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THE LAW OF THE MORPHOLOGY OR METAMORPHOSIS OF THE TEXTURES OF THE HUMAN BODY.

(Fourth Series of Experimental Researches.)

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(Concluded from page 342.)

"It were disgraceful, with this most spacious and admirable realm of nature before us, where the reward ever exceeds the promise, did we take the reports of others upon trust, and go on coining crude problems out of these, and on them hanging knotty and captious and petty disputations. Nature herself is to be addressed; the paths she shows us are to be boldly trodden; for thus, and whilst we consult our proper senses, from inferior advancing to superior levels, shall we penetrate at length into the heart of her mysteries."—HARVEY.

INFLAMMATION.—(Continued.)

The texture covering the outer and front part of the eye-ball is termed *tunica conjunctiva*, and is ranked as a mucous membrane. Analysed with a microscope, it is found in its natural and adult condition to be a thin, elastic, transparent, and simply fibrous texture, sparingly supplied with blood vessels. (Fig. I.) But in its embryonic or growing state, numerous nuclei and corpuscular forms are dispersed among the fibres,

Fig. I.—Nutrient vessels in the fibrous texture of the adult conjunctiva.

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especially along the interior margin of the walls of the nutrient vessels. (Fig. II.) The fluid excreted [by this texture in health is very small in quantity, merely sufficient to moisten the eye, and more resembling water than mucus.

CASE.

Inflammation of the Tunica Conjunctiva: Purulent Ophthalmia.—A labouring man, aged twenty-seven years, applied for relief from purulent ophthalmia in the left eye, which had existed seven days. The eye-lids were closed and much swollen, and upon my opening them, a large quantity of thick white matter escaped. On examination, the cornea appeared almost buried beneath a very red texture—a fungosity "having a kind of fleshy appearance," into which the natural texture just described had become transformed.

With a pair of curved scissors I cut off a portion of this red and flesh-like mass, the patient at the time complaining of considerable pain. The texture thus removed was, upon trial, found to be strong, elastic, and not tearable; and on submitting it to examination

Fig. II.—Nutrient vessels in the fibrous areolar texture of an infant two days old.

with the microscope, it was found composed of numerous blood vessels containing the usual red and colourless particles, and of four distinct elements,—colourless cells, fibres of different kinds, granular matter, and molecules. The *colourless cells* greatly predominated, occupying the interstices of the fibres. They were filled with molecules; and in some there was one, in others two or three larger rounded or oval particles termed *nuclei*, with a dark or light spot in their centre. Of these *nuclei*, it was impossible to say which were natural and belonged to the normal constitution of the cells, and which were spurious, or formed subsequently to the removal, by the corrugation of the molecular elements; and of the dark and light spots seen in the centre of these nuclei, I could not

determine which were due to refraction and which were not.

The *fibres* were of two kinds; the one simple and identical with those seen in the areolar textures, and in the fibrillated protoplasm (buffy coat) of the blood; the other thicker, with a double outline, and terminating in, or springing from, a cell at its extremity. With a little care I obtained a good view of, and was able to trace for a considerable distance, some of the smallest of the vessels, with a power 750. Their coats or walls were comparatively very thick—that is to say, they were on either side twice or three times the breadth of the slender blood-column still visible in their interior. They were composed of the four elements before mentioned—viz., colourless cells, fibres of two kinds,

Fig. III.—Vessels in the inflamed, red, and thickened conjunctiva, (purulent ophthalmia.)

nuclei, and molecules. (Fig. 3). No distinction could be drawn between the fibres of the coats of the vessels and of the more distant texture; and it was impossible also to distinguish any difference between the colourless cells still visible in the blood, and those of the coats of the vessels of the texture distant from the vessels, and of the white opaque excretion, except it was observed, that the cells at the inner margin of the vessels, those nearest to, or in actual contact with, the blood column were smaller, and had smaller nuclei than those at the outer margin of the vessels, and of the purulent excretion.

