found the vomiting had not stopped. A small quantity of sherry and water remained on the stomach. Pulse 110; tongue clean; the least movement to the left side produces vomiting. We deemed it prudent not to vex the stomach with medicine, and left him for the night.

18th. Has passed a bad night; constant vomiting of faecal matter; pulse 110; countenance remains good; tenderness of the abdomen increased. In the evening he said he felt "a movement of wind downwards." With Mr. Fricker's concurrence, I now ordered an enema of turpentine and oil, which produced a copious evacuation; his pulse fell to 90, and he felt exhausted and inclined for sleep. Calomel gr. v., cum Opil, gr. ij. In the evening we found him somewhat better, still he is harassed by hiccough; free from sickness. Mist. Effervescens cum Ammonia et Tinct. Opil.

12th. Unable to sleep on account of hiccough; pulse 84; tenderness of the abdomen considerable. Infus. Rosæ cum Magnes. Sulph., which operated freely. We prescribed some lemon ice in the day, which relieved the distressing hiccough.

20th. Has had several copious stools; is cheerful and doing well. The wound is healing by granulation.

From this time till the end of January, 1846, he went on favourably and is wearing a bag truss. The hernia is quite as large as it was before the operation; he complains of a dragging pain in the abdomen, and occasional irritation of the stomach and bowels.

CASE XIII.

FEMORAL HERNIA; STRANGULATION; OPERATION: RECOVERY.

Jane Barnett, aged 85, admitted March 17th, 1847, under the care of Mr. Fowler, with a femoral hernia of the right side. Symptoms of strangulation have existed since the 15th; vomiting; constipation; slight tenderness of the abdomen; pulse 80. She is of a spare habit; there is a tumour in the right groin, about the size of a walnut; she has never worn a truss, and is the subject of a procidentia uteri, and very deaf.

8, p.m. Mr. Fowler operated; the whole proceeding did not occupy more than five minutes. The fascia propria and sac formed an agglutinated mass, much thickened, and there was a small quantity of fluid in it. The sac contained a knuckle of dark-coloured intestine; the stricture was divided on a grooved director, and the protruded part reduced. Calomel, gr. iij., Opil., gr. iss., were given.

March 18th. Has had no vomiting since the operation; no action of the bowels; urine drawn off by catheter; pulse 84. Ol. Ricini, oz. j.

19th. Has had several stools; countenance a little flushed; pulse 90. Ordered nourishing diet. Mist. Cretæ. Comp. cum Liq. Opil. Sed.

20th. The purging stopped. Meat diet.

26th. Quite well.

CASE XIV.

CONGENITAL INGUINAL HERNIA; DESCENT OF THE TESTIS, INCOMPLETE; OPERATION: RECOVERY.

Mr. J., aged 26, sent for Mr. Whitmore, November 1st, 1832, late in the evening, complaining of pain in

the bowels. A tumour, about the size of an egg, situated in the left groin, was discovered, tense and very painful on pressure. He had been sick, and felt slight pain in the bowels; no stool since October 29th.

After giving some general directions, Mr. Whitmore left him for the night, being in attendance on a dangerous labour. On visiting him the next morning, Mr. Whitmore found him vomiting, with an anxious countenance, and the usual symptoms of strangulated hernia. The warm bath, bleeding from the arm, and a moderate use of the taxis were tried, but the reduction of the hernia was not effected. Neither testis had descended into the scrotum. He gave the following history of the case:—

He has had a rupture as long as he can remember; and about fifteen months since he had a similar attack to the present one, while residing in the country. He sent for a surgeon, who failed in affording him any relief. Having dismissed this practitioner, he applied to a noted quack-doctor. The case being one of obstinate constipation, he administered a drastic purgative powder, which he called "golden dust;" and after each dose he made the patient walk about the room. The rupture was reduced.

At 12, p.m., Mr. Fowler saw the patient, with Mr. Whitmore; an operation was proposed and performed by Mr. Whitmore. The sac was opened, and a quantity of fluid escaped; the contents were omentum and bowel; the stricture being divided, they were returned. The testis was found lying in the sac, and at the mouth of the external ring; it was small, but otherwise healthy. The patient recovered without a bad symptom.

