, that the feet showed a disposition to become the seat of the same morbid process."

Ruysch likewise has described some cases in which tumours grew from the fingers and metacarpal bones of both hands and from the toes of both feet, and which were, evidently, instances of the same disease.

* " A very remarkable specimen of this in both knee-joints of a man is contained in Meckel's Museum at Halle, and several similar are in the Museum at Bartholomew's."—*Müller.*

The second group of symmetrical affections, namely, those of humoral origin, may be again divided into two others: the first of these includes diseases in which the morbid state of the blood probably consists in deficiency of natural ingredients: the next, those in which it depends on the presence of morbid matter, of special kind, in that fluid.

As a distinct example of the former, may be mentioned those cases in which ulceration of the cornea comes on in man and animals fed on substances deficient in nitrogen, or exhausted by repeated bleedings, and which almost always affects both eyes in exactly similar manner.

Rickets is, probably, also another case in point.

The last group, that in which the morbid state of the blood consists in the presence of foreign matters, of special kind, in that fluid, includes a much larger number of diseases than either of the others.

It is this group which has more especially engaged my attention, and it is made the special subject of the remaining part of this paper.

My first object will be, to show, that, with the exceptions already named, all the forms of disease, of which examples are laid before the Society, depend on the presence of peculiar morbid principles in the blood, which may be regarded as their essential cause.

In support of this, it may be stated as very generally true, that whenever, in constitutional disease, (and all these forms of disease are of that kind,) a

number of similar and special lesions of *organic kind* are scattered widely over a surface, or disseminated among remote members of a system of identical structures,—as joints, for instance,—the affection, whatever its name, depends essentially on a morbid condition of the blood, and, for the most part, on the presence of a special morbid matter in that fluid. For it is quite clear that these lesions, whether leprous patches, rheumatic or gouty enlargements, or atheromatous spots,—to take instances from the diseases before us,—have, in each case, a single and special cause, and the blood is the only medium qualified, by its nature, functions, and diffusion, to become the vehicle of such a cause, and to distribute it thus widely over the system.

The truth of this proposition, as regards the particular group of diseases now considered, is at once illustrated and confirmed by the case of the exanthemata, and other contagious diseases, more particularly syphilis, in which the same scattering of lesions occurs, which offer strictly analogous types of local disease, in the form of eruptions, enlargements of joints, and various other affections, often, themselves, symmetrical in their distribution, and in which we have certain knowledge of the presence of morbid matters in the blood, by being privy to their introduction.

Having shown, however, that symmetrical affections may arise from morbid states of the blood, consisting in deficiency of its natural ingredients, it might be alleged, that some of these diseases origi-

nate in that way. But such a number and variety of considerations will be adduced in this paper, all at variance with the hypothesis that any of the group now treated of depends on a morbid condition of this negative kind, that it might be deemed superfluous to give this hypothesis a formal consideration in this place.

I shall, therefore, content myself with remarking,

First. That morbid states of the blood, consisting in mere deficiency of natural ingredients, seem generally inadequate to effect lesions of the different kinds, exhibited in the drawings, casts, and preparations, now before the Society.

Secondly. The greater number of these lesions consist of various eruptions on the skin. Now, all analogy tends to show, that these eruptions, especially of the kinds of which those now exhibited are examples, depend, not on deficiency of natural ingredients in the blood, but on the presence of morbid matters in that fluid,—as abundantly appears from the instance of the exanthemata, of eruptions from ingestion of unwholesome fish, and various other cases of the same purport.

Thirdly. A considerable number of the diseases included in this group, and of which examples are exhibited in illustration of these remarks, are very generally and rightly regarded as the effect of morbid matters in the blood, which may be considered their essential cause. Of these, gout and rheumatism may be cited as familiar examples.

That none of this group depend, on the other

hand, on fault originating in the solids affected, is sufficiently clear from the known circumstances of their origin, and is further attested by analogy of the strictest kind, and from very various sources; as has already in part been shown, and will more fully and distinctly appear in the further development of this question.

Relying, therefore, for the present, on the sufficiency of these considerations to sanction the proposition,—that the diseases here treated of, depend on the presence of morbid matters in the blood, I shall now proceed one step further, and endeavour to show, that, in any given case, the special morbid matter which belongs to the particular disease, that may be the object of regard, is accumulated in the seat of each individual lesion, and is there held in union or affinity with the tissue affected; and that this is, in fact, the primary and essential condition of such lesion.

This second proposition may seem to some an obvious consequence of the first, but on mature reflection, I have thought it necessary to bring additional evidence in its support.

Such evidence may be drawn from various sources, and especially from analogy, which furnishes it in great abundance, and of decisive authority in the numerous facts lately ascertained regarding the action of those medicines which take effect after absorption into the blood.

These facts are strictly analogous to those which form the subject of this paper; in so far that they

are equally cases essentially consisting in the presence of foreign matters in the blood, so that what is known of one series, in this quality, may be applied to the other with the utmost exactness.

But the evidence afforded by the former is of peculiar value and distinctness in regard to the question before us, because the matters contaminating the blood being possessed of marked chemical characters, and the observer being himself the conscious means of their introduction—their presence in particular parts is susceptible of being determined by direct experiment.

These facts, therefore, stand to those now considered, in the relation of experiment to observation. Now the whole course of recent inquiry has tended to show, that with the exception of some familiar instances of indirect action, which need not now be specified—whenever medicinal or other agents exert a special action on particular structures, these agents become accumulated in the structures thus affected, and may be recovered from their tissue in proper form, and in much greater quantity than from other parts ; and, that when this action takes effect on secreting organs, these substances are found in the fluid secreted by them in much greater quantity than elsewhere ; testifying in this case also accumulation of the active matter in the part specially acted upon.

In proof of this assertion, I need only refer to the valuable mass of exact observations of late made public, on the action of lead, antimony, ar-

senic, iodide of potassium, nitrate of potash, alcohol, copaiba, and other agents—observations all giving evidence of the fact asserted, and collectively showing the very general nature of the relation between the special actions of foreign matters present in the blood, and their accumulation in the part affected.*

In the case of iodide of potassium, this evidence is of the most explicit kind, showing in the remarkable transferences of action, and corresponding transferences of the agent, in substance, which invariably take place during the administration of this drug, the essential nature of the connexion between these two facts.†

Evidence to the same effect, though perhaps less free from ambiguity, in relation to the present question, is afforded by small pox, syphilis, and various other diseases, in which we have other proof that the morbid matter concerned is accumulated in the parts specially affected.‡ And that such is also the case in the affections which form the subject of this paper, may be gathered from the history of many among them.

* See Percy on Alcohol in the Ventricles of the Brain. (An Edinburgh Prize Essay.) Devergie and Guibourt, on Lead Poisoning in the Revue Médicale. Mars, 1840. Orfila, in the Mémoires de l'Académie de Médecine, 1840. Rees, Analysis of Blood and Urine.

† On these particular points I am in possession of many curious and I believe original observations.

‡ In one sense the analogy of these cases is perhaps of more strict application, since the lesions which characterise these diseases often affect a symmetrical distribution.

It will be seen that the greater number of the illustrations of symmetrical disease, exhibited to the Society, are taken from eruptions on the skin. Now many of these are liable, from various causes, to be suddenly repelled; and it is well known, that, when this happens, at the same time that the eruptions disappear, various disorders, often of serious kind, are set up in internal organs, or affect the system at large.* And what is the interpretation of this fact, but simply this—that the peculiar morbid matter of the disease, which was before detained in the part affected, and held in union with it, being now suddenly loosened and set afloat in the general circulation, has become free to fix on internal organs, or circulating everywhere with the blood to affect the system at large? This is the only satisfactory explanation of the case that can be offered. In the strictly analogous case of repelled gout, it receives most distinct confirmation.

A very different explanation has indeed been

* The following passage from Willan will suffice to refresh the memory of the reader on this point. Speaking of Lepra, he says —"It sometimes happens that a sudden application of cold, which originally produces the scaly eruption, will likewise cause it to strike in; and whenever this occurs it produces great disturbance in the system. Vomiting is a symptom that generally if not always precedes the eruption, at the commencement of the disease, and when the eruption is struck in this symptom again makes its appearance."—*Delineation*, p. 178.

For striking instances to the same effect, see pp. 22, 47, 77, 78, 401, of the same work.

proposed, and was, for a long time, very generally received, especially by French physiologists, but it has now been justly, and as generally, discarded.*

I had already been led by these various considerations, to the view here taken of the nature of the individual lesions occurring in those forms of symmetrical disease, which are the more especial subject of this paper, when accident furnished me with a very interesting and decisive confirmation of it.

My attention having been called to a case in King's College Hospital, in which the administration of iodide of potassium, in free doses, had been followed, about the fourth day, by an extensive erythematous eruption, I ascertained, on further examination, that the patches of which it consisted, were distributed on the limbs and trunk, in a perfectly symmetrical manner; those of one side repeating themselves on the other, with exact likeness of *pattern*, and almost spot for spot. There could be no reasonable doubt that the eruption was the effect of the medicine, for it came out at the exact time when such effects might be expected to occur (that is, before the medicine had found a free outlet through

* Having commenced my medical studies as pupil of the celebrated Broussais, and having continued them for a long time under his guidance, at a period when that remarkable man was displaying his greatest energy as a teacher, and was at the summit of his ascendancy over medical opinion, I may claim for myself a full appreciation of the scope and capabilities of the explanation referred to in the text.

the kidneys), it was attended with the other usual manifestations of the action of the medicine on the surface, which occur at this period, and it immediately began to fade, when the iodide was left off, on account of being the presumed cause of the disorder: and if the established facts regarding the action of this medicine, already referred to, be duly weighed, there can, it seems to me, be little doubt, either, that in the seat of each of the patches of eruption in this case, a certain portion of the iodide was detained and held in union or affinity with the part, and that this was, in fact, the initial and essential condition of the lesion.