In this example, then, there was an increased redness and vascularity, an energetic nutritive activity, and new nutritive elements constituting the phenomenon termed inflammation. The physical and vital properties of the texture being at the same time exalted and not diminished; for the texture was not brittle, but equally, if not more strong, elastic, and untearable than before; it was not less but more sensible and impatient to the impressions of light and touch, and the microscopic analysis proved that its swelling in growth was due not to any retrograde change or transformation of the natural fibrous elements, but to the increased quantity of blood to the new vessels and the new cell-elements interspersed

among the pre-existing and new-formed normal fibrous elements.

It is unnecessary to give any account of the treatment of the case which resulted in "the injured eye being restored to its natural state;" and, (as before observed, with respect to the fractured bone,) the organ being restored to its natural state, the metamorphosis was natural; and being natural, it was also conformable or regular. During the progress of the cure, (that is to say, during the return of an abnormal nutritive activity and an irregular morphology, to normal nutrition and a regular morphology,) the following events and changes were noticed:—The eye became less impatient of the impressions from touch and light; the swelling or fullness of the eyelids diminished; the quantity of opaque white matter discharged was less, and the red and flesh-like texture diminished in bulk, and daily became paler and less vascular; the colour of the discharge at the same time altered; its whiteness and opacity diminished; it was more transparent and mucus-like, then thinner and more watery, the later stages of the diminishing vascularity and excretion being more rapidly passed through than the former.

I have avoided multiplying facts, about which there can, I think, be no reasonable question raised; and taking therefore this case as typical, it furnishes intelligible grounds of distinction between inflammatory and scrofulous diseases, and a rational explanation why the former, as a class, are susceptible of cure, with a return of healthy function, and why the latter, as a class, are so difficult. But first let us notice more particularly the points of relation or identity, and then the essential distinctions between inflammation and scrofula. Both inflammation and scrofulous diseases are found in the same textures—in living vascular textures, in which a nutritive action or metamorphosis is already going on; in both there is a more or less increased supply of blood,—an increased number of new vessels,—a new nutritive energy, and new cellular or protoplasmic elements; these being the points of relation between inflammation and scrofulous disease. The essential points of distinction are, that in inflammation the natural elements remain, the new blood-vessels, the increased quantity of blood, and the new nutritive elements, being interspersed among the normal elements, which do not undergo any essential change, or retrograde transformation; on the contrary, the microscope proves that their amount is increased rather than diminished; and experience declares that the vital properties of the texture are exalted. Whereas in scrofulous diseases the microscope proves that the natural elements of the affected textures are changed and disappear, the new vessels, the increased supply of blood, and the new nutritive elements, establishing a morphology of a different kind, and of a lower grade than that necessary for the preservation of the normal elements, bones, cartilages, fibrous and the coherent parenchymatous textures, being reduced to highly vascular and energetic fungosities, or villous corpuscular textures, excreting abundantly early protoplasmic and corpuscular forms, to the prejudice and destruction of the higher natural elements, experience at the same time corroborating the testimony of the microscope, by testifying to the gradual disappearance of both the physical and vital properties of the affected textures.

Hence, therefore, in inflammation, when the nutritive energy and its accompanying phenomena have been subdued by appropriate treatment, the normal elements not having been destroyed, again resume their accustomed appearance and healthy functions; whereas, in scrofulous diseases, when the abnormal nutritive energy has been subdued, there are no longer the requisite normal elements to resume their usual appearance and healthy function. Hence the difficulty of curing these diseases; and why, when cured, we meet with opacities of the cornea, scars upon the skin, stiff joints, deformed bones, shortened fingers, and puckering in the lungs. But in the morphological study of disease, it is necessary to distinguish between

the physical and vital properties of a texture, and the function of the organ of which it forms a part. Thus in inflammation of the lung, (pneumonia,) the texture of some of the inflamed lobules is denser, and quite as coherent as the normal texture, grating against the edge of the knife, like a fibro-cartilaginous texture, the morphology being of the abnormally ascending order, whilst the texture of other lobules is soft, brittle, and almost purulent. In both conditions the air-cells are filled up and obliterated, and both, therefore, though differing essentially in their morphological types, are equally incompatible with, and destructive of, the respiratory function.