(To be continued.)

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

(Fourth Series of Experimental Researches.)

By WILLIAM ADDISON, M.D., F.R.S., Malvern.

(Continued from page 231.)

XIII. REGULAR, IRREGULAR, RETROGRADE, AND ASCENDING METAMORPHOSES IN ANIMAL TEXTURES.

"If we examine the broken ends of a fractured bone from the first to the tenth day after the injury, we shall find the periosteum and medullary membrane torn, the neighbouring soft parts swollen, and an effusion of blood around and between the fragments. The periosteum is more vascular, it has lost its fibrous character, and a reddish fluid is effused into its substance. The medullary membrane undergoes similar changes,—the marrow assumes a kind of fleshy appearance, and a viscid gelatinous matter makes its appearance in the situation of the fracture.

"From the tenth to the twenty-fifth day the soft parts in the immediate situation of the fracture become more solid, and adhere more intimately to the matter between the fragments, which has now assumed the fibrous form, and the membrane filling the medullary

cavity is also connected into a *fibrous texture*. From the twenty-fifth to the fiftieth day this fibrous texture gradually becomes *fibro-cartilaginous*, and then *osseous*. In from three to six months the whole substance between the fragments is converted into *bone*, and the injured limb is restored to its natural state." *

The textures surrounding the extremities of a fractured bone are irritated textures; they have been violently torn and wounded, and their vascularity and nutritive actions are increased by reason of a law existing in all living textures, by which irritated parts have an increased amount of nutritive elements determined towards them for their succour, or to support them under the infliction. We see the demonstration of this law, not only in the transparent web of the frog's foot, and in all parts of the human structure, during inflammation in a fractured bone, and in the prick from a pin's point, but also in all kinds of vegetable structure. "Galls or tumid excrescences," says Dr. Lindley, in speaking of the diseases of vegetables, "are local affections, caused by the puncture of insects; they are produced by an excessive deposition of cellular tissue, and are of no consequence to the general health of the individual subject to them." In these cases of galls and excrescences, the little insect not only irritates the living texture, thereby causing an increased deposition of cellular texture, but it actually models the excess produced by the irritation to its own use and purposes. Now, the facts related shew that, in the repair of a fractured bone the morphological stages observed are,—first, a viscid protoplasm or lymph, derived from, and mixed with, colourless incoherent cells or corpuscles;—then a very vascular texture, excreting cells;—then a fibrous texture, less vascular, and not excreting cells;—then fibro-cartilaginous;—and lastly, osseous textures. This order being in all respects the same with that observed in the growth of the textures from their embryo state, is *therefore* regular. But it is of the utmost importance in regard to practical medicine that the phenomena of a regular metamorphosis should be regarded in respect of time, for although the several textures pass by insensible limits into each other, yet there are no difficulties in recognizing the distinctions between lymph, fungosities, fibrous texture, cartilage, and bone; or between pus, mucus, and abnormal fibrous textures, and tubercles. Let me therefore recapitulate the phenomena with reference to the times.

From the first to the tenth day the following series has been observed in the textures involved in the injury of a fractured bone:—(1.) The soft parts are

swollen and there is an effusion of blood. (2.) The periosteum and the medullary membrane—i. e., the irritated or injured textures,—become more vascular, a new matter is effused into their substance, and they lose their normal characteristics. (3.) The marrow assumes a fleshy appearance, from which a viscid glutinous matter, a protoplasm, is excreted. *From the tenth to the twenty-fifth day*:—(4.) The soft parts become more solid, cellular or corpuscular forms are excreted in less quantity, the number of blood-channels diminishes, and the matter between the fragments of bone assumes the fibrous form. (5.) The fleshy appearance filling the medullary cavity is converted into a fibrous texture. *From the twenty-fifth to the fiftieth day*:—(6.) This fibrous texture gradually becomes fibro-cartilaginous, and then osseous.

These are but rough approximations towards the establishment of times and periods, more accurate researches are required to establish correct stages for the normal morphology.