Here, then, was an instance of symmetrical affection, depending on the presence of foreign matter in the blood, and in which the point sought to be established admitted of no reasonable doubt, so that, in regard to the question under discussion, this case might be looked upon as affording a verification by experiment, of inferences already drawn from observation.

But a still more conclusive case, is that of the paralysis of the hands, which often follows the absorption of lead, and which is known among house-painters and white-lead manufacturers by the name of wrist-drop. This paralysis almost always affects both hands in similar manner, and is generally confined to a small group of muscles, the extensors of the wrist and fingers. It is therefore strictly, and indeed very remarkably symmetrical.

Now this paralysis does not depend on affection

of the nervous centres, but is a purely local effect of the poison.

This is evident from the limitation of the paralysis, which is such as could not possibly result from affection of the central parts of the nervous system, as will at once appear from the following passage from M. Tanquerel's work on the poisonous effects of lead:—

"In one of the cases of superficial anæsthesia, there was paralysis of motion of the *extensors* of the wrist and fingers, the sensation of the *back* of the hand and fingers being preserved, while the *palmar* surface of the hand had entirely lost its sensibility, the *flexor* muscles, at the same time, retaining their powers of motion."*

It is quite clear that such a distribution as this, with all its precise and singular limitations, can only result from the local action of the lead on the parts affected.

But this assertion does not rest on mere physiological grounds. Lead has been detected in the palsied parts by direct experiment. This fact has been repeatedly ascertained by M. Tanquerel and by MM. Devergie and Guibourt, and quite recently at King's College Hospital.

In a man who died there, under the care of Dr. G. Budd, of epilepsy from lead-poisoning, and who also had wrist-drop, Mr. Miller detected lead

* Tanquerel on the Effects of Lead: quoted in the British and Foreign Medical Review.

in abundance in the paralysed extensors of the hands.*

So that here we have a case, which is not only, like that of the eruption from iodide of potassium, a perfect type of the group, but as remarkable as any among them for the singular degree of election, and the perfect symmetry exhibited in the distribution of the lesions, and in which the doctrine here advanced receives experimental proof.

The interpretation of these cases may be applied to all others of the same type with the greater certainty, on account of the essential connection they prove to exist between the local detention of the morbid matter and each individual lesion. So that, on these grounds, this is a case in which we are especially warranted in admitting the truth of a general proposition, on the ground of particular verifications.

I therefore regard the twofold proposition, 'That

* Exception may fairly be taken to this fact, because, by a strange omission, the other muscles were not analysed. Nevertheless, I think the case is fully made out. It is proved, on physiological grounds, that the paralysis depends on the local action of the lead. It is proved, by experiment, that the lead is present in the paralysed parts, and the only rational way of explaining their paralysis, is by the presence of a greater quantity of lead in them. The detection of lead in smaller quantity in other muscles, would not, in the least, invalidate the fact. As the lead is conveyed with the blood, it probably exists in all, and, indeed, its presence, in some, is testified by other evidence of its action, namely, violent pain and cramps. It is highly worthy of remark, that in the limbs, these affections also are almost invariably symmetrical.

the symmetrical affections, which form the subject of the present remarks, essentially depend on the presence of morbid matters in the blood,' and 'that the detention of these matters, and their being held in union or affinity with the part affected, is the essential condition of each individual lesion,' as securely established by the foregoing considerations.

In relation to this group therefore, the law now takes a more specific form, and requires a distinct interpretation.

For, according to these views, it is clear that the agency which here determines the lesions to assume a symmetrical arrangement, is in fact that which determines a given morbid matter in the blood, to fix on one particular part in preference to any other of the same structure: so that a given part once affected, the remaining morbid matter, not yet locally engaged, is not free to fix on this or that part, however like to the first in outward appearance, but is drawn to that very part on the opposite side of the body, which is symmetrical with or analogous to the first.

And this agency I conceive to be the same, in virtue of which, in the ordinary exercise of assimilation, corresponding parts of the body separate from the blood, and appropriate *matters of identical composition, and in equal measure*; thus maintaining through life their original likeness in form, composition and structure.

The agency is the same in both cases; the matters acted upon only are different.

But before I proceed, I must answer an objection which may be laid *in limine* to the whole body of facts treated of in this paper, to the effect that there is nothing at all remarkable in the fact that the two sides of the body should be affected alike; that, on the contrary, such a fact might have been anticipated, and really offers nothing worthy of serious consideration.

It will at once be seen that this objection does not hold, when it is remembered that in many diseases affecting the same structures as those in which the symmetrical diseases occur, and depending like them on the presence of morbid matters in the blood, as in many varieties of diseases of the joints and of the skin, for example, the individual lesions are scattered in most irregular manner, and without the slightest approach to symmetrical distribution. The symmetrical arrangement of such lesions in other diseases does therefore constitute a very remarkable peculiarity, and in what this peculiarity consists, what conditions it may require, and what other peculiarities it may imply, are objects well worthy of attentive inquiry.

And the answer to the first of these questions naturally leads me to the first important deduction to be drawn from the character of symmetrical arrangement itself.

Since this character does not occur in all diseases that depend alike on morbid matters in the blood, and also affect the same structures, its exhibition in those in which it does occur must necessarily de-

pend on some peculiarity in the morbid matters, which are their cause, and that peculiarity must consist in the very definite and elective nature of the affinity, which these matters possess, towards the particular structure they affect. For it is plain that in these cases, when any given joint, or any particular spot of the skin, is affected, the fellow joint or fellow spot becomes affected likewise, because identical with the first in organic composition, and because the morbid matter, from the elective nature of its affinity, is not free to fix on any other.

I have already stated my view of the relation of these affinities to the agencies concerned, in ordinary assimilation.

How singularly delicate their election may be in disease, has already appeared in the paralysis and anæsthesia from absorption of lead, and is still more strikingly shown by some of the drawings laid before the Society, in illustration of these views, in which eruptions on the limbs of one side are repeated on those of the other, sometimes spot for spot, with *electrotype* accuracy.

And here again we find, in the very elective and determinate way in which the action of certain medicines takes effect on particular structures, at once the best illustration and most substantial confirmation of this view of the case.

The very precise limitation of the action of strychnia to the structure named by Dr. M. Hall, the true spinal cord, is a striking case in point ; and is, in all respects, analogous to the facts here treated

of, excepting that the action of the foreign matter is exerted upon an organ which is *single* in its structure.

It admits of demonstration, that the effects of strychnia on the cord depend on its presence in the part.

It now appears, therefore, that the interpretation of the facts treated of in this paper, which has been derived from consideration of their symmetrical character, is by no means limited to them, but applies with equal exactness to all cases in which foreign matters in the blood exercise an elective action on particular structures, whether symmetrical or not.

And these cases include a vast body of facts in pathology and therapeutics. But it will at once be seen, that this quality of matters which act through the medium of the blood, their affinity, namely, for particular structures, is one which is susceptible of great variety in degree, in different cases; and in fact, in diseases which depend on the presence of such matters in the blood, this variety is seen, in every degree, from that which causes the matter of the disease to affect particular structures, in perfectly symmetrical order, to that of almost absolute indifference.

Gout offers an interesting case as standing midway between these extremes. For although the strongest affinity of the gouty matter is undoubtedly for structures of the fibrous class, yet it is sometimes exerted on other tissues, and its affinity for the fibrous structures, though in a considerable degree

elective, is not sufficiently so, as ever to cause the lesions to assume a perfectly symmetrical form. And this is easily understood; for in consequence of the comparative indifference of the gouty matter, there is no powerful agency in play to draw it to one point more than another, so that the election is determined by a variety of contingent circumstances, which, affecting the organic condition of any particular joint, may modify the affinity of this matter towards it.

And, as a direct consequence of this comparative indifference, it follows, that diseases in which it occurs, if the special matter which is their cause be of a kind admitting of transport in the circulation, and does not become permanently fixed in the tissue affected, are remarkably prone to metastasis: of which the disease now spoken of affords, I need scarcely add, a striking illustration.

These considerations are of much importance in their application to the action of medicines; for it is evident, from instances already adduced, that these views may be applied to the action of those which take effect after absorption into the blood, with the utmost strictness; and that great instruction may be derived from regarding such medicines, in relation to the degree of elective affinity they may bear to particular structures. The certainty of their effects must necessarily have close relation to the degree of this affinity, and such among them as are comparatively indifferent must be much less certain in their action on particular structures, and must be liable to

have that action disturbed, by lighter contingencies. And although this may seem to be only another way of stating the same fact, we certainly gain much in clearness by looking at it in this point of view.

In inquiring into the conditions of the manifestation of symmetry in disease, it was seen, that the most essential was furnished by that analogy of organic composition, which is an inseparable and fundamental character of symmetrical parts. From this it follows, that the special morbid matters which are the cause of symmetrical diseases, may be considered as tests or measures of the greater or less completeness of this analogy. These diseases may now therefore be looked at in another point of view —in that of the highly interesting illustrations they give, of those laws of symmetry, and analogies of organic composition, which anatomists have established as governing the evolution of opposite regions of the frame. Of this symmetry, that of the lateral halves is sufficiently evident—the most complete; that of the upper and lower less so, though, in the limbs, still very open to remark.

Both these relations receive curious illustration, in many of the drawings and preparations now exhibited. Thus in the case to which the cast represented in Plate II. belongs, the distortion of the *hands* is perfectly alike. Now the only other joints affected in the subject of this disease, were those of the *feet*, and the joints of the feet so affected were those which are analogous to the distorted joints of the hands. But as the analogy between the hands and feet is

much less perfect than that between the hands themselves, that between the corresponding distortions was much less perfect likewise, the distortion of the feet being far less advanced; a fact which, I may add, has repeated itself in every instance of this disease, that has hitherto fallen under my observation.

