The Ornithoscelida present a large series of modifications intermediate in structure between existing reptiles and birds. This transitional character of the skeleton is most marked in the pelvis and hind limbs. The ilium extends far in front of the acetabulum, and furnishes only a wide arched roof to it, as in birds. The front acetabular process is reptilian, being prolonged downwards; the ischium resembles that of the birds, being much prolonged in some forms, as for example in the Iguanodon. The lower extremity possesses a large crest and edge for the fibula; the distal end of the tibia is exactly the same as in birds; there is a fossa for the reception of the ascending process of the astragalus; the distal end of the fibula is much smaller than the proximal. The astragalus seems to have remained distinct through life in some genera, but in others to have become ankylosed to the end of the tibia. The reptiles belonging to this group were for the most part of very large size, the Iguanodon being one of the largest known terrestrial animals. Their thoracic vertebral ribs are very strong, but the sternal ribs and sternum are unknown. The skull seems to have been intermediate between crocodilian and lacertilian forms.

The Pterosauria contain the flying reptiles, which were remarkable for their long heads and necks, and for the modification of the anterior extremity into a wing, like that of the bat. The ulnar finger was very long, and devoid of a claw; the tail was very short; the skull very like that of a bird; and, in some species, this resemblance was increased by the presence of wide lacrimo-nasal cavities, and the beak-like form of the upper jaw. The scapulæ and coracoids were bird-like. The long bones enclose a large cavity, which appears to have been filled with air. Throughout the body, on the other hand, there are characters essentially reptilian.

LECTURE VIII.

THE birds have been separated into three divisions by Professor Huxley: 1. The Saururæ, in which the metacarpal bones are separate; the tail is longer than the body; and the ploughshare bone, which consists of the last two caudal vertebrae ankylosed together, is absent. Of this order, the Archaeopteryx is the only known representative. 2. Ratitæ, or those with raft-shaped breast-bones, in which the tail is much shorter than the body; the toes in many instances are diminished in number; the metacarpals are ankylosed together; and the wings, from being feebly developed in proportion to the size of the body, are useless as organs of flight. To this order belong many gigantic birds now extinct, such as the dinornis, as well as the largest existing birds—for example, the ostrich, rhea, and cassowary. It also contains the apteryx, a bird now, unfortunately, becoming rapidly extinct. 3. The Carinatæ, in which the sternum is provided with a keel. This order contains all the flying birds. The wings are well developed, with a few exceptions, chiefly amongst extinct birds. In its development, the bird is closely allied to the reptiles, as was shown in the first lecture. Remains of the reptilian exoskeleton may be seen in the scales which cover the metatarsals and digits of the bird; but no bird possesses dermal ossifications, unless the spurs sometimes found on the legs and wings are considered as such. The feathers which cover the surface of the body are of various kinds. Each consists of a stem made up of a quill and a van or shaft, bearing lateral processes—the barbs—which consist of narrow plates, with their edges directed upwards and downwards. The spaces between the barbs are occupied by barbules—pointed processes which stand in the same relation to the barbs as the barbs do to the stem or rachis, as it is called. The spinal column consists of numerous and well-ossified vertebrae. The cervical region contains from eight to twenty-three vertebrae, which are, as a rule, large in proportion to those of the rest of the body, and, like those of the crocodile, bear cervical ribs. The dorsal vertebrae vary in number. The sacrum is composed of six or more vertebrae; but of these, not more than from three to five can be considered homologous to the sacral vertebrae of the crocodile or lizard. The remaining are caudal vertebrae. The sternum is a broad plate of cartilage, which is almost always more or less replaced in the adult by membrane-bone; it differs in most birds considerably from that of the reptiles; but in the cassowary it is rhomboidal in form, and differs most from the reptilian sternum in being longer posteriorly, convex on its ventral surface, and wanting median backward prolongations. The extent to which the keel is developed varies very greatly. The skull presents many points of resemblance to that of the reptiles, especially during its development. The brain-case is generally more arched and spacious, and larger in proportion to the face, than in the reptiles; there is a well-marked interorbital septum; the nasal apertures are almost always situated far back, near the base of the beak. The posterior nares lie between the palatines and the vomer; the nasal passage is never separated from the cavity of the mouth, as the palatine plates of the palatine and pterygoid bones do not unite. The bones of the skull, and

