one root, or in fact are rooted at all, but always continue to grow at the base as they wear at the crown. They always want one of the constituents which enter into the composition of the complete mammalian tooth—the enamel (although, as shown by C. Tomes, the enamel-organ may be present at an early stage of development). They are almost always *monophodont*, or only developed as a single set; and, finally, they are never present in the anterior part of the mouth, and very rarely even in the premaxillary bones.

It is highly probable that the existing members of the group are very much differentiated representatives of a large group, the greater number of which are now extinct, and which have become so without attaining a high grade of organisation.

The great diversity of structure of the existing families, as shown not only in the more obvious characters, but even in the structure and arrangement of the foetal membranes, the high degree of specialisation to which many have attained, the paucity of species and even of individuals, their limited area of distribution, and their small size compared with known ancestral forms, all show that this is an ancient and waning group, the members of which seem still to hold their own, either by the remoteness and seclusion of their dwelling-places, their remarkable adaptation of structure to special conditions of life, or by aid of the peculiar defensive armature with which they are invested.

Their former history can, however, only be thus surmised, rather than read, at present; for, though we have ample evidence of the abundance and superior magnitude of certain forms in the most recent or post-tertiary geological age, and in one part of the world, beyond this time—i.e., in the true tertiary period, and in other parts of the world than America—the remains of animals of this order hitherto discovered are only fragmentary, and give a most imperfect idea of their actual condition, and afford no indications which serve to connect them with any other branch of the class.

The existing members of the order readily group themselves into five distinct families, the limits of which are perfectly clear. These are: 1. *Bradypodidae*, or Sloths; 2. *Myrmecophagidae*, or Anteaters; 3. *Dasyopodidae*, or Armadillos; 4. *Manidae*, Pangolins, or Scaly Anteaters; and 5. *Orycteropodidae*, Aardvarks (earth-pigs), or African Anteaters. The geographical distribution of these families coincides with their structural distinction; the first three being inhabitants of the New, and the last two of the Old World.

It has been usual to arrange these families into two larger groups or suborders: 1. The *Phyllophaga*, or leaf-eaters, also called *Tardigrada*, containing the Sloths alone; and 2. The *Entomophaga*, insect-eaters, or *Vermilingua*, worm-tongued, containing all the other families; from which sometimes the *Orycteropodidae* are separated as a third suborder, under the name of *Effodientia*.

At first sight, this arrangement seems well founded; but, bearing in mind the intermediate characters of some of the extinct forms, and giving full weight to certain anatomical peculiarities on which sufficient importance has not hitherto been laid, it appears highly probable, however opposed to preconceived views, that the Sloths are more nearly related to the American Anteaters than the latter are to animals which appear to represent them in the Old World, the Pangolins, etc.; and that the group of *Entomophaga* or *Vermilingua*, composed of the American and Old World Anteaters, has no existence in nature. These relationships will, however, be developed as the structure of each group is reviewed in succession. We shall then be in a better position to form some idea of their mutual affinities.

The general characters of the family of Sloths (*Bradypodidae*) are as follows:—Externally covered with long, coarse, rough hair. Head short and rounded. External ears inconspicuous. Fore limbs greatly longer than the hind limbs; all the extremities terminating in narrow curved feet; the digits never exceeding three in number, being encased for nearly their whole length in a common integument, and armed with long strong claws. Tail rudimentary. Teeth, five above and four below on each side. Stomach complex. No cæcum. Penis rudimentary. Uterus simple. Placenta deciduate, dome-like, composed of an aggregation of numerous discoidal lobes. They are strictly arboreal in their habits, feeding on the leaves and young shoots of trees; slow in their movements; solitary, nocturnal, silent, and inoffensive animals. They produce only one young one at a birth, and show an almost reptilian tenacity of life in surviving very serious injuries and poisons in large doses, and also in exhibiting irritability of muscular tissue persistent long after death. They are limited geographically to the forest regions of South and Central America. They were all included in the genus *Bradypus* by Linnæus; but Illiger separated the species distinguished by possessing only two toes on the fore feet under the generic name of *Cholepus*. Of the latter, there are two species—*C. didactylus*, the common two-toed Sloth of South America; and *C. Hoffmanni*, from Costa Rica, Panama, and Ecuador. Of the

genus *Bradypus* there are several species; but their characters are not yet well defined by zoologists.

