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PATHOLOGICAL POLARITY, OR WHAT HAS BEEN CALLED SYMMETRY IN DISEASE.

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By the term polarity is to be understood a law of philosophical anatomy which has been but little studied in this country, and which, under the name of symmetry, whether lateral or longitudinal (antero-posterior), defines a somewhat mysterious and peculiar relation between *regions, parts* or *organs* which lie on *opposite sides* of a *longitudinal* or *lateral median plane*.

This relation may take the form of a close anatomical resemblance with little or no difference in function, as between the right and left sides, or it may be obscured by a very great difference in form and a still greater dissimilarity of function, as between the anterior and posterior regions of the vertebrate body. The former is generally evident and really needs no confirmation, but in the latter case our belief in the conclusions which have been reached only after careful comparisons among the simpler animals is materially strengthened by the effects of certain morbid changes which, in their situation, their coincidence or their sequence, seem to conform to the above-mentioned law.

Such affections have been termed "sympathetic," and sometimes "metastatic," and have been supposed to depend upon some nervous or vascular connection between the parts in which they are manifested; doubtless some of them are due merely to the anatomical proximity of parts or organs, to a relation of *contiguity*, others to the identity and *continuity* of tissue, and others again to some *physiological* or *functional* connection—what is properly called *sympathy*.

But there are some affections which, whether organic or functional, can be explained only by assuming the existence of another relation, which is neither of contiguity nor of continuity, nor necessarily of functional association, but which implies a certain homology between parts, a more or less complete identity of structure, similar to that which exists between corresponding parts in different animals; as,

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for instance, between the arm of man, the flipper of the seal and the wing of the bird; it is, as said above, that morphological relation between two parts occupying similar positions, and sometimes, though by no means necessarily, performing similar functions upon opposite sides or ends of the body. It is not included in either of the two kinds of homology generally recognized, namely, the *special* homology between the corresponding parts in different animals, and the *serial* homology between parts which are in a *serial* or *successive* relation, as the bodies or the spinous processes of two vertebræ, or the segments of a worm or insect; this latter really depends upon what may almost be called a continuity of tissue, and implies only a general homology; but there must be something more than these two kinds of homology to account for a disease attacking at the same time or in a similar manner parts at the opposite ends of a lateral axis, as the two hands, the two knees, the two sides of a pelvis,* and also, though less frequently, corresponding parts in the anterior and posterior extremities, as the elbows and the knees, the back of the arm and the front of the thigh, the palms and the soles.

For this morphological relation, I have proposed the term polarity, or polar homology,† and this polarity may be lateral or longitudinal, and perhaps also vertical.

The adjective polar, and all possible derivatives therefrom, occur constantly in the Physio-philosophy of Oken, but after the section on Crystallography, where of course polarity is a well-understood term, Oken's general and apparently indiscriminate use of the word in connection with the position, the activities, the function of every description of animal, plant and organ, forces us to the conclusion that either his own ideas are not clear as to its precise significance, or else that they are too profound for ordinary comprehension. At any rate, there are some passages where polarity and symmetry appear to be used as if synonymous, while there are others in which their meaning is very different. Of the former examples are paragraphs 2093, 2100, 2103, 2114; and of the latter, paragraphs 2107, 2119, 2752, 4-6-8, 2854, &c.

I will first speak of the manner in which this subject originally occurred to me, next of what has been written thereon by others, then at some length of the anatomical features of the law of polarity, and lastly of the pathological evidences of its existence.

During the summer of 1863, while endeavoring to work out the details of the great anatomical law then called "antero-posterior symmetry," which had been suggested to me by Prof. Jeffries Wyman, and to which some very plain hints are contained in Oken's Physio-philosophy, it occurred to me that some confirmation of the anatomical idea might be derived from the phenomena of pathology,

* See Paget's *Surgical Pathology*, vol. i. p. 19.

† *Memoir on Morphology and Teleology*, p. 9. (*Memoirs Boston Society of Natural History*, vol. i. No. 1.)

and this more especially with reference to the translation of inflammation, the metastasis so commonly observed between certain organs at opposite ends of the body, viz., the testes and the parotid glands.

On page 19 of the memoir above referred to, the following passage occurs :—

“Pathology seems to indicate that the testes and the parotid glands are longitudinally homologous; for inflammation of the former is very prone to invade the latter, by what is called metastasis, but which in this case may be a physiological indication of a morphological relation otherwise obscure. So, also, are connected the diseases and their remedies, of the genito-urinary and respiratory passages, and both these cases, with that of the irritation of the nostrils sympathetic with the presence of worms in the rectum, are similar to what so often happens between parts which are laterally homologous.”