most of those of the face, become ankylosed early, and are mostly undistinguishable from one another. The periotic capsule is completely ossified; the epiotic and opisthotic are ankylosed with the occipital segment before they unite with the pro-otic. The lacrymal bones are large. The frame of the tympanic membrane not unfrequently contains distinct ossifications, which represent the tympanic bones of mammals. The premaxillæ are triradiate bones of great size, which usually give off three processes—a frontal, a palatine, and a maxillary process; this latter forms the greater part of the margin of the beak. The maxillæ are usually slender rod-like bones, articulating in front with the premaxillæ, behind with the jugala. The quadrate bone is always movable upon the skull, articulating with the pro-otic, alisphenoid and squamosal, by a single or a double head. Each ramus of the mandible consists of six pieces, as in the other sauropsida; but the dentary pieces on each side unite very early, as in turtles. The mandible articulates with the quadrate bone, and not with the skull directly—in this respect agreeing with the other sauropsida. The hyoid bone is composed of basal elements, the anterior of which lies in the tongue; and of two short anterior and two longer posterior cornua, which are never united with the periotic region of the skull, and commonly remain quite free.

ON GOUT CONSIDERED AS A TROPHO-NEUROSIS.

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In this paper, I propose to consider such parts of the pathology of gout as may fairly be attributed to nervous influence.

In an essay published in *Brain*, in April of this year, I put forward some arguments which tended, in my opinion, to support views promulgated by Cullen and other writers, to the effect that gout was a malady of neurotic origin.

In seeking to re-establish the neurosal theory of gout, it became necessary to take full cognisance of the solid and accepted advances made during the last twenty-five years by Dr. Garrod, which go mainly to support the humoral theory of the disease.

It is plainly impossible to resist the evidence adduced in favour of the direct connection between an excess of uric acid in the blood, and manifestations of gouty disease. No part of the pathology of gout is so exact as this; and, whatever views may subsequently come to be entertained upon the whole of the pathology of the subject, the facts revealed by Dr. Garrod can never be set aside.

The uric acid theory of gout is held by many to be sufficiently evident, and explanatory of all its phenomena. Some physicians who have thought much upon the subject are, however, not satisfied that this theory covers the whole ground, and they go further back, and seek for the causes of the chemical aberration. If it be the case that full acceptance must be given to the teaching of Dr. Garrod, then it is certain that a part, at all events, of the pathology of gout is humoral, and it is vain to plead for a purely neurotic theory of the malady.

Dr. Garrod himself, with a degree of caution worthy of his truly scientific position, allows that his views are "in themselves insufficient to explain all the phenomena of gout". He has striven to meet every opponent to his opinions, with great power and ingenuity. He has, however, not attempted to combat Cullen's particular theory of the specific involvement of the nervous centres.

Sir Charles Scudamore, in his classical work on gout, paid no heed to this doctrine, and held a humoralistic theory. I am not aware that Cullen's neurotic views of gout have been anywhere particularly criticised. Senator, referring to the views of the solidists, represented by Cullen, remarks that it has never been able to hold its ground against the various humoralistic theories (Ziemssen's *Cyclopædia*, art. Gout, p. 101. English translation). Cullen's views tended to overthrow the theory of any special morbid state of the fluids in gout. This portion of his doctrine is now exploded; but the following sentences of his may, I believe, still serve as a text to assist in elucidating the pathology of gout. "Gout", he remarked, "is a disease of the whole system, depending upon a certain general conformation and state of the body"; and again: "Gout is manifestly an affection of the nervous system, in which the primary moving powers of the whole system are lodged. This leads us to look for an explanation of the whole of the disease in the laws of the nervous system, and particularly in the changes which may happen in the balance of its several parts. Gout shows more than any other pyrexia does of an affection of the nervous system" (*First Lines of the Practice of Physic*).