The external dry, shaggy, dull-coloured covering of the Sloths renders them very inconspicuous among the mosses and lichens which abound in the trees among which they live; and the concealment thus afforded is heightened in some species by the peculiar greenish tint of the outer clothing, very uncommon among mammals, and which is not due to the colour of the hair itself, but to the growth upon its surface of an alga, the lodgment of which is facilitated by the fluted (in *Cholepus*) and rough (in *Bradypus*) surface of the exterior of the hair. This alga (*Pleurococcum*) has been fully described by Welcker and Kuhn, and also by Sorby. Its growth is promoted by the dampness of the atmosphere of the gloomy forests in which the Sloths dwell, as it soon disappears from the hair of animals kept in captivity in this country, and its colour is lost in dried museum specimens. If this parasitical growth really have any efficient action in concealing the Sloth from its enemies, it is a very remarkable instance of the co-operation of two such totally different organisms as the simple minute epiphyte and the highly organised mammal for their mutual benefit—the one affording protection, and the other lodgment.

NOTES

ON

THE VOLUNTARY DISLOCATIONS OF A CONTORTIONIST.

By EDMUND OWEN, F.R.C.S.,

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I READILY comply with the request of the Editor of the JOURNAL, that I would prepare for publication some account of Warren, the American acrobat and contortionist, who was seen at a recent meeting of the Medical Society of London. When, as was the case on that occasion, he acts as his own showman, his performance is somewhat suggestive, perhaps, of spangles and foot-lights; but, when he gives himself up to scientific examination or demonstration, he is found to be a pleasant and highly intelligent man, with a keen interest in the anatomy and surgery of his peculiar and abnormal accomplishments.

He appears to have been examined by almost every anatomist and surgeon of note in the western world; and, as he has been lately shown in several of the metropolitan and other hospitals, and is about to wander over the European continent, he promises to play a part in the republic of surgery not unlike that of Alexis St. Martin in physiology. Certainly one should not throw away the opportunity of examining him. The interest which Dr. Hamilton, of New York, has evinced in him, is of itself sufficient to give the imprint of genuineness to Warren's claims; and, though there happens to be no allusion to him in that edition of Hamilton on *Fractures and Dislocations* which I possess, the author considered the case worthy of forming the subject of a special clinical lecture, which he delivered at the Bellevue Hospital, at the end of the year 1878. This lecture was reported in the *Hospital Gazette* of March 8th, 1879, and a copy of it is now before me.

When Warren, who is about thirty-four years of age, was a small child, it was discovered that the occasional tumblers to which he was liable were due to the head of the femur slipping out of the acetabulum; but there was no difficulty experienced in the reduction of these displacements, and certainly the condition bore no analogy to the so-called congenital dislocation of the hip.

When he was eight years old, he joined a company of strolling performers, and soon showed such a proficiency in the dislocation of certain joints, and in the assumption of unclassical forms, that he earned from an increasing circle of admirers the proud title of the Yankee Dish Rag. Of his acrobatic talents, pure and simple, I have seen nothing, nor have I witnessed any of his displays of strength. His muscular system is, however, beautifully developed, each superficial bundle of fibres showing clearly through his delicate skin, nor is there a particle of superimposed fat to blur its definite outline. Altering the trim of his beard, and ignoring the gross anachronism, one might almost imagine him to have been the smaller model for Laocoon himself. Of his muscles he is justly proud; and, with the view of preserving their refined development, he has forsworn alcoholic drinks.