Believing that in pathology would be found a valuable auxiliary to the conclusions which had been already attained through anatomy alone, it was my intention at some future time to investigate the subject more thoroughly; but in April, 1864, I received from Dr. Norton Folsom the manuscript of a thesis on Anatomical Symmetry, written at his graduation from the Massachusetts Medical College in 1863, in which, after recapitulating those views of the subject which were commonly received by the students of Prof. Wyman, he referred to the paper of Dr. William Budd, on the “Symmetry of Disease,” in vol. xxv. of the *Medico-Chirurgical Transactions*, where are reported cases of disease, especially those of the arteries and the skin, affecting corresponding parts on the two sides of the body, and even in some instances on the arms and the legs.

In the same volume is a paper by Mr. James Paget, M.R.C.S., on the “Relation between the Symmetry and the Diseases of the Body,” which, however, treats only of the more common examples—those, viz., of a similar affection upon the right and left-sides; but the same author, in his *Surgical Pathology*,* after referring to his own previous paper and that of Dr. Budd, says:—“To conclude, these symmetrical diseases with seats of election, prove—

“1st. That in the same person the only parts of any tissue which are identical in composition are, or may be, first, those which occupy symmetrical positions on opposite sides of the body; and next, those which are in serial homology.†

“2d. That the portions of the body in different individuals which are identical, or most nearly so, in composition, are those in exactly corresponding positions.

* Vol. i. page 2.

† Owen (Report of Homologies on the Vertebrate Skeleton, to British Association for Advancement of Science for 1846) does not discriminate between serial and polar homology, the former existing only between parts on the *same* side of the lateral or longitudinal plane, and the latter between parts on opposite sides of such a plane.

"3d. That even in different individuals the specific morbid materials on which many diseases of the blood depend, are of identical composition."

So far as I know, these two distinguished authors are the only ones who have discussed this very interesting subject, but they have presented so many examples of disease affecting the two sides of the body and the upper and lower extremities, that, in the opinion of Dr. Budd,* "since this fact is common to such a large number of diseases, and to 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 a high order, and one which is justly entitled to the rank of a law."

On the following page, he says:—"The occurrence of deformities from disease in the corresponding parts of the upper and lower limbs gives curious and undeniable sanction for those speculative views of organic analogies which have long been entertained by a certain class of anatomists."

Herein he doubtless refers to Oken and others of the so-called transcendental school of anatomy; and to those of us who believe that, in spite of many and almost inexcusable errors, such deserve the name of philosophical anatomists, and that under the apparently vague and dreamy language of some of them, are to be discerned suggestions to a really sound philosophy, it is gratifying to find practical and thoroughly common-sense men like Budd and Paget able to see in any facts a confirmation of the views entertained by them.

I pass now to the proper subject of this essay, viz., the Pathological evidences of the existence of this anatomical law of polarity, considering first those of external form and regional anatomy, and then in turn the systems, organs and viscera.

In order to understand how any kind of symmetrical, or, as I prefer to call it, polar relation can be predicated of parts apparently so unlike in form and function as the anterior and posterior ends of the vertebrate body,† the head and tail, or, more properly, the pelvis, we must first appreciate the essential distinction between the two principles, morphology and teleology, which have been occasionally employed in this paper. For an extended consideration of them I may refer to my memoir on the subject, and will merely say now that morphology refers to the essential structure or plan of an animal or organ, irrespective of its mere external shape or figure, which is modified according to the particular function which it is to perform,

* Op. cit., page 102.

† That some degree of similarity between the two antagonistic regions under consideration has been observed by both the wise and the ignorant, I may call attention on the one hand to the Irishman's definition of an elephant, that it was a "a big pig with a tail at both ends," and on the other to the mistake of the learned French professor of obstetrics who, in diagnosing the presenting part of a child, affirmed it to be the face till the meconium on his finger convinced him of his error, and, without intending such a double-headed pun, we may reasonably adduce the two cases as good examples of the *a priori* and *a posteriori* line of argument.

and which is its teleology. It thus appears that the teleology may differ from the morphology, as the *spirit* of the law from the *letter* thereof, as the *expression* of a face from the *features* composing it, as the *practical* from the *technical* or *theoretical*, as the *actual* or *virtual* from the *nominal* or *ostensible*; in short, as the *thing* may differ from its *name*, the *de facto* from the *de jure*.

Having now seen that morphology and teleology are very different ideas, and that neither of them can be depended upon for the final determination of what concerns the other, and having also perceived that the polarity under consideration is a strictly morphological relation, we are better prepared to inquire into the extent to which, and the manner in which, it is confirmed by pathology.