XV.—STHENIC AND ASTHENIC INFLAMMATION: ACUTE AND CHRONIC DISEASES.

In the case of inflammation of the outer texture of the eye-ball just related, the normal fibrous elements preserved their integrity, and the new corpuscular elements accumulated by the nutritive energy were discharged, or thrown off in the excretion. But now we have to examine analytically, other instances of inflammation in which the abnormal corpuscular elements, from the situation of the part affected, cannot be excreted, but become organized, assume a morphology, and constitute adventitious texture upon the normal structure.

"In no part of the organism" says HASSE, "are the organized products of inflammation more marked than upon the free surface of the pleura, where we meet with solid and fluid matters of every gradation and variety."*

The first appearances of inflammation of the pleura consist in a congested state of its blood vessels, which are seen congregated here and there in dense though delicate nets beneath the still transparent membrane, which now, however, speedily loses its smoothness and transparency, becoming thicker and more dull. At numerous points the bright red colour deepens; these points are somewhat prominent, and crowd together, being encompassed with a progressively enlarging zone of congested blood-vessels. The first rudiments of an adventitious product now become perceptible, the points originally reddened presenting little dull white or yellowish spots, which rise above the serous surface, and often veil the inflammatory redness so thoroughly, that it requires a practised eye at once to detect it. During the above proceeding in the serous membrane, the areolar texture between the fasciculi of the intercostal muscles, and also that between the pulmonary lobules, is distinguished by an increased vascularity, and its interstices are filled with a half-fluid, half-gelatinous effusion.

HASSE describes the adventitious products of inflammation of the pleura under the following heads:—The gelatinous, the conditional, the purulent, and the tubercular.

* "Pathological Anatomy," Syd. Ed., 1847, p. 181.

In all cases of inflammation of the pleura, a *gelatinous product* is speedily diffused between the costal and pulmonary surfaces, blood-vessels form in it with surprising rapidity, and where the two surfaces approach each other, a few days appear sufficient to effect a tolerably firm coalition between them.

The *conditional products* consist for the most part of several homogeneous or else distinctly different layers, largely investing, and adherent to, the pleura. They tear easily, and display a pseudo-fibrous texture. Their surface directed to, and adherent on, the pleura, corresponds in character to that membrane; but their free surface facing the cavity of the pleura is usually soft, and displays a villous fabric. When these conditional products are present, the cavity of the pleura usually contains a considerable amount of either a light-brown, or a reddish, or else a flocculent fluid, bearing, it would seem, a close relation both in quantity and quality to the false membrane itself.

In the *purulent form of the product*, the surface of the pleura is dull, and of a dingy grey, covered with very soft granulations, or with soft and brittle puriform false membranes, which are either loosely adherent to the pleura, or else float as soft flakes in the collected fluid.

"The *tubercular constitution*," says HASSE, "is the frequent source of peculiar modifications; it changes the products of nutrition, and exerts a palpable influence upon the formative process when heightened by inflammation." The peculiar modifications here alluded to have been treated at length in the present memoir, and it remains only to remark, that tuberculous matter frequently manifests itself in the false membranes of the preceding conditional form, which, as HASSE remarks, is inaccessible to the vascularity pervading the texture in which it is embedded.