Equally interesting illustrations of these laws are seen in the cases of disease of the skin exhibited in the accompanying drawings.* For it will be seen that in the case from which these drawings were taken, the lateral symmetry is of the most absolute kind: the spots on the right elbow and knee repeating themselves on the left elbow and left knee with a likeness of the most singular exactness. The analogy between the elbows and knees is clearly expressed in the fact, that these were the only parts affected with the disease; the six patches exhibited in the drawings being the only ones occurring on the person; and the greater exactness of the lateral symmetry is curiously expressed in the equality, in the number of spots in that direction, and their inequality in the other.

Instances of this fourfold symmetry are mentioned, incidentally, by many writers.

Willan, speaking of psoriasis palmaria, says,— "When the palms of the hand are affected, as above stated, a similar appearance often takes place on the soles of the feet; but with the exception of rhagades or fissures, which seem less liable to form there, the feet being usually covered."

* See Plate III.

In disease of the arteries, also, interesting examples of this fact are met with. Among others may be cited the following, mentioned by M. Bizot:—"Une dernière circonstance qui frappera, sans doute, c'est que sur les *radiales*, et les *peronières*, les taches et les ossifications ont apparû au même âge."*

In the very exact and absolute character of the symmetry occurring in some of these cases, we find the best assurance of the molecular nature of the process by which such effects are realized, and the best proof of their internal origin.

For it is quite clear, that, although external irritation affecting corresponding parts in equal manner, may be the cause of lesions symmetrically disposed, as far as situation is concerned, it nevertheless acts, in far too gross a way, to ensure a repetition of lesions, so exactly alike, in number, form, character, and situation, as those exhibited in many of the accompanying drawings. Effects, such as these, molecular agencies alone can determine.

Facts of similar import are exhibited, more or less distinctly, and in various parts of the body, in all the other drawings and preparations. I may remark, however, that the lateral symmetry is in scarcely any of them so perfect as in the case of lepra just now referred to. The distortion of one hand, although offering a striking resemblance to that of the other, is almost always a slight exaggeration

* Mémoires de la Soc. Méd. d'Observ., tom. i. p. 389.

or a miniature of it; the pattern of an eruption on one limb is more or less reduced in the other; the atheromatous spots in the arteries of one side are smaller than corresponding spots in those of the other. (Bizot.) And, in this, we apparently have indication of that want of absolute symmetry between the two sides of the body, which anatomists have already been led to infer from other considerations, so that this very fact, the want, namely, of absolute symmetry in the lesions belonging to these diseases, which might at first view seem a defect, and as tending in some measure to invalidate the law, is probably one of its most interesting exemplifications.

Anatomists had already arrived at the knowledge of these analogies of symmetry and organic composition, by considerations grounded on outward form, and number of parts, but, here, we not only have their reality shown, by a more searching and inward proof, but their degrees accurately measured, as it were, by a delicate molecular test;—and, in this point of view, these diseases are remarkably interesting.

In this quality, they clearly show also, that the intimate composition of one and the same structure, as of the skin, for example, may differ, materially, in different regions; and from this, again, it follows that the affinity of any given morbid matter for this structure need not be equally elective in all these regions; so that while, in some, the lesions may be distributed with the most perfect symmetry, in others it may be much less distinctly defined.

I make these remarks, in order to explain what might otherwise appear to be a very serious anomaly.

Many of the diseases of the skin, which are represented in the drawings as confined to the limbs, sometimes become extended to the trunk likewise. Now, however perfect the symmetry of the eruption on the limbs, it often happens, that on the trunk it is but vaguely marked. The same aspects are, indeed, affected,—still showing the operation of the law in less definite effect,—but the likeness of the eruption on the two sides seldom descends to exact pattern, and scarcely even to equality in number of spots; circumstances which may be clearly accounted for by reference to the consideration just laid down.

Having said enough to show the extensive prevalence of a law of symmetry in diseases of humoral origin, and having pointed out the fundamental condition of its manifestation, let us now see by what circumstances that manifestation may be interfered with.

Three very powerful causes of interference may be easily recognized. Of these, the most influential is febrile movement. Of the effect of this in interfering with the manifestation of symmetry, I have seen, especially in acute rheumatism, a great number of striking examples. Among others, I may cite that of a young man, who lay in the Middlesex Hospital, in 1836, in a severe attack of acute rheumatism, attended with pericarditis and much febrile movement. As long as the fever ran high, the joints were attacked in very irregular order, but when it had entirely subsided, and the rheu-

matism continued in chronic form, without vascular excitement, the lesions assumed a perfectly symmetrical character.

But the disturbing effect of febrile movement is best appreciated in those diseases in which the tendency to symmetry is less determinate and more liable to be set aside by contingent circumstances : of this, gout, as already remarked, is a striking example. Now, the only cases I have seen in gout of any approach to absolute symmetry of lesions,—for a *tendency* towards it is often observed,—have been such as were, for the most part, chronic in their course, and unattended with febrile movement, or much local inflammatory disorder.

In therapeutics, again, the effect which febrile movement has in interfering with the determination of blood-medicines to particular parts, a fact, as already shown, strictly parallel to that now considered, is frequently exemplified. Thus it is well known, that no cause so effectually disturbs the determination of mercury to the gums, as febrile movement, and the same may be said of the specific effects of other *blood-medicines.** And the disturbing influence

* I have ventured to propose this word as a designation for the large and important class of medicines, whose chief effects take place after absorption, and through the medium of the blood. We are much in want of some generic term by which to designate these medicines, which cannot now be spoken of except by the use of a periphrase, which is often very inconvenient in argument. I do not much like the word I have adopted, but I have been unable to find a better. *Intravascular* might be proposed, but is on many accounts less proper.

of this cause might indeed have been anticipated, for it is quite clear that the exercise of the delicate affinities we have been considering, must, in great measure, depend on equable circulation of the fluid in which the morbid matter is suspended: and what so effectual as febrile movement in disturbing this?

Besides that, this state of the system may act in other ways less distinct to apprehension.

It may be stated then as a general proposition, that, in diseases consisting of a number of lesions having a tendency to symmetrical arrangement, the symmetry will be more perfect, as the course of the affection has been more free from febrile movement or local vascular excitement,—in short, has been more chronic in progress, and *has resembled more nearly in character, the ordinary processes of assimilation*, constituting in this latter relation, a fact of striking import, and giving, in the view which regards these processes, as consisting in the separation of matters of definite and identical composition from the blood, by structures of identical nature, the best authority for the particular theory of these diseases, maintained in the foregoing pages.

Another circumstance of great effect in interfering with the manifestation of symmetry in disease, consists in the influence which mechanical injury, or any other cause materially affecting the organic condition of a given part, has, in determining morbid matters present in the blood to that part, in preference to others of the same structure.

The powerful effect of this influence is sufficiently

familiar to practitioners. In gout especially, this influence of mechanical injury is of such frequent and obvious effect, that M. Cruveilhier has been led, whether rightly or not there is no present need to inquire, to regard the friction and mechanical shocks to which the joints of the feet are especially subject, as the sole cause of the preference of gout for these parts.*

In like manner, parts that have been severely damaged by gout are, from that cause, more liable to further attack; in consequence of which, as Dr. Holland has justly remarked, smaller accumulations of the morbid cause testify themselves in the joints, and thus finding places of outward deposit, seldom give rise to those severe and protracted constitutional disorders which so often precede the earlier attacks of the disease in the joints.

In other diseases of humoral origin, the same law is also frequently exemplified. I have at present a music master under my care, who has for some time past been subject to occasional and slight attacks of rheumatic gout, giving evidence of the diathesis, and in whom a very severe attack of that disease was brought on in the finger-joints of the left hand, by many days' incessant endeavour with that hand to

* "Les articulations qui éprouvent les frottemens, les pressions les plus considérables, sont le siège spécial de la goutte, et lorsque la goutte se fixe sur un grand nombre d'articulations, l'ordre de développement, et l'intensité de la lésion sont dans un rapport direct, j'ai presque dit nécessaire avec le degré de frottement et de pression."—*Cruveilhier, Anat. Pathol.*, liv. xxxiv.

perform on the piano a musical passage, requiring very powerful fingering.

An instance of similar purport, though perhaps less free from ambiguity, in relation to the matter under consideration, occurs in the following case, for which I am indebted to my brother, Dr. G. Budd, and which I am induced to bring forward on account of its intrinsic interest.

A sailor was admitted into the Dreadnought on account of a bruise inflicted on one side of his breech by a fall into the hold of a ship. In the course of some days he left the hospital, having recovered from the injury, but still showing a bruise mark on the breech.

A short time after, he was again admitted with severe febrile symptoms, which terminated in the eruption of small-pox. The pustules were discrete, and very few in number all over the body, except in the exact seat of the former bruise, and there they were extremely numerous, and for the most part confluent.

Now when mechanical injury, or other influential cause of organic change, acts in the same way, in diseases whose lesions have a tendency to symmetrical arrangement, and takes effect on single or unsymmetrical parts, it is clear that the symmetry usual in such cases will be thereby disturbed or entirely prevented.

Most distinct and striking instances of this are seen in the atheromatous disease of arteries.

Of the whole group of symmetrical diseases, this

is one of the most remarkable for the exactness of the symmetry in which the lesions usually occur ; a circumstance probably owing in part to the very chronic course of the affection, and to the exclusion from external disturbing influences, which the arterial tissue enjoys by reason of its deep seat.