Cullen's pathological theory was not a narrow one in the sense of his taking the nervous system only into account, any more than was Sydenham's doctrine, which, though commonly regarded as humoral-

istic, has been pointedly shown by Dr. Ord to include both the solids and fluids of the body (Sydenham's *Treatise on Gout*, cap. xvii. *Vide On the Relation of Gout to Uric Acid*, by Dr. Ord, *St. Thomas's Hospital Reports*, p. 227, 1872).

At the present time, the purely humoral theory of gout is most commonly held. The late Dr. Murchison gave in his full adherence to it. "Gout," he remarked, "is merely one of the results of lithæmia; a gouty diathesis always indicates, and is the result of, hepatic derangement" (*Lectures on Disease of the Liver*, second edition).

The neurotic theory of gout appears to have been first promulgated by Stahl, in the earlier part of the eighteenth century. Cullen states that he adopted his views. Sydenham directed attention to the influence of mental exhaustion on gout. In more recent times, this theory has been held and discussed by Professor Laycock, by Dr. Meldon of Dublin, by Dr. Ord, and by Dr. Edward Liveing.

Concise expressed, the views of these several writers are as follows.

Dr. Laycock maintained that excessive activity of the nervous system, or of portions of it, became a highly predisposing cause of the neuroses; that these excesses, when habitual or long-continued, were apt to develop hereditary tendencies, and thus, that great mental labour, drunkenness, strain on special nerves, and the like, of parents, were often manifested in children as neuroses. He taught that the trophic influence of the nerve-centres on the several tissues was shown in such affections as hereditary insanity, epilepsy, hysteria, angina pectoris, and upon gouty diseases in general, which he held to be "primarily, neurose degenerations in the nutrition, and transformation of certain tissues".

Dr. Austin Meldon published, in 1872, his objections to the uric acid theory as fully explanatory of gout (*Lancet*, vol. ii (1872), p. 115). Quoting cases to prove that urates may exist largely in the blood without giving rise to gout, he invokes, as a connecting link, the influence of the nervous system. He believes that the presence of uric acid and of soda in some form in the blood, are essential to gout; but he holds that "nerve-force, when in healthy condition, preserves these two in a fluid state, separately, in a condition fit for elimination by the skin, kidneys, or bowels. As soon as this nerve-influence is lessened, these two substances unite in the tissues most removed from the brain and circulation. The irritation and inflammation excite the nervous system to increased energy, and the disease for the time is arrested". Dr. Meldon lays stress upon the occurrence of gouty attacks during the night, when both the nervous force and the circulation are feeble; upon the common affection of the great toe-joint; and he specially notes the marked effect of depression of nervous power as an important factor in the induction of attacks. This is a neuro-humoral theory.

Writing also in 1872, Dr. Ord, in the valuable essay already quoted, remarks that "the extension of gouty inflammation does not require the interference of uric acid for its explanation. As it is certain that, in many cases, simple inflammation is propagated from part to part by nerve-influence, it is not illogical to assume that this may occur in gout". He quotes a case, ultimately fatal, where non-gouty polyarthritis followed an injury to the left metacarpo-phalangeal joint; and expresses his belief "that reflex nerve-influence was the agency by which the local ailment became ultimately a general disease". He further believes that, "in gout proper, the influence of the part upon the system through reflex nervous agency must be regarded as most important".

Dr. Ord also acknowledges a direct action of the nervous system in gout, as inducing irregularities of the circulation, and thus disordered chemical relations of the tissues, maintaining that "the nutrition of the body is constantly affected in a visible way by the state of the nervous system". He quotes instances showing the effect of nerve-depression upon several tissues, and others in proof of the fact that a strong will can "fight down" or "walk down" the gout.

Dr. Edward Liveing has expressed himself very strongly in favour of the neurotic origin of gout. In his most able treatise on Megrin (*On Megrin, Sick-Headache, and some Allied Disorders*, London, 1873, p. 404), while discussing the alliances and various symptomatic forms of the disorder, he observes that "there is much in the history of gout—its hereditary character, limitation to particular ages and sexes, periodicity, explosive character, sudden translations, and remarkable metamorphic relations with nervous disorders—which seems to stamp the malady as a pure neurosis.....On the whole", he remarks, "there is much to be said in support of the view that gout in its various forms is the manifestation of a disorder which has its primary seat in the nervous system itself; and there is no more difficulty in conceiving that inflammation and pain may be an effect of deranged innervation in the case of arthritis, than in the analogous case of herpes zoster; or that an excess of uric acid should be generated and retained in the system under a similar influence, than that sugar should, in the parallel case of the diabetes which follows a lesion in the floor of the fourth ventricle."