Irregular Metamorphosis.—In the disease termed rickets, the bones resemble very vascular cartilage, and the medullary canal is filled with a reddish gelatinous matter instead of marrow; the structure everywhere presenting a much more red and vascular appearance than healthy bone.†

I forbear to notice many local diseases and congenital defects which might appropriately perhaps be placed under this head,—*nævi*, warts, fatty tumours, &c., my attention being now confined to those irregularities and changes which connect scrofulous diseases with the law of the metamorphosis.

Retrograde Metamorphosis.—The facts, proving that phthisis or consumption is a retrograde metamorphosis of the parenchyma of the lung, have already been mentioned. In the disease termed mollities ossium, the smooth surface of the bone is raised by internal growths and red projections, visible through the periosteum. The cancellous cavities of the bone are filled with a gelatinous substance, composed of myriads of colourless cells, of different sizes, forming a soft incoherent cellular or corpuscular texture. In some cases the bones become so soft and flexible, that they may be bent in any direction; and they have the properties and appearance of a highly vascular texture, which secretes or excretes a gelatinous matter, "containing multitude of corpuscles, of the same size as the corpuscles of blood, each filled with a minutely granular matter."‡

In scrofulous joints we see, during the progress of the disease, almost every grade and variety of texture,—

* I am indebted for the above account to the industry of Mr. Gulliver, who has collected the facts bearing upon the subject from Dupuytren and Breschet, and stated them in his usual clear and satisfactory manner. Vide *Edinburgh Medical and Surgical Journal*, July, 1835. I have particularly examined with the microscope the nature of the "fleshy appearance" or fungosity, and find it a corpuscular

excreting texture, full of blood-vessels, and abounding with colourless cells.

† "Cyclopædia of Practical Medicine." Art., Rickets.

‡ Solly—"Medico-Chirurgical Transactions," vol. xxvii; Cumlin—"Cyclopædia of Practical Medicine," Art., Mollities Ossium; and Dalrymple—"Dublin Quarterly Journal of Medical Science," Aug., 1846.

pus, tuberculous matter, fungosities or granulations, lardaceous, fibrous, and cartilaginous textures. Fungosities or granulations are highly vascular textures, assuming a kind of fleshy appearance, excreting in abundance a viscid gelatinous matter, and colourless cells, (pus;) lardaceous tissue is an intermediate form between fungosities and fibrous texture; it is in fact a highly vascular corpuscular excreting texture, ascending to the fibrous non-excreting form, which is the natural order, and "its presence," as Bonnet states, "indicates a better state of constitution than the existence of fungosities alone does; but its metamorphosis into fibrous texture is indispensable to the recovery of the joint.*"

CASE.—"A pale-looking boy, sixteen years of age, came under treatment for dropsy of the belly and anasarca, and died gradually exhausted with hectic fever. He had no symptoms which could have revealed the existence of the disease found on examination after death. The cavities of the chest and belly contained much serous fluid. The peritoneum was everywhere thickened, and studded over with tubercles. The glands of the mesentery were enlarged and tuberculous. There was an immense abscess, containing four pints of curdy pus, situated on each side and in front of the spine, which was denuded of periosteum. The kidneys were enlarged and pale. There was a cicatrix on the inner aspect of the left shoulder, where an abscess had opened two years previously, which, after discharging matter for some time, healed. On opening the joint pus escaped; the articulating surface of the humerus was rough from being denuded of its usual smooth covering. A section exposed to view a perfect specimen of yellow tubercle, in the cancellated structure of the head and neck of the bone. The cancellated texture was deeply congested with blood, intensely red, and slightly softer, than in its healthy condition; in the midst of the red cancelli were seen the straw-coloured tubercles; similar tubercles were also found in the diseased lumbar vertebrae."†

In remarking on the above case, Dr. Watts states "that the formation of tubercle in the bones had been doubted by many, and it is only a few years ago that the question was satisfactorily determined in the affirmative. Respecting the manner in which tubercles form in the osseous structure, the cancellated structure becomes congested with blood, its nutrition is disturbed, it apparently has some tendency to soften, and a badly vitalized lymph is exuded in spots, and forms into tubercle, all of which may happen without the excess of heat or manifestation of pain usually attending inflammation."‡