But now and then, inflammation occurs in the lining membrane of the arteries, and the ulterior effect of this is, following in this the analogy of other diseases, to cause the atheromatous matter to be deposited in the former seat of inflammation, in preference to other parts ; and as inflammation of the arteries does not generally follow the law of symmetry in its development, the atheromatous deposits which ensue are not distributed in their usual symmetrical order.

This cause of interference with the remarkable symmetry of arrangement so general in this disease, was, I believe, first recognized by M. Bizot, and is very explicitly pointed out in his valuable memoir on the heart and arteries.*

Acting in the same way, local irritation applied to the skin, often causes an irregular and unsymme-

* The proximate cause of this effect of mechanical injury or other lesion is an interesting subject of speculation. It is probable that alteration in the rate of the circulation through parts thus affected, and perhaps alteration in the diameter of their capillaries, are materially concerned in the effect. Of a considerable degree of stasis in the blood of such parts, we have certain evidence in their colour, and many other circumstances, and it is not difficult to see how this might act for the effect required.

trical development of eruptions, which, when they appear spontaneously, almost invariably affect the person in a perfectly symmetrical manner. Instances of this, in eczema particularly, must be familiar to every practitioner.

These facts are susceptible of important application in elucidation of the action of medicines ; for it is evident, from the power which they show to be connected with local irritation, or other material organic change, of determining foreign matters present in the blood, to the part which is the subject of such change, in preference to others,* that such medicines as take effect after absorption into the blood, will, whether for good or evil, act more powerfully on diseased parts than on others, by reason of that very organic change they are intended to remedy.

From these views we may also learn the great importance in the treatment of diseases which are liable to shift their seat, of keeping the vital organs as far as possible in a quiescent state, lest by ex-

* A clear perception of the relation between these two facts, (so essential, among others, to a right theory of metastasis,) of the effect, namely, which diseased action has in determining morbid matters in the blood, to parts which are the subject of it, and which is so frequently exemplified in the development of tuberculous disease especially, might have spared us the endless controversy which has sprung up between the humoralists and the advocates of the doctrines of irritation : the former maintaining the almost exclusively humoral origin of all organic diseases, the latter asserting the full power of local irritation to cause every variety of organic alteration.

posing them to causes of irritation, we thereby favour the metastasis of the morbid matter to the irritated organ, and endanger the life of the patient.

The neglect of this important precaution may be, I have several times seen reason to believe, the cause of the transference of gouty matter to the stomach, and the occasion of a fatal event.

I now pass on to the third cause of interference with the manifestation of symmetry, which has presumed relation to the amount of any given morbid matter present in the system. The influence of this, although not a matter of direct observation, is, I believe, not the less real.

It may be conceived to take effect in this way—So long as the amount of any such matter present in the blood remains small, its whole mass may be spent on a single part, but when this amount increases, and becomes more than sufficient to saturate, if I may so speak, the part first affected, the fellow part then becomes the seat of a similar lesion. The part first affected will be, *cæteris paribus*, that for which the affinity of the morbid matter is the strongest.

And, in conformity with this, I have observed, that, in a great number of symmetrical diseases which have fallen under my notice, the affection of one part has begun before that of its fellow, and, in the part first affected, has generally attained a higher degree than in the other. From this it appears also that the interference from the cause now considered is in general temporary only, and resolves itself into an affair of date.

This is very well shown in the following passage from the memoir by M. Bizot, to which I have already referred :—

" Ainsi qu'en un point du vaisseau, on trouve une fort petite tache jaune, il y a grande chance pour qu'au point correspondant de l'artère symmétrique, il en existe, aussi, une ; mais, cependant, cela peut ne point se rencontrer ainsi, parce qu'il n'arrive pas constamment que le début de ces alterations ait lieu des deux cotés d'une manière parfaitement simultanée, et cette explication est si bien l'expression de la verité, qu'il est infiniment rare de trouver une tache un peu developpée d'un coté, sans en voir aussi une de l'autre ; mais elles différent quelquefois en étendue, l'une ayant débuté avant l'autre. Ces legères différences pourront aussi exister quant au nombre des taches developpées en deux points symmétriques, et quant au degré plus ou moins avancé de leur transformation : ainsi l'on pourra trouver un petit point osseux déja developpé au centre d'une tache jaune tandis que du coté opposé ce point osseux n'existera pas encore, ou bien, au contraire, aura déja atteint des dimensions plus considerables."—(Op. cit.)*

* I gladly avail myself of every opportunity of quoting the observations of writers, who, having no speculations to connect with these curious facts, have no motive for overstating them.

The passage quoted in the text, is, in this respect, particularly valuable, as coming from one of the disciples of a school, of which it is difficult to say, whether it be more remarkable for the faithful and scrupulous exactness of its records, or its unqualified distrust and entire renunciation of all speculative considerations.

In other cases, when the supply of the morbid matter ceases, after having produced its appropriate effect on the part first affected, the symmetrical part will remain untouched, and the symmetry usual in the case will fail. How suddenly the production of a given morbid matter in the system may cease, is beautifully shown by those interesting records of the chemistry of the living body, the alternating calculi.

In effect of these several causes of prevention, or interference; namely, febrile movement, mechanical injury, or other agency materially affecting the organic state of any part; and, lastly, variations in the amount of a given morbid matter present in the blood,—numerous exceptions to the law of symmetry *necessarily* occur even in those diseases the most remarkable, in general, for the perfectness of the symmetry they exhibit.

Other causes of interference, less open to observation, there probably are, which multiply still more the cases of exception.

If indeed the presumed relation of the agencies concerned in giving these diseases their peculiar character, to those presiding over ordinary assimilation, be real, we shall gain the best view of the nature and influence of such causes, by studying those by which ordinary assimilation is affected. Now among the most influential of these is the exercise of function, and the *wear* of parts; and in this quality, the greater strain of arteries at certain points, and the pressure and mechanical shocks to which

certain joints are peculiarly exposed, are probably materially concerned, as many writers have suggested, in determining the seat of deposits in these particular structures.

Lesions of innervation, whether temporary or permanent, must also have appropriate effect.

In short, as already hinted, any cause, of whatever kind, materially affecting the organic state of a given part, must materially alter the relation of the blood to that part, for the time being, and thus modify every process in which both are concerned.*

Having now laid before the Society, facts sufficient to show that symmetry of lesions in disease has, in the frequency of its occurrence, in the definite character of its results, and in the nature of the agencies by which they are realised, ample claims to the title of a *law*; and having, further, endeavoured to show that the manifestation of this law depends on a peculiar quality of certain matters, whose presence in the blood constitutes the essential condition of the diseases in question,—two objects of inquiry, of the first importance, at once suggest themselves—

First. What is the specific nature and chemical character of the morbid matter peculiar to each of

* It is interesting to remark that the cerebro-spinal system of nerves, which offers in its peripheral distribution one of the most perfect examples of symmetrical structures, is, except in lead-poisoning, very seldom affected by disease in a symmetrical manner. This fact leads to curious inferences.

these forms of symmetrical disease? (Lepra, rheumatism, &c.) And,

Secondly. What, in each case, is the source of this matter, and how does it find admission into the blood?

These, it will be seen, are most abstruse and difficult questions, requiring for their complete elucidation, long-continued and searching investigation of various character; itself demanding for its prosecution, the most accurate chemical knowledge on the part of the inquirer.

Also in the brief and cursory discussion of them which is here attempted, the considerations advanced are, at once, of very general and presumptive character, and are offered with great diffidence. As the little I have to say in reference to the first of these questions will be elicited in the shape of inference from the discussion of the second, I shall consider them in the order which this relation suggests.

In considering, generally, the source of morbid matters existing in the blood, it may be safely assumed at first (excluding, for the present, one or two examples of infectious diseases which exhibit a certain degree of symmetry in the arrangement of their lesions,) that these matters are either formed in the blood itself in the exercise of its multiform relation to the tissues—or are introduced by absorption from without, in the shape of food or other ingesta.

Under the latter supposition, two cases may occur; the morbid matter may either be a product of digestion, or may be introduced from without, in proper form. Of this, the case of symmetrical eruption from iodide of potassium, already cited, is an example. The circumstances of that case may, therefore, be further inquired into, with the view of ascertaining how far other cases of symmetrical disease, of humoral origin, may have a similar source.

Now the important circumstance of that case, in relation to this question, is, that when the supply of the morbid matter was withheld, the affection almost immediately ceased: thus showing that the union of the active matter with the tissue affected was not of permanent kind, but liable to be continually dissolved by the vital processes, and the matter, being thus set afloat in the circulation, to become eliminated from the system. And a variety of considerations,* which I need not now allege, have led me to infer, that, with the exception of the few examples of symmetrical disease in which the

* Such are largely furnished by the analogies found in the action of those medicines which take effect after absorption, so fruitful of illustration for every part of this inquiry. For of the great number of these which are detained and become accumulated in the tissues on which they exert their special actions, very few enter into permanent union with these tissues, but far the greater number are soon set free and eliminated from the body. Evidence to the point affirmed in the text is also seen in the frequently sudden disappearance of eruptions under the influence of various causes, often trivial in operation.

lesions take the form of permanent deposits—as in atheromatous arteries—and with that of one or two other diseases, which will be particularly referred to hereafter, and to which, therefore, these remarks do not apply, the same is very generally the case with the lesions of other symmetrical affections: that in the greater number of these, as in the case just referred to, the union of the morbid matter with the tissue affected, is not of permanent kind, but liable to be readily and continually dissolved, by the constant operation of the vital processes.*

And this is especially true of affections of the skin, which constitute so large a group of the peculiar diseases which form the subject of this paper.