Dr. Liveing mentions that Dr. Todd used to compare a fit of gout, in respect of its sudden nocturnal invasion, with an attack of epilepsy or asthma.

In his masterly lectures on some of the surgical relations of gout (*Clinical Lectures and Essays*, second edition, 1879, p. 382), Sir James Paget remarks that, "disturbance of the nervous system in some form and part may be regarded as a factor in every case of gout. There are reasons enough for thinking that changes in the nervous centres determine the locality of each gouty process, while changes in the blood and tissues determine its method and effects; and that thus we may explain the symmetries of disease in gout—sometimes bilateral, sometimes antero-posterior—and thus its metastases. But these changes are a part of the pathology of gout which is not yet clinical."

Mr. Spencer Wells (*Practical Observations on Gout*, etc., 1859, p. 21), has called attention to the highly developed nervous system of the gouty, and to the influence of the irregular exercise of it, in inducing paroxysms.

To demonstrate the part of gouty pathology that seems to be dependent on neuro-trophic changes, it is necessary to review the special characters of the neuroses in general, and then to examine how far the ascertained features of gout conform to these. It seems to be imperative to look beyond the mere chemico-pathogenetic theory, that would ascribe gout in all its aspects to the aberrant relations of uric acid. It is quite unsatisfactory to regard gout as an outcome of either gastric or hepatic distemper. In the last quarter of a century, the numerous researches made into the nature and functions of the nervous system come to our aid in this inquiry, and from these we have learned two main and important points respecting the neuroses in general. The first is, that they may be primary or central; and the other is, that they may be secondary or induced.

Thus, we may take it that a neurosis is implanted, or a tendency to it established, and that this shall be hereditarily passed on, and thus a diathetic state be formed; or, in consequence of some toxæmia or blood-degeneration, a secondary or induced neurosis may be established.

It is upon this basis that I seek to establish the neurotic position of gouty pathogeny; and I feel strongly that an effort should be made in this direction at the present time, because the influence of the nervous system can no longer be ignored in connection with this peculiar malady, and an attempt, though speculative and tentative, is herewith made and humbly offered for consideration.

The neuroses represent special conditions, or special morbid modes of evolution of nerve-force. They are implanted in individuals as part of their intimate nature. They are truly as characteristic of the individual, as are his features or other physiognomical traits. An implanted neurosis is, as it were, the representative of a morbid physiognomy for the cerebro-spinal axis. It is, then, a peculiar disposition or tendency on the part of the nervous system, or of some definite tract of it, towards morbid evolution, or manifestation of nerve-functions. It does not necessitate the existence of any gross or coarse disease, but it is a more or less abiding condition, ready to manifest itself on suitable provocation.

It is a special characteristic of neuroses that, being thus primarily impressed upon an individual, they tend to be transmitted by heredity. The female sex is alleged to be more neurotically disposed than the male, but proof of this is not forthcoming. Certain neuroses appear to prevail with greater frequency in males, and others in females; and not only so, but, in the case of those that are common to both sexes, the manifestation occurs at different epochs of life. Thus, some outbreaks are seen to occur at the several climacteric periods, and often at the grand climacteric. In this manner, an element of distinct periodicity attaches to neuroses in general. Further, a very marked feature in all neurotic affections is that of paroxysmal tendency. Thus, there is the abiding element, with proclivity to recurring outbreak. Again, it is certain that a law of alternation or substitution prevails in neuroses, and thus we meet with certain affections in the parents or ancestors, and with others, equally neurotic, in the collateral relatives or descendants.

It is not difficult to understand the course pursued by a neurotic taint once impressed; but it is less easy to conceive the original implanting of such a tendency. The mischief, however, is constantly being laid down in individuals, and as constantly undergoing further development, modification, or even repression.