Pathology concerns the effects of disease, and this consists in a perverted or unduly increased or diminished degree of the normal physiological action of the part or organs; so that in the brief survey of the subject which time will now allow, it will not perhaps be always easy to separate purely pathological phenomena from those anatomical and physiological facts upon which, of course, they to a greater or less extent depend.

I have already alluded to the possibility of confounding with each other the anterior and posterior regions of the foetus *in utero* or rather during labor; the error would scarcely be possible after birth, yet the early application of the term *labia* to the external folds of the female pudendum implies the existence of an apparent or teleological resemblance to the lips, which is not precluded by the difference in the division of the lines of aperture, since in many reptiles the genital orifice is horizontal; and the correspondence is borne out by relative position, one of the surest guides to homology—for, enumerating the parts from the vertebral column downward (in a quadruped of course, and not in man, whose upright posture reverses the relation of the parts), we find, anteriorly, the *nose* or *anterior nares*, the *upper lip*, the *mouth*, the *tongue* and the *chin*; and posteriorly, the *anus*, the *perinæum*, the *genital orifice*, the *clitoris* (or *penis*) and the *pubes*, covered, like the chin, with hair.

The anatomical correspondence is as evident as are the physiological distinctions; and yet we have no right to deny the existence of at least a morphological relation with nobler parts, to organs which, though they lie between the rectum and the bladder, fulfilling the vilest functions of the animal economy, yet furnish the germs of what shall become a new being, which nourish and protect it and at last bring it forth.

All the phenomena of conception and birth are illustrations of the law that not the name of a thing, but its *use*, can ennoble or debase; and a wish that the fabled up-springing of Minerva from the head of Jupiter should become the normal mode of human parturition, will be entertained only by such as refuse to recognize the essential dis

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inction between morphology and teleology—between the thing as it is named and as it is used.

In considering the diseased conditions of these parts, and indeed of all others, it is well to bear in mind the following observation of Mr. Paget.* “It is obvious that if there be no such law (as that of symmetry or polarity in disease), then the probabilities are greatly against any slight disease ever occurring coincidentally on two exactly corresponding parts of the body, and leading to exactly similar results in each of them. This being the case, a single example of symmetry must be of much more weight to affirm the existence of such a law, than a hundred, in which it is absent, to deny it.” An argument perfectly correct, and which recalls a case in law, where a single positive outweighed a dozen negatives: a man being confronted by a witness who swore that he had seen him steal a fowl, indignantly exclaimed, “Surely I can bring a dozen men to swear they did not see me steal it.” But the court considered the latter kind of evidence inadmissible.

In addition to the above from Mr. Paget, I will refer also to a remark of Dr. Budd, to nearly the same effect;† and on the following page he says, “the examples of symmetrical disease are most often presented in chronic affections.”

But, besides this, it is obvious that the condition in which the normal or morphological polar manifestations of disease are least modified by external agencies is that of the foetus *in utero*; and in the remaining portion of this paper I shall confine myself chiefly to illustrations of pathological polarity drawn from the effects of chronic and constitutional diseases upon the new-born infant and young child: and furthermore, since the correspondence or polarity between the right and left sides (lateral polarity) is so generally admitted as to need no confirmation from pathology, I shall speak more particularly of those diseased states which, so far as they go, confirm the other and less evident relation of homology—*longitudinal polarity*.

In the work of Whitehead on Hereditary Diseases, which treats almost exclusively of infantile syphilis, under the head of external phenomena, are specially described certain cutaneous diseases of roseolous and tubercular nature which by preference attack the *face* and the *breech*, as is also the case with gummy tumors and an affection resembling psoriasis.

The frequent occurrence of the cutaneous symptoms of venereal disease upon the anterior and posterior regions of the body, is sometimes generalized and supposed to be accounted for, by saying that they occur most frequently about the mucous orifices. Diday‡ says, “we place the reasons for this frequency in the structure and the functions of these parts.” But I am inclined to think that these facts

* Op cit., page 34.

† Op cit., page 134.

‡ On page 63 of his work on Infantile Syphilis.

are not *causes* but *coincidences*, associated with the general law of polarity, which, as has been said, is oftener broken than kept.

Dr. Budd describes and figures cases of ordinary lepra in which the eruption appeared only upon the elbows and the knees; and Willan speaks of psoriasis affecting the palms and the soles.

On the other hand, however, the more common occurrence of cracks, or *rhagades*, at places where the skin folds, as over the joints, at the angle of the mouth, septum of the nose and corners of the eyes, and of certain patches of ulceration in the flexures of the body, where they may commence as simple intertrigo, are cases where the locality may properly be regarded as a predisposing cause.