Admitting this proposition, the continuance of these affections must, therefore, necessarily depend on continuance in the supply of the morbid matters

* In the application of this proposition to particular cases, some variation in the strictness of its terms must be allowed in consideration of the real variation which must necessarily occur in such complicated effects. Thus the degree of permanence of the union of a given substance with a particular tissue, probably depends as much on the degree of permanence of the elements of the tissue itself, as on the nature of the substance. And how much this varies in different tissues, and in the same tissue at different periods of life, is well known to physiologists, and is admirably shown in the bones, particularly in the different effects of madder on the bones of old and those of young animals. The proposition above stated must not, therefore, be taken in an absolute sense, nor the inferences drawn from it be regarded as absolutely conclusive.

which are their cause. And, as a great number of these affections are of long duration,—for the most chronic are, as already shown, those which exhibit the most perfect examples of symmetry,—this supply must admit also of being kept up for long periods of time. Now, if this condition be viewed in relation to the question under consideration, it will at once be seen, that circumstances very seldom occur, in which a permanent supply of matters, so effectual, and so specific in action, is furnished in the shape of ingesta.

And the frequent continuance of these chronic affections in particular cases, in spite of great change in the quality of these, and the circumstance of their often affecting but one of many persons situated exactly alike in regard to food, leave no doubt of the general truth of this inference.

It may, therefore, be considered as pretty well established, that almost the only cases of this kind which are caused by matters introduced in proper form from without, are such as are, like that of the eruption from iodide of potassium, so often referred to, of very short duration.*

If, therefore, the more numerous cases, of chronic course, and long duration, be caused by matters supplied by the ingesta, these matters must necessarily be products of digestion. But to this view of their origin, it may also be objected, that the process of digestion, which is so liable to be modi-

* The palsy from lead is, however, a striking exception.

fied in its results by changes in food, and the many other causes of disturbance to which their function is so peculiarly exposed, is not likely, often, to furnish a permanent or long-continued supply of morbid matters, so specific in action, (each causing, through a long lapse of time, the same specific form of lesion) and, therefore, definite in composition, as these matters must necessarily be.

As diminishing the weight of this objection, it must, however, be admitted, that in certain forms of disordered digestion, abnormal substances of very definite composition continue to be formed for long periods of time, notwithstanding great changes of diet, and the employment of medicines known to exert, in general, very powerful modifications on the results of this process. Of this, diabetes offers a very striking example.

Abstractedly, therefore, we can see no reason why the morbid matters of these chronic forms of symmetrical disease may not, in some cases, be formed in this way; and, indeed, the interesting case related by Frank,* of a young man in whom, for a long period of time, an eruption of nettle rash came out largely over the person, every day at a regular interval after dinner, although spirituous liquors were never taken, was probably a case in point. How

* Willan's Delineations, p. 410. I am inclined to apply the same interpretation to all cases in which articles void of noxious properties, and which are taken with impunity by most persons, produce in others severe general disorders, followed by eruptions.

far a similar origin is probable in other forms of disease, can only be determined by attentive investigation of particular cases.

At any rate, where this happens, it would seem highly probable that the formation of such active principles in the process of digestion would be attended with some direct evidence of disorder in the process itself, or that the affections of which these principles are the cause, would exhibit towards that process some such relation, in point of time, as that observed in the case just quoted.

Now, it is precisely from having remarked the entire absence of any such connection in a great number of cases of many different forms of these diseases, that I have been led to infer, that in the greater number of them, the morbid matter is not a product of digestion, but is formed in the blood itself, probably in the shape of complementary principles, generated in the manifold acts of assimilation, disintegration and secretion, to which that fluid is subservient.

Still, however, the inference drawn from the former of these considerations, is far from being decisive, since other facts show, that agents causing serious mischief in remote tissues may be absorbed from the intestinal canal, without occasioning appreciable symptoms of irritation on its surface; so that here, again, we must rest content with probability, in default of better evidence.

As somewhat strengthening this probability, may however be cited the great difficulty experienced in

the cure of these diseases, and arising, in many cases it is believed, not so much in the want of medicines having a real power over them, as in our inability, from the nature of the case, to introduce medicinal agents in sufficient amount, and with sufficient preservation of their active properties, to tell with effect on processes carried on so deep in the system, and so remote from the surface at which these agents gain admission.

Other facts of more peremptory import will appear in the history of individual cases, to be related hereafter.

But, whether the morbid matters of chronic symmetrical diseases be products of digestion or of processes carried on between the blood and tissues, it will appear at once that these matters are, of necessity, organic compounds, or such among inorganic as are incidental to the human body; a fact which places them in contrast with those inorganic compounds which, like iodide of potassium, gain casual admission into the system, and which gives us a footing, from which to go forward on more specific inquiry into their chemical nature.

Among such of these matters as are clearly generated in the blood, an important division may be made,—into such as have no power within themselves of multiplying in the blood, independently of their original source, whose amount therefore is limited by the supply from that source,—being, in this respect, on a level with simple chemical substances, introduced from without; and

such as have, on the contrary, a power of self-multiplication, and whose ultimate amount may have no proportion to that of the original supply: these latter also being, for the most part, susceptible of transmission, with their active properties, from one organism to another.

For although, in the casts and drawings laid before the Society, the instances taken from the group of contagious diseases are few, and although many of the remarks in the preceding pages apply less strictly to them, I may now state, that many of that group, and especially the chronic forms of disease, exhibit a very manifest degree of symmetry in the arrangement of the lesions by which they are characterised.*

But this symmetry is, in general, far from being so perfect as in the group of diseases already treated of; for while in these, corresponding joints are often affected so alike, that one is almost a model of the other, and eruptions repeat themselves on corresponding surfaces, almost spot for spot; in the others, joints (as in syphilis, for instance) are seldom affected in *pairs*, and eruptions are symmetrical, in so far only as affecting the same aspects, their likeness seldom descending to exact pattern, and still less to equality in number of spots.

And this is no more than might have been

* Whether the symmetry often observed in the spreading of erysipelas fall within the law before enumerated, or is a fact of another order, (contamination by contiguity,) I am not prepared to decide.

expected, whether we regard the great variety of tissues on which most of these poisons exert their action, giving evidence of less determinate affinity, or the remarkable peculiarities of their nature,—so unlike, in essential properties, to common chemical agents, and therefore less likely to be influenced by those agencies which regulate the actions of the latter.

Nevertheless, in syphilitic diseases of the bones, and in gonorrheal rheumatism, a very remarkable degree of symmetry is often observed, and the same is true of syphilitic diseases of the eyes.

Apart from all these, and still more remote in nature from common chemical agents, is the morbid element of cancer. This element is, in fact, not a mere chemical agent, but an organized form, possessed of vital endowments.

And from the almost perfect agreement between the cancer element and globules of pus and mercury, in the manner of their dissemination, after they have found their way into the blood, it may be clearly shown, that the distribution of disseminated cancer is, in great part, determined by mechanical conditions.* And although this leads to a certain kind of symmetry in arrangement, since these conditions must be alike in double organs, it is sufficiently obvious, that the fact is different in its nature, and in that of the agencies by which it is

* See a paper by the Author, "On the Pathology and Causes of Cancer," in the Lancet, for May the 21st and 28th, 1842.

determined, from those which form the subject of these pages.

With the exception of some brief remarks, in the shape of comment, on one or two cases to be related in conclusion of this paper, I here close what I have to say on the specific nature and chemical character of the morbid matters of symmetrical diseases.

I much regret the very general and doubtful character of the little I have had to communicate on these points; and the more, because it is evident from all analogy, that in diseases which are the effect of abnormal matters in the blood, it is the specific nature and chemical character of these matters which *mainly** determine the course and character

* I say *mainly*, because it is evident that in this variety of effect other conditions are concerned. That of seat in particular, though in itself partly determined by the specific nature of the cause of disease, has close relation to the action of remedies. The twofold way in which the action of a given remedy is governed,—on the one part by the specific nature of the cause of disease, and on the other by the seat this disease may affect, is most clearly illustrated by the curative effect of iodide of potassium in syphilitic periostitis. It is certain that the specific nature of the poison has essential relation to this effect, for iodide of potassium is of little or no efficacy in periostitis from other causes, as I have myself had frequent opportunity of ascertaining. The relation which seat has, on the other hand, to this effect is shown by the fact that this medicine is of little or no efficacy in syphilis affecting many other textures. It cures the periostitis, but does not remove the syphilitic taint.

In the relation of colchicum to gout, evidence of the same purport may be had. All blood-medicines must be regarded in this

of the affection in each specific form of disease, and which governs the relation of remedies towards it; and especially of such as exercise a specific curative action.*

And in an exact knowledge of the chemical constitution of these matters, we shall probably find the best clue to their source in the living economy.†

double point of view. From want of clear perception of this important distinction in practice, much misapplication of remedies occurs, to the disappointment alike of patient and physician.

* It is in this direction we must look for the largest and most important additions to our knowledge of the nature of inflammation. In all that concerns the state of the circulation in inflamed parts; the changes the blood undergoes in the proportion of its staminal principles; the organization of effusion; the formation of pus; and, finally, the relation of antiphlogistic and other general treatment to these several conditions,—our knowledge is already tolerably precise, and will scarcely admit of much greater advance. But looking at inflammation, as originating in disturbance of the normal relations between the blood and a given part, it will at once be seen that this disturbance may be effected in two ways; by modification begun in the blood itself, or in the part affected; and abundance of facts might be adduced, to show that inflammations of the same structures, originating thus differently, differ widely from one another, both as regards their course and general character, and the relation of remedies towards them. But the more we reflect on the circumstances attending the invasion and after-course of inflammatory diseases in general, the greater will the number appear of those which are of humoral origin, and depending on contamination of the blood with morbid principles.

Of the exact nature of these principles in each species of disease, so important in its influence on the nature of the case, we are, for the most part, entirely ignorant.