Excessive activity of the nervous system, or of any part of it, is, according to Laycock, a highly disposing cause of the neuroses. Prolonged excess comes thus to develop hereditary tendency. Hence, undue mental labour, gluttony, alcoholic intemperance, debauchery, and other indulged evil propensities in the parent, come to be developed in the offspring as definite neurotic taints and tendencies. Particular

examples in illustration of this are unhappily not far to seek, and amongst them comes out, as I believe, the disorder we know as gout. According to this view, gout appears as a diathetic neurosis. This I term *primary gout*. The tendency may be transmitted or modified, or even allowed to die out.

Gout may, however, "grow up" or appear in individuals who have no neurotic taint or tendency. In such an individual, the disease is said to be earned by high living and over-indulgence of appetites; and in this case a morbid blood-state is induced—lithæmia and hyperinosis; but this is not gout. We must, at this point, drop the humoral pathology, and seek for the effects of the blood-dyscrasia upon the nervous centres. Guided by the analogy of other toxæmic states, we have full warrant for this course, and may believe that a secondary affection of some nerve-centre occurs in consequence of the altered blood-state *ab intra*, and that thus the order and particular phenomena of the gouty attack are evolved. I term this *secondary or acquired gout*. A diathetic neurosis is thus impressed upon the individual.

It becomes of deep interest to study, side by side with gouty processes, the several joint-affections which have come to be regarded of late as of spinal, or otherwise nervous, origin. I think it is hardly possible to separate gouty arthritis from this connection; and, if it be conceded that this particular form, which is but one of many, is truly and directly dependent upon nerve-influence, the greatest part of the difficulty in establishing the neuropathic origin of gout is forthwith removed. I suppose no greater obstacle has stood in the way of the acceptance of a nervous theory of gout, than the impossibility hitherto of connecting arthritic disposition with any form of neurosis. So many of the other and less obvious manifestations of gout are plainly dependent upon nervous influence, that the complete phenomena of the malady now appear to fall more naturally into their places.

The special action of nerve-influence upon joints has received attention from many physicians. Remak and Benedict were, perhaps, amongst the earliest to call attention to this matter. Charcot, Ball, Weir Mitchell, Ord, and Buzzard, have more recently added to our knowledge of neuro-arthritis; and Dr. Ord has contended for a more scientific revision of the present views upon the pathology of the states classed under the head of rheumatoid arthritis, based upon a full recognition of nervous influence.

The researches of Charcot, Dr. Buzzard, and others, into the nature of the peculiar arthropathy associated sometimes with locomotor ataxia, are signally suggestive in working out the neurotic theory of gout. Charcot believes that the anterior cornua of the spinal cord are implicated. Dr. Buzzard does not accept this opinion; and, guided by the frequent association of gastric crises with these arthropathies in locomotor ataxy—a fact previously noted by Ball—has suggested very ingeniously that the lesion may consist in a sclerosis involving the roots of the vagus in the medulla oblongata, in close relation to some trophic centre that may be localised there, presiding over the osseous and articular systems. And he further indicates the bond that may thus exist between the implication of joints and such metastasis as may occur to the heart in rheumatic fever; also the occurrence of hyperpyrexia, which is sometimes present in such cases. We have yet to seek for this hypothetical trophic centre for joints; but in the meantime we are fairly warranted in widening our conceptions, and in directing attention to the high significance of predicating such a centre in the nervous system.

The analogies of gout with the other neuroses may be now adduced, and prominent amongst these is the marked hereditary tendency. The sudden supervention of an attack is a noteworthy feature, recalling the onset of such neurotic affections as epilepsy, angina pectoris, asthmatic or neuralgic paroxysms. And, as is the case in many of these ailments, the patient has euphoria, or a sense of *bien être*, which delusive corporeal satisfaction is itself a nervous derangement. The time of the occurrence of the attacks, commonly in the early morning, is that at which other neurotic seizures are apt to occur.

The pyrexia of gout is paroxysmal, and so is the pain. These paroxysmal and periodic factors in the malady stamp a nervous character upon it, and ally it to the other nervous diseases.