An interesting feature in connection with his muscular system is, that he has, by determined practice, obtained isolated control over individual muscles which one is accustomed to see acting in concert. No doubt, the dissociation of contracting muscles is a mere matter of edu-

cation : as little children, few of us, I suppose, could afford the doctor a thorough inspection of the tongue, without at the same time widely spreading out the fingers; nor, at the first attempt, could we call into solitary contraction an orbicularis oculi. But, in all such matters, Warren has left us far behind; he can throw into energetic contraction the biceps alone, the supinator longus, the radial extensors, the platysma myoides, and I know not how many other muscles; and when he "strings" (as he calls it) the sartorius, he makes that riband muscle start up from its groove, and show itself as a tightened cord, from the front of the iliac spine to the inner side of the knee.

Fig. A.

Another and more "showy" feat of his is to leave flaccid that part of the serratus magnus which is attached to the inferior angle of the scapula, whilst he rouses into energetic contraction the rhomboids and certain other muscles, until the shoulder-blades are so displaced, and their lower angles made so prominent, that a condition like that which Liston described as "luxation of the scapula" is produced. But all this is effected with a considerable *coup de théâtre*; and though, no

doubt, it was considered an effective part of his old performances, still it is so utterly devoid of grace and artistic merit, that its discontinuance might have been advised.—"O, it offends me to the soul, to hear a robustious periwig-pated fellow tear a passion to tatters, to very rags, to split the ears of the groundlings."

That accomplishment of his in which the "judicious" are most interested is the power of producing, by muscular contraction, a dislocation at each hip-joint, which, with less local commotion, is as quickly

Fig. B.

reduced. These changes of position of the upper end of the femur are, however, accomplished with so sudden a jerk, that it is impossible to work out in detail either the muscular movements by which they are effected, or the course which the head of the bone is made to take. But this much is certain; first, that after the disturbance the top of the great trochanter is brought an inch and a half, or more, above the line which runs from the anterior superior spine of the ilium to the prominence of the ischial tuberosity; and, secondly, that the head of the femur has come out of the acetabulum, and has travelled in a direction backwards as well as upwards. The accompanying illustration shows the knee advanced, the thigh inverted, and the outline of the hip disfigured. The first time that I saw Warren stand with his femur dislocated, I accused him of having arranged the limb after Sir Astley Cooper's drawing; this he denied; but he confessed that the toes on the dislocated side did not necessarily abut on the opposite instep. Nevertheless, in posing him for Mr. Jerrard, I placed the toes upon the opposite tarsus; and, in this way, steadied the trembling limb, showed the amount of its shortening, and bowed to a conventionality which every reader of and writer upon the subject of dislocations of the hip, is justified in expecting. (I put the word "reader" first in order, for I apprehend that every modern writer on the hip first reads Sir Astley Cooper's work; and certain it is that the closer he keeps to the master's lines, the more clear and practical will his description be.) Perhaps one may express regret, however, that Sir Astley depicted his patient as cheerful and erect; for, with this sketch in his mind, the student winds up his account of the signs of the dislocation with the statement that, when the man stands up, his great toe points across the opposite tarsus. The assurance that such patients are invariably found in the horizontal posture comes to him as a shock which should have been avoided.

Like every practical surgeon, Warren is fully alive to the value of Nélaton's line in the diagnosis of dislocation of the femur; but he states—and I give the assertion for what it is worth—that comparatively few of the surgeons who examine him draw the line with accuracy. I am inclined to think that the student is not, as a rule, made sufficiently appreciative of the practical bearing of this diagonal. Its importance in the late stages of hip-joint disease can hardly be over-estimated. A child, for instance, has been suffering from suppurative in the articulation, and the ligamentum teres having been destroyed, the upper end of the femur makes its way with the escaping matter through the thin posterior part of the capsule into the dorsum of the

ilium; and because from that time the local and general disturbance diminishes, it is but natural that the parents of the little sufferer should comfort themselves with the belief that the cessation of pain denoted the advent of the long looked-for convalescence. If the surgeon should now have recourse to Nélaton's line, he will at once appreciate the retrogressive changes, and, dispelling vain hopes, may at once consider the propriety of excising the diseased parts, and so save much valuable time. Illustration B shows the line represented by a dark cord, which,

Fig. C.

running over the buttock, connects the prominent parts of the anterior superior iliac spine and the ischial tuberosity; in its course it just touches the top of the great trochanter of the femur when in the normal position. (Before taking this, and in the succeeding illustration (C), the free borders of the great trochanter were traced out on the skin in dark chalk.)