† The ingenious idea of tracing abnormal principles to their

The attainment of this knowledge is indeed a task beset with difficulties of no ordinary kind, but nevertheless one which falls quite within the scope of direct investigation, and, moreover, lies in the precise direction which chemical inquiry is at present taking. We need not therefore despair of seeing in time its full accomplishment.

source in a given tissue by means of analogy in the chemical composition of the two, originated, I believe, with Dr. Prout, and many novel theories are founded upon it in his profound and important work on stomach and urinary diseases. But seeing the close analogy in the chemical constitution of many of the animal tissues, and bearing in mind, also, the great freedom and latitude of chemical transformation, which is the peculiar characteristic of organized compounds, freedom allowing of great variation of result under slight variation of conditions, it may fairly be questioned, how far this analogy is a safe ground of deduction, especially as regards the origin of *organic* compounds. Dr. Prout indeed does not trust to it alone, but states that he has other reasons for placing reliance on the indications thus afforded. These reasons he does not explicitly declare, but one of the most important seems to be derived from the supposition, that various lesions of the skin, and of the joints, may be regarded as processes for the formation of certain of these compounds. But if the view of the nature of these affections maintained in the text be correct, they must be regarded, not as the *source* of abnormal principles, but the *effect* of such, generated elsewhere. Until, therefore, more certain authority is shown for relying on analogy in chemical composition as evidence of the origin of disorganized compounds in particular tissues, this analogy must be received as suggesting research, not supplanting it: nevertheless, this is one of the many valuable clues to discovery, which we owe to the sagacity of this profound inquirer.

I shall now ask permission to relate some cases in illustration of the views developed in the foregoing pages.

Elizabeth Alford, aged 18, is affected with lepra over a large surface of the person. The arrangement of the eruption is as follows :—

The dorsal aspect of the arms and forearms thickly set with leprous spots, more crowded than elsewhere, on a line forwards from the point of the elbow, where indeed scarcely any intervals occur between them. The eruption vanishing upwards towards the shoulders, and downwards about the wrists, there being however a few imperfectly-formed spots, not covered with scales, on the back of each hand.

The palmar aspect of the whole limb almost fair, and only sprinkled with a very few imperfectly-formed spots. The front (corresponding) aspect of the leg and thigh beset with leprous spots in the same manner of arrangement, and within corresponding limits; the eruption occupying the front aspect only, and most crowded in a line downwards from the patella, vanishing upwards towards the groin, terminating below at the ankle, with the exception of a few imperfectly-formed spots on the instep (illustrating in these several circumstances the symmetrical analogy of the upper and lower extremities).

The eruption on the right arm, and right leg, offers an almost exact agreement, in its arrangement

and limits, with that on the left arm and left leg. On these limbs is the thickest of the eruption. On the trunk there are a few spots widely scattered, and without very evident symmetrical order.

On the face also there are a few imperfectly-formed spots, not strictly regular in their distribution, though offering a very manifest degree of symmetry in their general arrangement.

In the front of the ear, at the termination of the hairy scalp, on each side, are two large oval spots, one the exact likeness of the other.

William Alford, aged 17, and brother of the last, is also the subject of lepra, which does not however cover a large surface.

There are a few isolated spots on the arms and legs, the spots on the limbs of one side corresponding to others similarly situated on the other.

On the trunk, the spots are numerous, but mostly isolated, and offering a very manifest degree of symmetry in form and arrangement. The same of a few on the face. On each eyebrow is a series of spots disposed in lineal manner, and following the course of the eyebrow. One series an exact pattern of the other.

In both these persons the lepra appeared a few years ago, without apparent cause. They do not remember the exact order in which the eruption appeared on the series of parts it now occupies.

General health good, and to all appearance nowise affected by the disease. Digestion easy, and not subject to disorder. Once or twice the lepra has

disappeared during the internal use of liquor arsenicalis, but has again returned soon after the medicine has been given up. During the temporary disappearance of the eruption, the health continuing good.

The father of these two persons was also, when young, the subject of lepra, covering a large surface of the body. Under the continued use of liquor arsenicalis, and sea-bathing, it entirely disappeared, and has not since returned to any great extent, though a few isolated patches appear from time to time about the elbow, and remain for a week or two.

Does not know what was the cause of the disease in his case, nor whether similar eruptions had before occurred in his family. Has three other children younger than the leprous subjects, but past the age at which these became so. These three have no eruption of any kind, nor any disorder that may be regarded as equivalent, being in all respects healthy. All these persons live together, and use the same food. None of them take sugar habitually.

Now it is evident from the circumstances of this history, that the lepra-matter was not in these cases furnished ready-formed in the ingesta.

The disease was, in fact, as it so often is, hereditary; showing, that the formation of the morbid matter depended on original structure, and on the actions of the body, as governed by this structure, upon the materials appropriated by it.

I shall not repeat here the arguments already

brought forward, in the general discussion of this question, by which it is rendered highly probable that this matter is not formed in the process of digestion, and introduced into the blood by absorption, but is generated in the blood itself, in certain of the manifold acts of assimilation, or disintegration, which are accomplished in those deep recesses of the system, where the blood and tissues meet in molecular relation.

But admitting this point, we are entirely unprovided with a clue, to trace the morbid matter further to a specific source in the economy.

It will, however, be asked in particular, Is not this matter formed in the seat of each individual lesion? This is a question which repeats itself for every form of these affections, and the answer to it is implied in the view taken of their nature in the foregoing pages. For, as an essential part of that view, they are all regarded as affections caused by special morbid matters, not originating in the seat of lesion, but supplied from another and independent source, of which, for the sake of illustration and distinctness, the case of eruption from iodide of potassium, and that of paralysis from lead, may be alleged as unequivocal examples.

I need not, therefore, now bring forward the additional evidence to the same effect, which analogy furnishes, in great abundance, in the history of gout, and other diseases of humoral origin.

In the instance of lepra itself, the circumstances usually attending the invasion of the disease tell

strongly in favour of this view. For the appearance of the eruption is almost invariably preceded, for many days, by severe symptoms of general disorder. The eruption at length comes out, and the general disorder at once subsides. Now, if we seek from analogy a rational interpretation of these facts, there will scarcely be a doubt, that accumulation of the lepra-matter in the blood is the cause of the general symptoms. So long as this matter accumulates, and continues to circulate in mass with the blood, it is free to set up disorder in the system at large; but as soon as it is appropriated by the skin, the general disorder at once subsides.* Reason, and

* I cannot forbear from calling attention to the very close analogy between this fact and that which has received the name of *toleration*, in the case of certain medicines which take effect after absorption into the system. It is well known that certain of these, so long as they continue to accumulate in the system, and circulate in mass with the blood, set up very serious constitutional disorder, but as soon as they become derived to a particular part, on which their action is then specially exerted, especially when this part affords an outlet from the body, the constitutional disorder ceases. I could adduce experiments of the most exact kind, instituted on agents of marked chemical character, showing that this is a true statement of the case, and the real relation of the phenomena; most valuable, therefore, for the very distinct illustration they afford of the views in the text.

But what is most remarkable is, that when once this direction to a particular part has taken place, that very fact becomes a cause, just as a nucleus causes accretion of similar crystalline substances around it, for all future supplies of the same matter to be drawn to the same part, so that, however free the supply may afterwards be, there is less danger of accumulation in the general mass of blood, less danger of general disorder. Familiar exam-

analogy of the strictest kind, concur to show the truth of this interpretation.

On the first formation of the lepra-matter, therefore, and while it is accumulating, there is no evidence of any mischief going forward in the skin, and no ground for a presumption, even, that it originates in that tissue. And there certainly is no reason to suppose that the source of this matter is, afterwards, different from that it had at first.

And circumstances of similar import may be remarked, in the invasion and course of other symmetrical affections of the skin, and which lead, consequently, to the same inference.

I may now add that the arrangement of the leprous eruption in the person of Elizabeth Alford, both as regards the parts most affected, and the symmetry of distribution, is not a rare or exceptional case, but that which is most usual in the disease. Willan had remarked this, and the symmetrical arrangement of lepra is, in particular, often adverted to in his great work on skin diseases; although he drew no inference from the fact, but merely spoke of it

ples of this are seen in the administration of mercury and tartar emetic.

In the same way, when the specific matter, which is the cause of a given disease of the skin, has once become directed to that tissue, all future supplies of the same follow the same direction. Indeed, this a fact of very wide-spreading and important effect in pathology and therapeutics. But this fact must itself be governed by another, more fundamental, and the discovery of which will probably give us clear insight into many of the most obscure phenomena of disease.

as a curious circumstance. His words are these :— "The lepra, almost constantly, affects both sides, appearing at each elbow or at each knee about the same time, and extending from thence along the limbs in a similar manner."* And having noticed the same fact in other scaly diseases, he says in another page, when speaking of psoriasis gyrata,—

"The uniform disposition of these patches is *singular*—I have seen a large circular one situated on each breast, above the papilla, and two or three others of serpentine form, in analogous situations, along the sides of the chest. The back is often variegated in like manner, with convoluted letters similarly arranged on each side of the spine."†

The three cases of lepra above related, are, according to the theory of those affections maintained in the foregoing pages, further interesting, as examples of the formation of identical morbid matters, of specific kind, in several individuals of one family, differently situated in regard to age, sex, and other influential circumstances.

Prurigo, lichen, and many other cutaneous affections, abound in examples to the same effect. The same fact is seen, in a different form, in those very remarkable instances in which urinary calculi, of rare kind, and of identical composition, occur in several members of the same family; instances, in which the continued elimination of the same chemical matters, *in substance*, leaves no doubt of the nature of the case; and, on this account, valuable

* Delineations, &c., p. 117. † Ib. p. 163.

for the very explicit illustration they afford of the more obscure examples of the same fact, which form the subject of this paper, and in which this kind of evidence is not to be had.