Again, gout itself blends with other well-recognised neuroses. Many examples of this may be adduced: thus hemicrania is sometimes distinctly a manifestation of gout in both sexes, or may alternate with arthritic attacks of true gout in the same individual. It has been sought to explain the capricious metastases which are common to gout and rheumatism upon the humoral theory of these two affections; but it must be conceded that some nervous law regulates the phenomena of shifting inflammation.

Reflex influence, as suggested by Dr. Ord and others, has doubtless much to do with these phenomena. There is probably a distinct predisposition to suffer in the parts which come to be affected, and the

same classes of tissue are apt to suffer. As shown by Laycock, these textures are related embryologically, and are thus prone to suffer when diathetically impressed.

Localised trophical changes follow locally acting causes of depressed nervous power. Thus impairment of certain centres may lead to the specific nutritional changes witnessed in metastases; and thus these caprices are explained.

The nervous symptoms which are readily observed in cases of gout, and which are fairly to be considered as part of the ailment, are many and varied. Amongst them may be enumerated certain perverted sensations, such as tinglings, numbness, and paræsthesia. Other maladies, such as cancer, are rendered more painful in the gouty than in other persons, as has been well pointed out by Paget. Grinding of the teeth, somnambulism, severe cramps in the muscles, priapism, and a well-marked variety of insomnia, are all recognisable in dependence upon gouty taint. Gouty neuralgia is largely manifested. The late Dr. Anstie denied this; but I can entertain no doubt as to the specificity of this form of disorder. It is more commonly occipital, according to my experience, than in any other locality, but is found in the heel, breast, tongue, and in the great sciatic nerve. That coarse changes occur in the sheath of the nerve, in certain cases, cannot be doubted; but the neuralgia is probably often independent of these. One proof, amongst others, of the truly gouty nature of these neuralgiæ, is gained from the fact that they yield best to anti-gouty treatment; and another lies in the fact that they are elicited by just such conditions as provoke other gouty ailments.

Amongst the strongest evidences in favour of the view that gout depends upon nervous influences, are the facts relating to the induction of its attacks. In the majority of instances, causes are at work which tend to *depress nervous power*. Exhaustion of any kind, whether caused by overwork of mind or body, excitement, rage, worry, is provocative of attacks. Sudden shock, injury, or powerful emotions, will elicit gout; and, indeed, any circumstances or conditions which are of a kind to break in upon the even tenour of life. Dietetic errors, excesses of all kinds, are well recognised factors.

Many of the causes thus enumerated are likewise efficient to produce other neurotic affections, such as epilepsy, asthma, hemicrania, or angina pectoris. Hence most neurotically disposed persons hold much of their comfort in life by pursuing a very equitable routine. They are prone to give way under undue pressure. These considerations help to explain in part why men are more liable than women to gout. They carry on the world's rough work, are engaged in more exciting pursuits, and have much anxiety to bear. On the other hand, for the idlers of society, who cannot be said to live under pressure, save that of *ennui*, the tendency is maintained by over-indulgence of appetites, insufficient exercise, and resulting toxæmia. The more sedentary the occupation, the more intense the strain of life, the greater the tendency to nervous depression, and to the peculiar form of its expression in gout. If to these habits be added high living, as often occurs in the case of statesmen, lawyers, speculators, and those who, while working hard, are "exposed to luxury", no link is wanting in the chain of causation.

The influence of climate cannot be disregarded in relation to influences affecting the nervous system. Dull and "shifty" weather, cold east winds, and the negation of solar light and influence, are all bad for gout. These causes are too frequently at work in our latitudes. The action of the skin is much checked, and thus aberrant chemical changes are apt to be determined in various parts.

The unfrequency of gout amongst sailors is explicable, in all probability, by their free exposure to the open air, by their active lives, and by their diet, which is not excessive, and is void of malt liquors.

A consideration of the mental condition of the goutily disposed throws light upon the nervous pathology of the malady. Intense irritability of temper is proverbial, and an outburst of rage is sometimes a metamorphic substitution for a regular attack of gout. Hypochondriasis, low spirits, and grievous forebodings, sometimes give token of the approach of gout. Hysteria has been observed to precede attacks in women, and to disappear with the onset of them; and the same holds good sometimes of epilepsy.