We have seen in respect to a regular metamorphosis in the union of a fractured bone, and in the healing of wounds, that a viscid gelatinous matter, lymph, or protoplasm is an early morphological form, and also that a similar matter is almost universally found shading

off into pus or tuberculous matter in scrofulous diseases. LOUIS, whose authority is paramount in all questions relating to the pathology of phthisis, says that he has detected this matter in both its principal forms,—granulations, and larger shapeless masses, in all the fibrous textures, in the pleura, on the free surface of the peritoneum, in the substance of the pia mater, and in the great omentum; and he adds that in all these situations he has found it susceptible of transformation into opaque tubercle, and in this opinion he coincides with the conclusion previously formed by Laennec. The observations of Louis, and the conclusions of Laennec upon this point, are quite in accordance with the facts and morphological doctrines deduced from my microscopical investigations, which have shewn that the lymph or protoplasm of the blood consists of colourless cells, molecules, granules, and nuclei, imbedded in viscid fibrillating material; that the lymph is susceptible of conversion into pus by the addition to it of an unusual multitude of cells derived from the blood current; into fibrous texture, upon the fibrillation of the coagulable element; and into tubercle, by the rupture of the cells and degeneration of elements, when the morphological tendencies of the textures on which the lymph appears, are retrograde.

An increased redness or vascularity of a texture, with an increased nutritive activity and new products, has been considered characteristic of inflammation; but it is manifest, that an increased redness, with an increased nutritive activity and new products, followed by the union of a fractured bone by bone, has a very different result from the nutritive activity which fails, (in rickets,) to accomplish the required conversion into bone, and from that also which (in mollities osseum,) accomplishes the retrograde conversion of an osseous texture into a corpuscular one, which changes the textures of a joint (scrofulous joints,) into fungosities, tuberculous matter, and pus, and converts (in phthisis,) the coherent cellular parenchyma of the lung into similar degraded forms.

In the first example, the fractured bone, the injury gives rise to an increased vascularity and nutritive action, and the result is, that in a certain time "the injured limb is restored to its natural state." The limb being restored to its natural state, the metamorphoses is natural, and being natural, it is also conformable or regular. But an increased vascularity, with an increased nutritive activity, and conformable products, fulfils the definition before given of simple, healthy, or conservative inflammation; and it follows, therefore, that simple inflammation attends the reparation of a fractured bone. If the metamorphosis happen to be arrested at any stage short of perfect ossification, the limb will not be restored to its natural state; in that case the metamorphosis would be unconformable or

* The quotation is taken from the *British and Foreign Medical Review* Art. Bonnet—*Traité des Maladies des Articulations*, January, 1846.

† Dr. Watts—"Manchester Pathological Society."—*Medical Gazette*, Jan. 1, 1847.

‡ Loc. cit.

irregular, and the inflammation (the redness and vascularity,) *therefore* unhealthy.

In the second example, (rickets,) the normal metamorphosis is arrested, and the cartilaginous texture, notwithstanding its redness and vascularity, will not proceed to bone. The metamorphosis is therefore irregular; and if we call the redness and vascularity, inflammation, the inflammation is unhealthy.

In the third examples, (genuine scrofulous diseases,) mollities ossium, scrofulous joints, and consumption, the natural textures, from an *inherent disposition*, or an *irritation* coming from without, or from both these causes acting conjointly, are unable to preserve their type, and with an increasing vascularity, fall rapidly back into lower and earlier forms.

A retrograde metamorphosis, it will be observed, does not embrace any of the changes resulting from a loss of vitality, it simply expresses a fact of living structure,—the replacement of a later or higher texture by one of an earlier or more primary type, and the phenomenon is one of great energy and activity; new textures, new vessels, and new products, are as rapidly formed as when the structure was evolving from its embryo state.