The most interesting cases of the kind referred to, are, perhaps, those of cystic oxide calculi; on account of the rareness and peculiar nature of the material; but those of oxalate of lime are scarcely less so, seeing the great variety of conditions, in regard to age, and other important circumstances, under which they occur.

All cases of this kind are of peculiar interest to the practitioner, whether regarded as evidence of the predominant effect of original constitution over external circumstance, in many serious forms of disease; or as giving explicit reason, *in direct measure of this predominance*, of the peculiar difficulty experienced in their cure. I have in my possession a considerable number of cases, of other forms of symmetrical skin disease, and, in particular, of eczema, which is especially remarkable, for the exactness of the symmetry it often exhibits.

Many of these cases are of much intrinsic interest, but as they do not serve to open any general views beyond those already developed in the foregoing considerations, I will not trespass on the indulgence of the Society by relating them.

But, before I leave the subject of skin diseases, I must touch upon a question which is naturally raised by the whole tenour of the foregoing observations.

If these various affections of the skin be the effect

of specific principles in the blood, are these principles, of necessity, specifically different for each of the *nominal* types of skin disease, for eczema, and for different forms of scaly disease, for instance?

The case of syphilis is decisive of this question; for, in that disease, it is well known that all the *nominal* types of authors may be the effect of a poison of a single specific origin. In the history of skin disease of other origin, there is evidence to the same effect, of which the frequent transition, *in situ*, of lichen into psoriasis guttata, (that is lepra,) is a very distinct example.*

But the same facts also show, that if different types of skin disease be the effect of one specific cause, types *nominally* the same may also be the effect of matters *specifically* different. It is the knowledge of the specific nature of these matters, in each particular case, that alone can give us clear insight into the nature of these affections, and until we have attained that knowledge, we shall constantly be confounding diseases essentially different, and making distinctions between others where no essential difference exists.

That we are daily committing this twofold error, seems alike probable, from the equal and remarkable efficacy of certain remedies in diseases of the skin, very different in *nominal* type, and, on the other hand, from the signal success attending the employment of a given remedy in one case, and the utter failure of the same remedy in another, bearing the

* Willan, p. 153.

same name in our present systems of classification.

And it is further evident, that until we shall have discovered the relation of these remedies to each kind of these specific morbid matters, it will be entirely out of our power to collect any precise experience touching their efficacy.

From these remarks, it sufficiently appears, that the only true and natural classification of these diseases must, eventually, be constructed with reference to the specific nature of the morbid matters which constitute their essential cause, and the best cognomen for the generic groups thus formed will be derived from the name of the specific principle common to each group.

Of the way in which this method may be applied to our present nomenclature, the example of syphilis affords an excellent precedent, and of the degree of light the discovery of the specific causes of these affections may be expected to throw upon their treatment, that same disease gives a striking illustration.*

I now proceed to give an account of some instances of symmetry in diseases of other structures.

* How forced and unnatural is the present system of classification, is strikingly shown in the fact, that scabies is placed in the same category with many skin diseases of internal origin, merely because characterised by a vesicular eruption.

Symmetrical Affection of Joints and other parts.

William Godfrey, aged 70, formerly employed in a serge factory. About seven years ago was confined to his bed and room for several months, with rheumatism, affecting all the joints of his limbs. They were much swelled, stiff, and painful, and for some time, to begin with, there was considerable fever. Does not remember whether or not the joints were then affected in any definite order.

During the course of the illness, his eyes became very painful and inflamed, and, eventually, affected with cataract.

The rheumatism gradually left all the joints, but those of the *hands* and *feet* (analogous parts). In these, it continued many months in chronic form, causing much distortion.

The disease came on without apparent cause. Never before had it, or other severe illness, but has always been delicate and ailing.

Suffered much, some years before, from bleeding piles, but these had become quite well some months before the attack of rheumatism.

Rheumatism not, he believes, a family complaint. Always of temperate habits.

Present state.—The only joints now affected are those of the hands and feet. The hands exhibit distortion, in character exactly like that of the cast shown in Plate II. The distortion of the feet less advanced. Both eyes affected with cataract.

The distortion of the right hand is greater than that

of the left, of the right foot greater than that of the left foot. The cataract of the right eye more complete than the left, there being total blindness of the right eye, while the left still admits light.

In this case there are two facts which demand particular comment: the first is the distinctly rheumatic origin of the cataract, showing, according to the views here adopted, that this affection may be the effect of a specific morbid matter in the blood; a fact, I believe, already recognized by the profession, and, which many circumstances concur to render probable, is very general in the disease.

Another fact, which might become of great interest, if not mere coincidence, (and several other instances of it, which have fallen under my notice, lead me to think it was not so,) is the more advanced degree of the disease, in all the parts affected on the right side than in those on the left, indicating, under the condition before named, a material difference of organic composition pervading half the body; placing these affections as tests and measures of such difference, in a very curious and striking point of view; and, lastly, drawing still closer, in this particular case, the connection between the cataract and the joint affection.

I have accurate notes of many other cases of this disease, still more remarkable than that just related, for the exact symmetry of their lesions.

On looking over the series of casts and drawings taken from them, one cannot fail to be struck with the singular likeness and uniformity of the

distortions they exhibit. In this, we have the best proof of the very special nature of this disease, for no proof of the speciality of a disease, and thence of its cause, is so striking as a uniform tendency to affect the same series of parts in the same order, and to effect, in individuals not otherwise related, structural changes of these parts so singularly alike, as those shown in the casts and drawings now submitted to the inspection of the Society.

The principal structural change found in cases of this kind is more or less complete absorption of the articular cartilages. In sequel to this, the form of the heads of the bones becomes much altered, and ankylosis or dislocation follows. No deposits of lithate of soda ever occur in the affected parts, and from this we may safely infer that the disease is essentially different from gout.

I have no other remarks to offer on this affection, except that it is much less prone to shift than gout or common rheumatism, that it is more common in women than in men, that it seldom comes on before middle age, and that it is occasionally excited by the puerperal state. This fact was remarked by Cruveilhier, and the person from whom the cast represented in Plate II. was taken, offered an example of it.

In conclusion, it may be well to give a summary of the leading observations dispersed over the foregoing pages.

It will be seen, that the subject of inquiry was opened with a general survey of the different forms under which deviations from the normal state affect the body symmetrically.

Several cases, entirely different in nature, were recognized, but admitting of division into two principal groups, namely, deviations arising from original fault in the solids, and those which originate in morbid states of the blood.

Of the former, symmetrical monstrosities were taken as an extreme case, and a fit type;—a case already considered in science, and when viewed in connection with its manifestation in animals, plants and crystals, constituting a mysterious order of facts; quite insusceptible of further analysis in the present state of knowledge, and inaccessible to all known speculation.

The latter group, that of cases originating in morbid states of the blood, was further divided into those which arise from the presence of morbid matters, of special kind, in that fluid, and others which depend on deficiency of its natural ingredients. A large number of facts were seen to fall under the former description, and these facts were made the express subject of the foregoing inquiry.

In endeavouring to analyse the conditions, in virtue of which the body is affected, symmetrically, in this case, it was first established, that in any given disease of this class, the morbid matter concerned is detained in the seat of each individual lesion, and is there held in affinity with the part affected.

And this at once led to the following deduction: That the agency which determines the lesions to occur in symmetrical form in these cases is, in fact, *that* which determines certain morbid matters in the blood to fix on a given part, in preference to others of the same structure.

And it was further seen that this agency could be no other than a special affinity between the morbid matter and the tissue affected; affinity so elective, that the symmetrical or analogous parts of opposite regions of the frame are singled out by it, to the exclusion of all others, however like to these in outward appearance.

This view of the case constitutes the cardinal doctrine sought to be established in the foregoing pages. On it, almost all the other inferences depend, and on the full and complete development of it, in application to the remarkable cases which form the subject of this paper, any claims to originality these observations may be supposed to have, are chiefly rested.

It is, in fact, this view of their nature which imparts to these cases their peculiar interest and importance. For, thus interpreted, they exhibit the agencies which govern the special actions of abnormal elements in the blood, in a point of view which, whether in showing the intimate relation of these agencies to those which preside over ordinary assimilation, as curiously traced in many ways in the foregoing pages, or in evincing the special and elective character of their power, so strikingly manifested

in the limited and peculiar form their results here assume, as objects of sight, is singularly calculated to give clearness and simplicity to our ideas of their nature, and to aid in our perception of the conditions by which their effects are determined.

Viewed in connection with these several relations, the action of medicines, which take effect after absorption into the blood, and that of the specific matters of humoral diseases, receive equal elucidation, alike valuable in either case, for right guidance in practice.

Pursuing this subject further, it was clearly seen in what manner a tendency to metastasis in diseases of humoral origin might depend on the comparative indifference of certain morbid matters, in that affinity whose very elective character, in the diseases considered in this paper, was held to be the origin of their peculiar characteristic.

It was next shown, how, by reason of this affinity, the morbid matters of these latter diseases might be truly regarded as tests or measures of likeness or identity in organic composition; thus enabling us to discover in the drawings, and preparations laid before the Society, much curious and novel illustration of those laws of symmetry and organic analogy which govern the evolution of opposite parts of the frame.

The circumstances which may interfere with the usual and appropriate effects of this affinity of morbid matters for particular parts were then exa-

mined, and three influential circumstances of this kind especially recognised.

These were, febrile movement; lesion, or other material cause of organic change (in its effect in determining morbid matters present in the blood to act in preference on parts thus affected); and, lastly, variations in the amount of the morbid matter itself; conditions, to which a vast number of facts, both in pathology and therapeutics, are subordinate, and all largely influential, in giving variety of effect to a single physical agent, whether morbid or medicinal.