Of the four so-called special senses, the organs of three—sight, hearing and smell—contain actual prolongations of the brain towards the surface, and are not repeated posteriorly.* The fourth, however, has for its organ the tongue, and this, as we have seen, answers to the penis or clitoris, the sensibility of which, like taste, is only a peculiar exaltation of the general sense of touch, and depends for its exercise upon the common cranio-spinal nerves, and not upon any special prolongation of the nervous axis.

There is a *frænum linguae* and a *frænum preputii*, but one is on the lower, the other on the upper side of the organ (supposing man in a horizontal position, with the penis directed backwards); neither of them, however, are sufficiently constant among vertebrates to warrant us in regarding them as of much morphological value, and their existence in some mammalia is rather suggestive than confirmatory.

But it is not an accident that sensuality is predicated of the abuse only of the taste,† this including both gluttony and lust; also that social and sexual intercourse are exercised by the two organs above named, occupying corresponding portions at opposite ends of the body. The subject need not be pursued further.

It is well known that the eye is very liable to gonorrhœal ophthalmia, and its mucous membrane seems to be particularly capable of receiving, and being excited to action by, the poison of gonorrhœa. It does not follow from this that we should try to homologize the eye with any of the organs primarily affected with that disease, or that, failing in this, we should deny a polar relation between any two parts whatever, but rather recollect that the eye is the sense-organ more peculiarly appertaining to the head, as the ear and the nose do to the thorax and abdomen respectively, and may therefore be expected to partake of the general depression of the cephalic organs caused by abuse of the sexual functions, as is also indicated by the peculiar dryness of the conjunctiva complained of in the same connection.

Passing now to the nervous system, we find that, despite the vast preponderance of the cephalic end of the cranio-spinal axis in the

* The existence of posterior eyes in certain worms (*Rhabdella*, *Fabricii* and *Amphiora sabella*) does not conflict with this, since the eyes of articulates are not, morphologically, so different from the general integument as those of vertebrates.

† See Oken's *Physio-Philosophy*, paragraph 2331.

adult state of the higher vertebrates, yet in the immature stages of these and in the perfect state of the lowest, no such discrepancy exists; and in the goose-fish there is a distinct posterior ganglion of the spinal cord: the brain is an after-growth for teleological cause, and no one who has suffered the excruciating pain in the small of the back, accompanying most febrile diseases, will question the importance of the portion of the myelon there situated, to which part also are referred the sensations of relief, more or less distinctly felt, upon the discharge of the contents of intestine, bladder, uterus or testis.

Romberg* says that hyperæsthesia of the sexual organs in females is usually due to a centric cause, and that a principal part of the treatment consists in counter-irritation applied to the small of the back; on page 142 he adds, that in hyperæsthesia of the hypogastric plexus the lumbar portion of the cord is implicated, as shown by the pain in the small of the back, from which the neuralgic attack frequently proceeds. The same author† speaks of an antagonism between the upper and lower portions of the spinal cord, irritation of the former causing flexions, and that of the latter extension of the limbs.

I have myself noticed that when, during the process of shampooing, the stream of warm water was directed over the occipital region there was a distinct creeping or crawling sensation in the small of the back.‡

In regard to nervous affections of other organs, Romberg further states§ that priapism often follows injury to the cervical portion of the cord, and that respiratory and œsophageal spasm may be brought on by irritation of the uterine nerves.

Intestinal irritation, especially that produced by *lumbrici*, often excites pruritus of the nose; so, also, does stone in the bladder often cause irritation of the glans-penis; but this is evidently a case of sympathy between parts of the same functional system, and in this respect resembles the sympathy of the mammary gland with uterine disturbance, though in this case a direct connection other than a general nervous one cannot be traced.

In Circular No. 6, Surgeon-General's Office, March 10th, 1864, are described seven cases of reflex paralysis from traumatic cause; to them may be added an interesting case reported to me by Dr. J. F. A. Adams, under whose care it was in Washington. Of these eight cases, five indicate a sympathetic relation between the affected limb and its lateral or longitudinal homologue; in three of these the leg was hit, and the arm of the same side was paralyzed. In four cases the leg was hit and the paralysis affected the other leg, and in two of these latter the paralysis of tact and the pain were observed to

* Diseases of the Nervous System, vol. i. p. 146.

† Op. cit., vol. ii. p. 52.

‡ Op. cit., vol. i. p. 286.