There remains yet to be mentioned the remarkable relation between gout and glycosuria. Diabetes mellitus is met with in certain members of gouty families; some having regular arthritic attacks; others, incomplete gout; and others, again, gout alternating with glycosuria. The glucose alternates with uric acid. I believe that many cases of temporary glycosuria are due to gouty conditions, and the alliances between these two states are very intimate. In both the gouty and the diabetic, the law of heredity holds good, and the nervous system is involved. The same dietetic habits lead to each; the same classes of persons are affected; and the same exciting causes, such as tend to exhaust and depress the nervous system, will evoke both.

One is thus led to the belief, that the nervous central elements involved in each can hardly be far apart. The medulla oblongata, the sympathetic and splanchnic nerves, have been found chiefly affected, and sometimes the spinal cord, in cases of diabetes. The point for the diabetic puncture is believed to correspond to the vaso-motor centre in the medulla oblongata.

Guided, in part, by these facts, and by the knowledge that the glyco-genic function of the liver is under nervous influence; as also by the theory which refers the special arthropathy of locomotor ataxia to a centre in the medulla oblongata; I am induced to advance the proposition, that the portion of the nervous system, which is specially disposed to the irregular mode of action known as gout, is likewise situated in the medulla oblongata, where, possibly, may be found a trophic centre for the joints.

The trophical results of gout may be described under two heads: first, according to the transmitted physiognomical characteristics; and, secondly, with relation to the tissue-degenerations characteristic of the malady.

Under the first head may be enumerated the large head, florid complexion, the strong well-enamelled teeth, little prone to decay, the strongly built and muscular frame.

Under the second, amongst the special degenerations due to gout, are the well-known tissue-changes of this cachexia. Thus, we find the hair often prematurely grey; marked tendency to tartar incrustation on the teeth; at times enlargement of the nose. Further are to be noted the general sclerosed condition of the whole arterial system, in association with both chronic interstitial nephritis, and changes in the walls and valves of the heart. The skin is soft and smooth, the veins are large and full, the fauces become coarse and granular, and the uvula glairy and much enlarged. The nails often become coarse, brittle, and lined. Special arthritic changes, with deposits of urates, are present in varying degree. Some of these changes are more marked at times, and some are only found—as, for example, the unduly smooth skin—in association with excessive gouty deposits of urates. This action is truly specific. Colchicum does nothing, so far as I know, for any arthritis or ailment in which pain is a symptom, and in which gout does not take part; and this drug belongs to a whole class of agents which powerfully affect the nervous system. It appears to act upon the vaso-motor nerves.

Again, the effect for good upon gouty disease of all agencies which cheer and inspire the mental condition indicates the marked influence of the nervous system in this malady.

The theory that gout is a tropho-neurosis appears to correlate all the known factors concerned in the production of the varied symptoms of the malady. It certainly displaces the humoral pathology of gout from the pre-eminence it has so long held; but it takes full cognisance of it, and seeks to place it in a clearer relation to the overruling neurosis.

PATHOLOGY AND TREATMENT OF GOUT.

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FROM my earliest acquaintance with medicine, I have taken the greatest interest in gout, to which disease I myself have a strong hereditary tendency. In 1872, in a short article in the *Lancet*, and subsequently in a small volume in more detail, I published my views, derived from a note-book containing five hundred cases. Now, from an experience extending over three times that number, I see no reason to change those views, and once more place them before my professional brethren.

It is now more than two thousand years since Hippocrates first described gout; and since his time, every medical writer has devoted much space to its consideration. Many, too, have been the hypotheses concerning its nature; and yet it must be confessed that the progress made in two thousand years has been but very slight. Hippocrates believed the disease to be due to the retention in the blood of some natural humour which ought to have been eliminated.

At the present time, it is the opinion of most medical men that the disease is caused by the retention in the blood of uric acid or urate of soda; and all recent treatment has for its object its elimination. Thus it may be seen that the advance made in the course of so many centuries has been confined to the discovery of the particular matter retained in the blood of the gouty. That this is the sole cause of gout I have grave doubts, to prove which will be the object of this paper.

It may be thought that, although the pathology of the disease has progressed so little, we are much in advance of our forefathers in regard to treatment. Yet this is not so certain.