In any comparison of the phenomena of a retrograde metamorphosis in plants, with scrofulous diseases in animals, wide differences and distinctions must of course be expected. Plants have no nerves nor muscles, nor have they a rapidly circulating corpuscular fluid or blood; their organs are more uniformly cellular in texture than those of animals, and thus in them it happens, that an entire organ may be converted into the form and shape of another; an event not observable in the more multiplied textures of the organs of animal bodies. Such a transformation, however, necessarily involves a change of texture, and it is with *the textures* rather than with *the organs*, that the morphological analogies between plants and animals must be traced. The retrograde metamorphosis in plants is to a green leafy parenchymatous texture, which having the properties of a solid, must therefore have a form and shape, and it is this which constitutes the abnormal leaf or leafy texture. In animals, the retrograde morphology is to the cellular elements and protoplasm of the blood, (the primary nutritive condition of the solid textures,) which having more the properties of a fluid than a solid, are therefore without definite shape or fashion. Hence the term ulceration is applied to scrofulous diseases in animal textures, in which the solid texture gradually softens, and being replaced only by a fluid or semi-fluid protoplasm, and incoherent cells, large excavations and hollow places, termed abscesses, are left filled with what is technically termed pus, or mucus; and the morphology is more rapid and energetic in animals, because a current of protoplasm and incoherent cells, is at all times ceaselessly flowing through all parts of their structure.

The general conclusion derived from these investi-

gations is,—first, that a morphological law governs the transformations of the elements of the human structure, analogous to that established in respect of plants, in which the normal order is, soft corpuscular textures, coherent cellular, elastic fibrous, firm cartilaginous, and hard bone. The intermediate or transitional forms being fibro-corpuscular, fibro-cellular, and fibro-cartilaginous. Secondly, that whatever may be the type, or nature, or function of an organ, there is, as a consequence of the order or law of its evolution and nutrition, a disposition in the textures composing it—exhibited upon appropriate conditions applied—to revert or go back, especially during the period of their growth, to the primary incoherent corpuscular condition out of which they were originally metamorphosed. Thirdly, that scrofulous diseases are special examples of this disposition, proofs of an irregular and retrograde morphology. But as the conclusions here enunciated will hereafter be converted into principles for the prevention, treatment, and cure of scrofulous diseases, inflammation, and consumption; so therefore it is desirable, to support them by as many points of similarity between the growth of animal and vegetable textures, as occur to me at the moment.

In the first place, then, it has been stated, that in plants an inherent disposition to a retrograde metamorphosis is transmitted from the parent plant to the seed, and that unfavourable external conditions will produce the same result in otherwise healthy individuals, for in the human subject parents impart or transmit to their offspring an inherent disposition to scrofulous diseases, and unfavourable external conditions will bring about the same result.

"It may truly be asserted," says Dr. Cumin, "That no original temperament or frame of body confers immunity from scrofulous diseases, for it is observed to originate in the healthy offspring of healthy parents under circumstances the principal of which are habitual exposure to cold and damp, with insufficient food, privation of pure air, and want of healthful exercise. Instances are recorded where persons in good health have been affected with scrofulous diseases after being confined in dungeons or prisons, and there scantily fed. The influence of such causes in producing scrofulous diseases in the inferior animals, has been made the subject of experiment by Dr. Jenner, Dr. Baron, and others, and the results have satisfactorily proved, both the great extent of that influence, and the power we possess of removing the factitious disease by replacing the animals in healthy situations, and supplying them with wholesome food."

Scrofulous diseases in animals, therefore, have this additional analogy or similarity with the retrograde metamorphosis of plants, viz., that the phenomena arise in both from precisely the same causes,—an inherent disposition transmitted from parent to offspring, and

unsuitable external conditions; moreover, experience proves that no person can be considered as exempted from scrofulous diseases, and this result ought to follow if my conclusion be true,—for if these diseases be retrograde morphological states, arising from a law of nature pervading all living structures, there can be no exceptions in favour of individuals.

(To be continued.)

OPERATIONS PERFORMED UNDER THE INFLUENCE OF ÆTHER.

By W. C. WORTHINGTON, Esq., F.R.C.S., Senior Surgeon to the Lowestoft Infirmary.

TO THE EDITOR OF THE PROVINCIAL MEDICAL AND SURGICAL JOURNAL.