Fig. D.

C is an exact copy of the photograph which was taken just after the dislocation had been effected, the former marking of the great trochanter having been washed off, and the outline marked in the new and abnormal position. For the accuracy of the lines I hold myself responsible. That there is a dislocation of the head of the femur upwards and backwards does not admit of questioning, though, from the strain of the muscles and the thickness of their covering, it is impossible to say with certainty the exact position in which the head is placed. Warren inclines to the belief that it has entered the great sacro-sciatic notch, an opinion to which I am not prepared to assent, though

probably it is not far from the upper border of the notch. The luxation, whatever its exact nature may be, differs from that which the surgeon is now and then called upon to treat, in this, that the head of the femur is still inclosed within the capsule. In all probability both the capsule and the ligamentum teres are entire, though stretched, as it were, far beyond the limits of anatomical possibility. Warren has, apparently, regarded a condition of congenital relaxation of various ligaments as his "talent"; certainly he has not wrapped it in a napkin. On the contrary, he has employed it so profitably that he can now produce at will many subluxations and distortions. Of these I have neither the space nor the inclination to say much, though I considered the partial dislocation of the left humerus worthy of being photographed and permanently represented (Fig. D).

Fig. E.

Of the last two illustrations, E represents the abdomen rendered so

Fig. F.

flat and shallow that the contour of the aorta may be distinctly made out by the fingers a little above the umbilicus and slightly to the left

of the median line. In this performance he has "crowded" most of the abdominal contents beneath the diaphragm. In F, on the other hand, he has produced a "phantom tumour" by driving coils of intestine within the weird and peculiar grasp of the rectus and oblique muscles. The "growth" is rounded, and dull on percussion, and, as he remarks, looks as if it wanted an exploratory puncture. Certainly it is most suggestive, and well worth an inspection.

In conclusion, I would tender my best thanks to Mr. Jerrard of 107, Regent Street, for the time and skill which he placed at my disposal in the preparation of the excellent photographs from which the woodcuts have been prepared by which these notes are illustrated.

TRAUMATIC MALIGNANCY.

By W. HARRISON CRIPPS, F.R.C.S. Eng.,

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THE communications of Mr. Barwell and Mr. Butlin, in recent numbers of the JOURNAL, are of great interest and value in again directing attention to the connection occasionally existing between injuries and malignant growths. All who have had opportunities of recording the history of patients suffering from malignant disease, must remember cases in which traumatism has been the starting-point of malignancy. During my period of office, as registrar of St. Bartholomew's Hospital, several cases came under observation, in which malignant growth more or less rapidly supervened upon injury. I select the following as examples of malignant growth following blood-extravasation.

CASE I.—A woman, aged 40, admitted under the care of Mr. Willett, stated that she was quite healthy a year previously to her admission. At that time, after a walk in a new pair of boots, she noticed a blood-blisther (of the size of a sixpence) on the sole of her right foot. She was very certain that, previously to the blister, her foot was sound. After a while, the blister broke, leaving a raw surface, which never healed, and gradually increased in size. On admission into the hospital, a growth (of the size of a florin) was seen on the foot, in the site of the blister. It was moderately hard, and covered with a thin bluish cuticle. The growth was removed, with a narrow margin of healthy skin round it; and a flap of skin, cut on the near side of the foot, was turned downward, so as to cover the wound on the sole. The wound healed satisfactorily, and the patient was discharged from the hospital in fair health; there was, however, a slight enlargement of one of the femoral glands. In six months, she was readmitted. At the margins of the cicatrix on the foot were several little nodules of recurrent disease; but the portion of skin brought down to cover the wound was healthy. In the groin, the femoral glands formed a mass of disease of the size of a small orange, and about the upper part of the body were a few small subcutaneous nodules. She was greatly emaciated. During the next few weeks, hundreds of small nodules appeared beneath the skin of the trunk, the limbs remaining free. Symptoms of internal complication rapidly supervened, and she died, nine months after the original operation.