Now, the gelatinous and conditional products of pleurisy, are early morphological forms, consisting of protoplasm and slightly coherent cells, which, when they become organized and vascular, are in all respects analogous to an embryonic texture, and it appears that by the subsequent morphology of these elements, the *sthenic or asthenic character of the disease, and the good or bad constitution of the patient are determined*. For if a severe form of pleurisy be cured, it is so by the gelatinous and conditional, or purulent products,—the soft vascular excreting textures,—undergoing the fibrous or fibro-cartilaginous metamorphosis. So also, if a scrofulous joint or a pulmonary consumption be cured, it is by the same morphological forms,—the soft, vascular, excreting textures, passing onward into the non-excreting and less vascular fibrous or fibro-cartilaginous types; and in all these instances we say the constitution of the patient is good. In cases of severe pleurisy, the cavity of the pleura has been opened to allow of the escape of the fluid and non-adherent matters accumulated within it, and the

operation has been sometimes once or twice repeated. The first operation frequently gives vent to a clear serum, but when a second or third is required, an opaque and flaky pus escapes. The former occurrence denotes that the gelatinous and conditional products have undergone a fibrous morphology, analogous to that of the protoplasm of the blood when withdrawn in venesection, and it is well known to be the most favourable to the recovery of the patient; whereas the latter occurrence denotes an unconformable morphology and is unfavourable. Moreover, persons who have recovered from an attack of pleurisy, and have afterwards died of other diseases, have been carefully examined; and in such cases the adventitious products of the pleurisy, are found fibrous or fibro-cartilaginous; whereas, in those who die of pleurisy, we find the conditional and purulent products—the early, soft, vascular, and corpuscular excreting textures.

Hence, then, it appears that as scrofulous diseases are retrograde morphological conditions of the growing normal textures, and chiefly, therefore, observed in children and youth, so inflammatory diseases are asthenic, and the constitution bad, when the products accumulated by the nutritive energy or inflammation, persist in a morphological type or growth, which is below or retrograde in comparison with the texture from which they spring. The truth of this conclusion cannot be rightly estimated during life by the health of the patient, and it is necessary again to point to the distinctions between the morphology, which has regard to the forms of elements and textures, and the office or function of the organ of which they form a part. The morphology of the adventitious products of pleurisy may be conformable, assuming a type identical with that of the texture from which they arise; but if they be so abundant or so related as to impede the motions of the lung, the function of the organ will be impaired, and, notwithstanding the conformability of the morphology of the pleuritic products, the nutrition of the whole body will thereby be asthenically inclined; and thus many persons who have recovered from an attack of pleurisy, (considered in its inflammatory form,) have from this source, had their constitutions weakened, and incurred a liability to asthenic forms of disease for the future.

These observations regarding the distinction between sthenic and asthenic diseases, and the conclusions deduced therefrom, are further illustrated and confirmed by the history and phenomena of *gout* and *phlebitis*. Gout is a sthenic disease. The ordinary phenomena of a first attack of gout,—the pain, heat, redness, and swelling, are well-known; but the morphological results of this increased nutritive energy have not been accurately regarded. Their conformable character, however, in the first or early paroxysms, is shewn by a copious exfoliation of the cuticle or epidermis over and for a long distance around the part

affected, by the thickening of the areolar and fibrous textures involved, and the accompanying oedema, and which is most important, by the part being restored to its natural state. But unfavourable conditions, intemperate modes of life, mental anxiety, and other causes, produce repetitions of the attack, and prolong its times and stages. Unconformable products then appear in the affected textures, and *pari passu* with irregular or abnormal morphological phenomena, asthenic gout becomes asthenic.

Phlebitis is an asthenic disease. The blood of pregnant women is well known to contain an unusual abundance of colourless cells and protoplasm, administering to the growth and preservation of the foetus. When the infant is born, a new but natural channel is opened for these nutritive materials; the breasts experience a physiological and conservative inflammation a new nutritive energy and an increased vascularity are established in them, and a new product is formed for the sustenance of the child. But adverse external conditions, a contagious poison, and other causes, sometimes disturb these events, and a train of phenomena termed *puerperal phlebitis* ensue. The nutritive materials with which the blood is highly charge are unfitted for their office, their morphology is arrested or rendered retrograde, and they accumulate in the circulating fluid, upon the walls of the blood-vessels, and in the textures that have been irritated by the process of the labour; the milk is not at all or only very scantily secreted, and thus arises one of the most asthenic diseases to which the human structure is obnoxious.