SIR,

I was much struck with the value and importance of your remarks on the subject of æther-inhalation, contained in the Journal of March 10th, and am quite of your opinion, that practitioners residing in the country are imperatively called upon to co-operate with those of the metropolis, in helping to elucidate the use of the letheon, by a faithful record of cases. It must be acknowledged that great circumspection is required in the employment of any new agents, when it happens that the functions of so important an organ as the brain are manifestly influenced by its operation. In a former number of the Journal I reported the result of eight cases of surgical operation, in which the inhalation of æther had been employed. Since that time some further cases have fallen under my notice, which I beg leave to transmit for insertion.

CASE I.

Thomas Rose, aged 42, a labourer at the Lowestoft Harbour Works, was received into the Infirmary March 5th, with his right hand severely crushed by the heavy bell of a pile-driving machine falling upon it. After the accident he was incautiously allowed to walk from the works to the Infirmary, a distance of three quarters of a mile. The fatigue arising out of this circumstance, added to the shock the nervous system had so recently sustained, caused a considerable degree of collapse to follow. Amputation was considered necessary, but the operation was deferred two or three hours, until some degree of re-action took place. Previously to commencing it, an attempt was made to letheonize the patient. After a few inhalations, his respiration became extremely hurried. At the end of two or three minutes, to the amazement of myself and those present, he started from his seat in a state of furious delirium, vociferating the most awful curses, at the same time stamping vehemently with his feet, and throwing his arms about in a most wild and frantic manner, requiring four or five persons to restrain him. This paroxysm lasted nearly four minutes, when he fell back in his chair, apparently somewhat exhausted. Upon returning consciousness, which soon took place, he remarked it was "*rum stuff he had been taking, but now was all right again.*" The

operation was then performed, which he bore with calmness and fortitude. It was afterwards ascertained the patient was of an exceedingly irritable habit, and addicted to intemperance; and when under the influence of intoxicating drink, he became so exceedingly noisy and quarrelsome, that it was with difficulty he could be prevented doing mischief. Here evidently was a case where the inhalation of æther was inadmissible, and it shows the importance of inquiring into the habit and temperament of individuals, previous to undergoing the narcotizing process.

CASE II.

March 15th. Sarah Sullins, aged 43, a patient of the Infirmary, was narcotized previous to submitting to excision of the left breast for carcinoma. She went through the operation without any expression of pain, and when asked if she experienced any during its performance, she answered in the negative, but confessed she was not altogether unconscious of what was going on. After removing her to bed, she remained several hours in a perfectly tranquil state, and free from pain, her condition very much resembling that produced by a mild opiate. For some days she progressed favourably, when erysipelas attacked the wound, and thereby retarded recovery.

CASE III.

April 7th. Mary Read, aged 22, an Infirmary patient, was narcotized previously to being operated upon for ganglion, situated on the anterior part of the wrist. A sharp-pointed straight bistoury was passed through the swelling, and a probe armed with cotton rapidly followed. On recovering from the effect of the æther she expressed herself as not being altogether unconscious that the operation had been performed, but suffered no pain. No unpleasant symptoms followed.

CASE IV.

The same morning at the Infirmary, I removed the middle finger, at the metacarpal bone, of a man, aged 22. He was of an exceedingly calm temperament, and sober habits. No difficulty was experienced in narcotizing him. The stupor lasted nearly five minutes. When restored, his first impression was, he had been travelling on the railroad to Norwich, and had passed some days very agreeably with his friends. He manifested great surprise on being informed he had undergone the operation, and some minutes elapsed before he could be persuaded of the fact. No unfavourable symptoms followed.

At the Infirmary, on the same morning the two preceding operations took place, an aged female was couched in both eyes, and also another patient submitted to the extirpation of a malignant tumour from the inner canthus of the eye. In neither of these cases, however, did I deem it advisable to employ æther. The age of the former patient was considered a sufficient reason for not using it. The latter had for some months before been treated at the Dispensary of a neighbouring town for paralysis, from which she had not entirely recovered, and, notwithstanding she earnestly intreated to be permitted to inhale, the request was not complied with, upon the supposition that there might still exist a