§ I desire here to say that on page 17 in the memoir already mentioned, was too hastily expressed an opinion as to the longitudinally homologous parts of the cranio-spinal axis. I do not now feel able to decide in my own mind, and leave it for further investigation.

have fallen upon a place exactly corresponding to the wounded spot as regards position.

The peculiar infantile convulsion called, from its affecting both the hands and the feet, *carpo-pedal contraction*,* is, as it were, a pathological corollary to the simultaneous movements of all the limbs in a young child when attempting to move any one of them.

I have already alluded to the remarkable sympathy between the testes and the parotid glands, inflammation of the latter being very prone to invade the former; generally it attacks the organ of the same side, and even returns from the testes to the gland and back again, oscillating thus two or three times between the two organs.†

The muscles have not, so far as I know, afforded any pathological illustrations of longitudinal polarity, but the correspondence between those of the anterior and posterior limbs is quite close, and is readily seen if we are content to compare in some cases groups of muscles instead of endeavoring to homologize single individual muscles with each other.‡

The puzzling phenomena of acute and chronic rheumatism, which attacks various parts of the body according to no rule yet offered, may with careful study be found to more or less closely conform to the law of pathological polarity.

As to the osseous framework, no aid has been furnished by pathology towards a solution of the still mooted question as to which bones of the shoulder (which is morphologically the visceral arch of the occipital vertebra) and of the pelvis repeat each other. Most of the attempts so far have been made on the assumption that the two limbs repeated each other in the *same directions*, which has led to the most extraordinary conceptions, on the part of men otherwise quite reasonable, as to the precise homology of these bones. There is still room for doubt, but I fully believe that, like the limbs themselves, the bones of the pelvis and shoulder (including, perhaps, the hyoid arch) repeat each other in *opposite directions*.§ There are recorded cases of disease affecting the front of the femur and the back of the humerus, the knee and the elbow, and the front of the tibia and the back of the ulna.||

But by far the most satisfactory examples of pathological polarity, both lateral and longitudinal, especially the former, are supplied by the arteries, which like the nerves are deep-seated and removed from external agencies which might interfere with the manifestations of so peculiar a law as the one under consideration; but unlike the affections of the nerves, inflammation of their inner coat is decidedly organic in its character, and leaves a visible trace of its occurrence.

Bizot,¶ in treating of the atheromatous affections of arteries,

* Romberg, op. cit., vol. i. p. 329.

† Watson's Practice, p. 775. Cynanche Parotidea.

‡ Memoir on Morphology and Teleology, p. 32.

§ Ibid, p. 18.

|| Paget's Surgical Pathology, vol. ii. p. 245.

¶ Memoirs de la Société d'Observation, vol. i. p. 262.

after having enumerated many cases of deposit occurring in a polar manner upon the right and left side, says, that "in the radial and peroneal arteries, the patches and the ossifications appear at the same time."

But the limits of my time and opportunities have prevented the preparation of a complete and exhaustive survey of this subject, such as must be made before we can expect all to look upon the principle of pathological polarity as established; and I shall be satisfied if the facts and ideas which I have presented may serve to indicate to others the direction in which they may profitably employ their thoughts and observations.

It cannot, however, be denied that, interesting and instructive as is the law of pathological polarity, yet it is one of theory rather than of practice, and that though its recognition may sometimes be of practical importance, and though the physician may find that some idea of it is essential to a comprehension of many facts which come under his observation, yet, having done this, his concern is more often with the exceptions thereto.

Perhaps there is no better illustration than this of what may have been inferred from preceding considerations, that morphology is for the sake of teleology, and not *vice versa*; that rules are made for the sake of the facts which they include. If morphology, if laws, if principles were the final objects of creation, we surely should oftener meet with typical forms departing as little as possible therefrom. Owen's hypothetical archetype of the skeleton would actually occur in some species, and it would not have required years of research and the closest scrutiny to demonstrate its existence.

So with groups of animals. It is only by patient and laborious comparison of different species that we obtain an idea of the typical form of any one group; while if the mere manifestation of this typical form had been the end and aim of the Creator, we should meet with only the simpler animals, in which the type, or morphology, would readily be discovered.

Such, however, is not the case; and the difficulties encountered by the philosophical anatomist and zoölogist in their endeavors to gain a clear idea of the plan, or morphology, of animals, or groups thereof, may be a hint that their study is not the only one, and that it should not be pursued to the exclusion of the simpler though no less elevating contemplation of the uses or functions which they perform.

In the same manner that the bones are made for the attachment of muscles and the support of other organs, and not that they themselves may be covered and protected by them, do laws and principles exist, not for themselves, but for the sake of the particular facts which are grouped around them.