Dr. Garrod's opinions as to the relation of uric acid to gout have gained almost universal assent. Many medical men, indeed, do not believe with him that the kidneys are the organs whose functional impairment causes the undue accumulation, but refer it to derangement of the stomach, liver, or skin; yet it seems all but an acknowledged fact that the principle of the doctrine is correct. Nevertheless, I have not the slightest doubt that very little reflection will convince every practical physician that the presence of uric acid in the blood cannot be the sole cause of this distressing malady. It would be a satisfactory explanation were it not that, as is now a recognised fact, there are many persons whose blood is loaded with uric acid, and who are in perfect health. In Ireland, gout is one of the rarest affections met with in hospital practice; yet I have repeatedly found the blood of otherwise healthy men, lying in our accident-ward, loaded with urates. For some years past, my own blood has been in this condition, although I have never had the least symptom of the disease. Dr. Gairdner found urates in the blood of a boy four years of age, in whose family gout had never been known. Quite recently, I have had the opportunity of examining the blood of an elderly gentleman, who is subject to regular attacks of gout, and who, at the time of the examination, was just convalescent from a very severe attack, which he allowed to run its course without any treatment. I found the serum rich in urate of soda; which proved conclusively to my mind that Garrod's theory, that inflammation destroys the uric acid in the blood, is not correct.

It is, then, necessary to find some other explanation of the disease. My theory is as follows.

The condition of the liquor sanguinis I believe to be of the first importance in the production of this formidable malady. The disease cannot be developed unless the blood contained a considerable quantity of uric acid and soda in some form. Thus far the uric acid theory is correct; but, in my opinion, it is an error to suppose that these two exist in combination before an attack of gout; the moment they combine, the disease is produced.

Nerve-force, I believe, when in a healthy condition, preserves these two separately in a form in which they may be eliminated by the kidneys, skin, or bowels. As soon, however, as this nervous influence is removed or lessened, these two unite. Thus, when blood or serum is taken from gouty patients, the uric acid and soda, no longer retained separate by the nerve-force, unite and crystallise as urate of soda. In gout, when nerve-force is lessened, the circulation becomes languid, passive congestion occurs, and the uric acid, seizing on the soda, forms urate of soda. This is deposited in the tissues, generally in those most removed from the brain and centre of circulation; inflammation results, and an attack of acute gout is established.

The irritation produced by the disease excites the nervous system to unusual energy. This invigorates the heart to increased action, and a greater or less amount of fever is set up. This, for the moment, arrests the disease; but soon depressing reaction produces a second, a third, and even a fourth exacerbation, and then nature gradually restores the nervous system to its normal condition. The rapid circulation stimulates the almost congested organs; and the kidney, liver, and skin aid one another in eliminating the uric acid. Thus the fit passes off, leaving the nervous system in a more energetic condition than before, and the mental faculties clearer; and the patient finds himself in a far better state of health than previously to his illness.

In youth, before care, anxiety, and disappointment have well-nigh worn out the brain, the nervous system is active; and, in spite of dissipation and indulgences of all kinds, gout is rare; but, as soon as age and care lay their mark on the great nerve-centre, gout too often appears. Every cause I know which is capable of exciting an attack of gout is such as would produce nervous depression. Air and exercise tend to invigorate the nervous system; the want of them must produce a depression. In this way, sedentary employment is one of the most frequent causes of gout.

In the present day, women are comparatively free from gouty affections. This immunity is in a great measure, if not entirely, owing to the fact that they seldom indulge in the excesses common with men. Hippocrates stated that women were free from the gout; but at a later period, when, during the Roman Republic, their habits had changed, Seneca wrote: "The nature of women is not changed, but their manner of living; for, while they come up to men in every kind of licentiousness, they equal them in their bodily disorders. Is it, then, surprising to find the most skilful physician (Hippocrates) in error, when we see so many women gouty and bald-headed? They have lost the benefit of their sex; they have cast off the woman, and are doomed to the diseases of men. Gout, moreover, is a frequent disease among prostitutes after a certain age."

The time that an attack generally commences is at night, when both nerve-force and circulation are weakest. The part, too, most usually