Experience suggests that possibly these conclusions may be deemed speculative and theoretical; but let the candid reader be reminded, that no department of human knowledge can assume a scientific form without a theory, and because hitherto physiological or medical theories have presented an unfavourable aspect, still we must not, on that account, relinquish the right use of theory, and repudiate the term. "In framing a theory," says Sir John Herschel, "which shall render a rational account of any natural phenomenon, we have *first* to consider the agents on which it depends, or the causes to which we regard it as ultimately referrible. These agents are not to be arbitrarily assumed; they must be such as we have good inductive grounds to believe do exist in nature, and do perform a part in phenomena analogous to those we would render an account of, or such whose presence in the actual case can be demonstrated by unequivocal signs. They must be *vera cause*, in short, which we can not only show to exist and to act, but the laws of whose action we can derive independently, by direct induction, from experiments purposely instituted. We have *next* to consider the laws which regulate the action of these agents, and these we can only arrive at in three ways—1st, by examining all the cases in which we know them to be

exercised, inferring, as well as circumstances will permit, the amount or intensity in each particular case, and then generalizing from them; and so arriving at the laws desired; 2nd, by forming at once a bold hypothesis, particularizing the law, and then trying the truth of it by following out its consequences, and comparing them with facts; or, 3rd, by a process partaking of both these, and combining the advantages of both without their defects—viz., by assuming the laws we would discover, but so generally expressed, that they shall include an unlimited variety of particular laws;—following out the consequences of this assumption by the application of such general principles as the case admits; comparing them in succession with all the particular cases within our knowledge; and lastly, on this comparison, so modifying and restricting the general enunciation of our laws, as to *make the results agree*."* Now, in the law of the morphology of animal structures to which I refer the phenomena of inflammatory and scrofulous diseases, the agents of the metamorphosis are not arbitrarily assumed. We know them to exist in nature. Their presence in normal growth is demonstrated by unequivocal signs, and they perform a part in phenomena analogous to those we would render an account of. The laws which regulate their action have been derived by examining the cases of scrofula and inflammation, in which we know them to be exercised, by inductive reasoning from experiments and observations purposely instituted in vegetable and embryo animal textures, and by comparing the assumed law with all the particular cases within our knowledge, on which comparison the results agree; so that if my conclusions are theoretical, the terms of a good theory have been fulfilled. Supposing it necessary to inquire further what the agents are, then both experiment and observation afford grounds for concluding that they are the active molecules so copiously distributed amongst the textural elements, and so abundant in the interior of the cells of both vegetable and animal structures; and the colourless cells of blood filled with these molecules remaining stationary, and undergoing changes upon the textures, is a *vera causa*, explaining how, in animal structures, and in the human body, these active molecules are transferred from the flowing nutritive current to the fixed solids.

In bringing to a termination this inquiry into the laws of scrofulous diseases and inflammation in the human body, based upon the phenomena observed in lower structures, and in the growth of embryo-textures, it may be useful to review the facts, and recapitulate the conclusions grounded upon them.