For not the least prominent feature which emerges from the considerations brought to bear on these various topics, was the great extent to which those medicines which take effect after absorption into the blood, and the morbid matters of a large class of humoral diseases, might be considered as exact types of each other, and their effects viewed in connection with the advantage of mutual illustration: thus communicating in some degree—small perhaps—but susceptible of indefinite extension to a large province of humoral pathology, that character of exactness which belongs to subjects of experimental inquiry.

The origin and chemical character of the morbid matters of the diseases treated of were the next subjects of discussion.

The observations which followed on these abstruse and difficult topics were offered with much diffidence, and all that could be elicited from them

was stated in the form of a general presumption to this effect: that some of these matters are introduced from without in the shape of ingesta, or are formed in the act of digestion, while others are engendered in the blood itself: but that the latter is the most common mode of origin in chronic forms of disease, the morbid matters being in this case, of necessity, organic compounds, or such among inorganic, as are incidental to the human body.

In the whole course of the inquiry, of which a summary is here given, it cannot fail to be remarked, that almost all the important and leading inferences, although arising out of the consideration of a comparatively small group of diseases, are nevertheless strictly applicable to a large proportion of all cases which originate in the presence of morbid matters in the blood, and which form the largest and most important province of humoral pathology.

And by the help of these inferences, it would not be difficult to lay down, in general terms, many of the fundamental conditions by which the course and character of these diseases are determined in each particular case. But these remarks have already grown to such length, that others must be left to accomplish this task for themselves.

To pursue these conditions into detail, to give them individual reality, and to assign their exact value in each specific kind of disease, form the proper objects of future research.

The mode and degree in which the effect of these

conditions may become complicated by vital or organic changes once effected, and the new elements these may introduce into the treatment of the case, are interesting problems in the physiology of inflammation, but form no part of the present inquiry.

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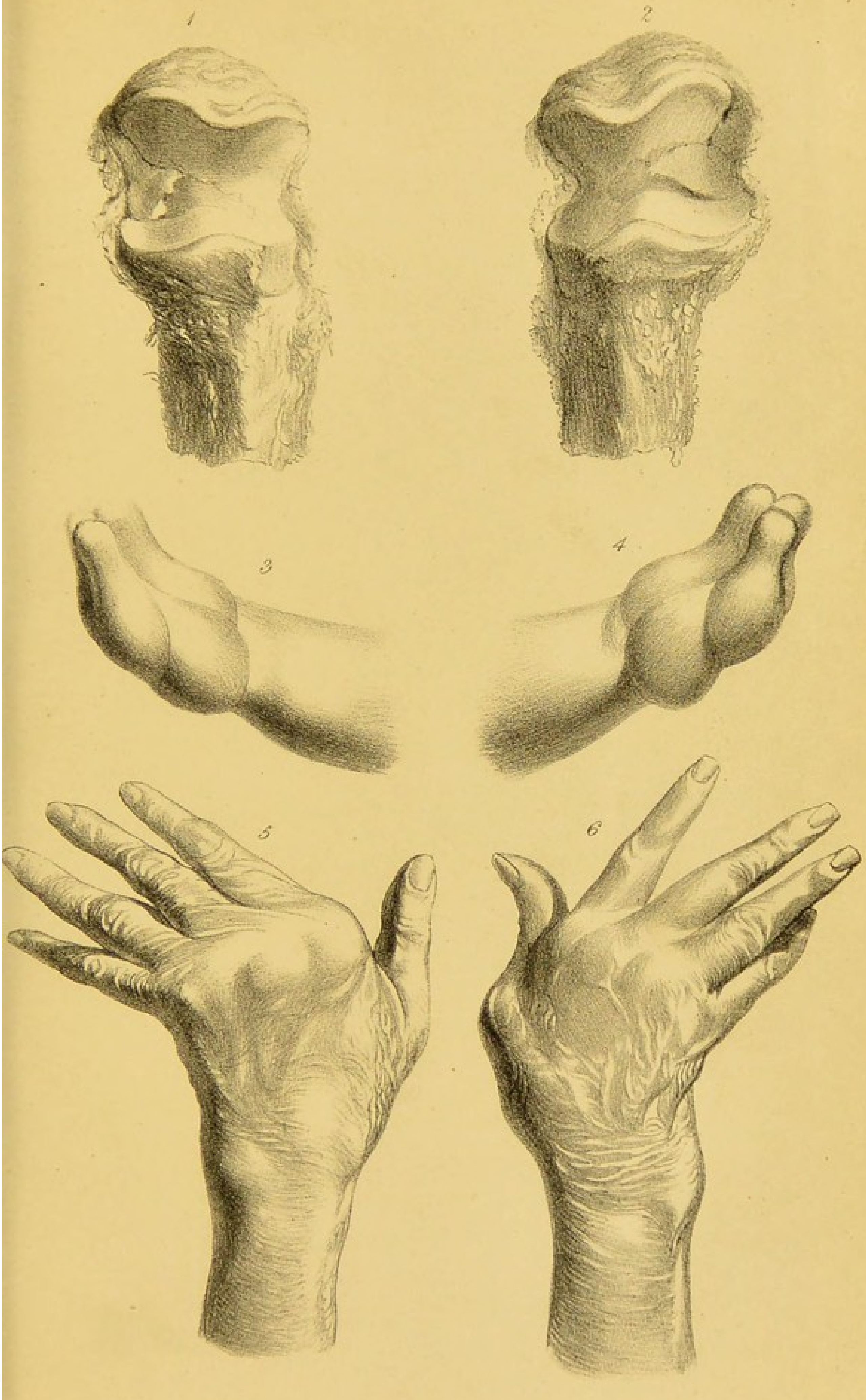
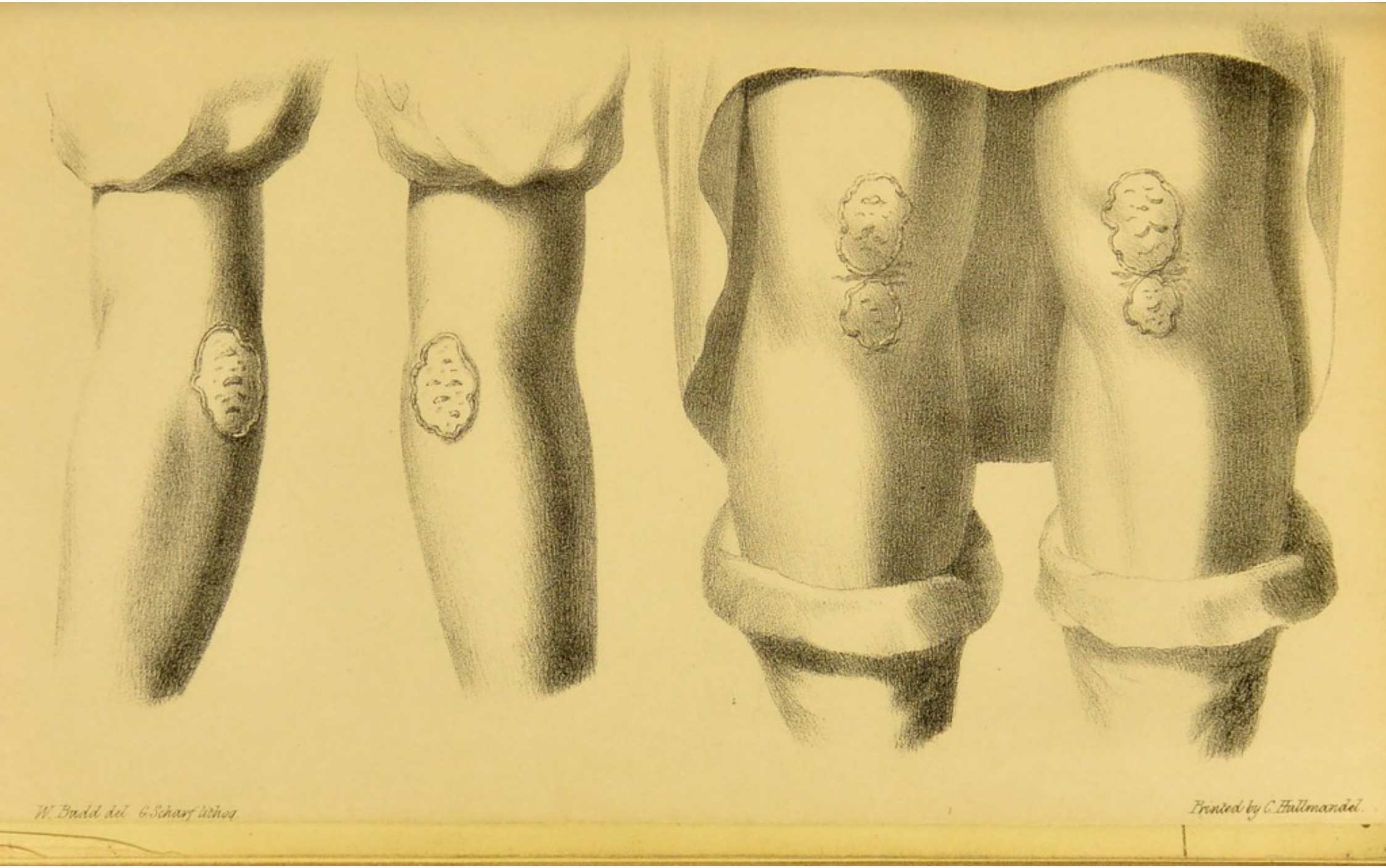


Fig. 1, 2, 5, 6 Lithog. from Nature by G. Scharf. Fig. 3, 4. W. Budd del. Printed by C. H. ...



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