All living bodies grow and are sustained by an epigenesis or *morphology*,—that is to say, by a series of changes and transformations in matter effected in

* "Preliminary Discourse," pp. 197, 198, &c.

closed cells, and consequent upon two necessary antecedents,—a vital power or inherent disposition imparted from the parent to the offspring, and certain external conditions, in which are included food, air, water, and temperature. The lowest living beings are simple isolated-cells; the next in order are aggregates of slightly-cohering-cells; then follow the structures, composed of coherent-cells; after which come the fibrous and cartilaginous textures; and lastly, bone or wood. And it is to be particularly observed as we ascend the scale of animated nature, that the additional later-formed or higher elements do not supersede, but are superadded to, the prior ones:—thus fibrous elements are superadded to the cellular; cartilaginous to the fibrous and cellular; and bone to the cartilaginous, the fibrous, and cellular, until in the human body we meet with all the varieties,—osseous, cartilaginous, fibrous, and coherent cellular textures, superadded to slightly coherent and incoherent cells. All these textures, and every organ in the human body, in their primary or embryo state, are groups of slightly cohering cells, from which, by an epigenesis and morphology, are formed coherent cellular textures, traversed by numerous vessels or channels, conveying a current of the primary forms,—incoherent cells; to these are subsequently added various fibrous elements, and lastly, cartilage and bone.

The phenomena of inflammation observe the same order. The first steps of the process are indicated by an unusual accumulation of incoherent red and colourless cells derived from the blood current, the latter of which remain stationary upon the affected texture, become slightly coherent, and discharge their protoplasmatic contents, the conformable or unconformable morphology of which determines the nature of the product and the sthenic or asthenic character of the disorder. The products of a conformable metamorphosis added to the pre-existing natural elements, constitute sthenic, curable and conservative inflammation. The products of an unconformable metamorphosis, whether irregular or retrograde, added to the pre-existing textures constitute asthenic inflammation.

The phenomena of scrofulous diseases also commence with an accumulation of incoherent cells from the same source, (the blood,) and it is by the products of the unconformable metamorphosis hindering their natural growth and supplanting the natural elements, that these diseases are produced.

ON A NEW AND SUCCESSFUL MODE OF TREATING FEVER.

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(Read before the Provincial Medical and Surgical Association, at the Anniversary Meeting, at Derby, Thursday, August 5th, 1847.)

At a period when fever, to an alarming extent, prevails in our great manufacturing towns, I have much pleasure in bringing before the consideration of the members of the Association, a new method of treatment of fever, which is generally applicable, and has proved very effective. Twenty-five cases of fever occurring in our Union Hospital, during the last two months, have tested its power. This remedy is capable, not only of controlling some of the most distressing symptoms of the typhoid state, but frequently of arresting its progress, both at the commencement, and at a more advanced stage of the disease. Still a more extended experience is required before its merits can be fully determined. It is said, that very lately, in Liverpool, no less than 10,000 people were at the same time suffering from typhus fever, accompanied with a considerable mortality. Its attacks were not limited to the poorer classes, as many of the Roman clergy, and several in the higher ranks, have fallen victims to its power. In London, Glasgow, Leeds, Huddersfield, and Manchester, and other large towns, the same type of fever exists. Should the constitution of the atmosphere, during the autumnal season, prove favourable to its dissemination, may we not expect its wide spread in an epidemical form? In Liverpool, as in other large places, the introduction of typhus was traceable to the vagrant Irish. Its rapid diffusion may be easily accounted for, by their gregarious habits. Wherever they wander, a family of contagious disorders is carried with them. Small-pox, measles, skin diseases, and fever, were imported wholesale into the Union Hospital, by the droves of Irish driven by famine from their native land. The appearance of these unfortunates, especially the children, was wretched in the extreme, and told an unerring tale of hunger and suffering. Very soon typhus fever broke out, and raged with considerable severity.

Holding the appointment of Honorary Physician to the Hospital, I had a fair opportunity of trying a method of cure, the success of which had frequently reached my ears whilst living in Germany. I think it proper to mention that the hospital, in connection with the Nottingham Union, is a building well adapted for the treatment of fever, the rooms being lofty, and well ventilated, and kept very clean, and readily admits of the classification of patients. The diet is wholesome and liberal, and an intelligent medical officer, Dr. Stiff, has the management of the in-door sick. After the commencement of the mode of treatment to