At the *post mortem* examination, the subcutaneous nodules described were found to be little masses of sarcomatous material, lying beneath the skin. The surface of both lungs were found studded with nodules as large as peas. These nodules were just beneath the pleuræ, and apparently growing in the course of the lymphatic vessels. Similar nodules were found growing beneath the pericardium and the endocardium. The right femoral and inguinal glands, and the lumbar glands of both sides, were converted into masses of disease. Secondary growths were thickly studded in the kidneys, pancreas, and liver. The intestines presented an extraordinary appearance, looking as if they had been thickly covered with boiled sago, caused by thousands of nodules in the peritoneal coat. The mesenteries were similarly affected, and the great omentum was converted into a white nodular mass, weighing four pounds.

Portions of the disease, from the sole of the foot close to the cutaneous margin, presented (under the microscope) an appearance closely resembling alveolar cancer—that is to say, a series of spaces, formed by fairly well-marked fibrous tissue, filled with cells approximating an epithelial type. If, however, the slide were moved, so as to obtain a view of a deeper portion of the tumour, the alveolar structure was lost, and it presented the structure of a round-celled sarcoma—that is to say, a collection of small round-cells, without definite arrangement, and only here and there divided by fibrous trabeculæ. These cells, both in their shape and staining, closely resembled the nuclei of the epithelial-looking cells towards the surface of the tumour, and, I believe, were derived from them. Sections of the secondary deposits had a similar structure, or rather want of structure, to that seen in the deeper parts of the pri-

mary growth. They consisted, in fact, of a collection of small round-cells, described pathologically as sarcoma. These sarcomatous masses, when examined under the microscope, often present appearances exactly similar to the collection of lymphoid cells normally found in the sub-mucous tissue of the healthy intestinal tract.

CASE II.—E. M., a police constable, was kicked in the left breast whilst arresting a prisoner; the blow was not severe, nor did it prevent his continuing his duty. On the following day, there was a bruise of small size surrounding the nipple. The dark mark of the bruise remained for some weeks. A little more than two months later, he noticed a lump, of the size of a marble, on a portion of the site previously occupied by the bruise. He was perfectly certain that there had been no hard swelling of any kind at the time of the injury; for he had carefully examined the part during the first few days after the blow. The swelling steadily increased; and, when admitted to the hospital a year after the accident, there was a large sarcomatous tumour, of the size of a foetal head, with two large lumps in the axilla.

Notwithstanding the undoubted connection, in these two cases, between the injury and tumour-formation, yet it is exceptional to trace the starting-point of malignant disease from a local injury. Such a connection cannot be traced in more than 7 or 8 per cent. of cases. Small as this percentage is, it is sufficient for our present purpose, as showing conclusively that an injury may be the starting point of malignancy. The question immediately arises, seeing that malignancy may be the sequel to an injury, how it comes to pass that thousands of injuries are inflicted without being followed by such an untoward result? Mr. Butlin and Mr. Barwell answer such a question, by assuming that an injury, which in an ordinary person would be followed by no ill consequence, is, if it fall on a patient with a "constitutional cancerous diathesis", likely to produce a malignant growth. Mr. Butlin, in his paper, thus expresses this belief: "That there is probably a strong predisposition to the development of tumours in persons who thus break out in tumour-growth on the application of a violence." He further states: "The evidence in favour of this theory is as strong as that which supports a like belief in a strumous or rheumatic diathesis."

This theory has long been held, and often advocated, among others, by Sir William Jenner, who, at the discussion at the Pathological Society in 1873, called this constitutional state "a disposition, under irritation, to form cancer."

From the manner in which this diathesis is spoken of, and its being compared with gout and rheumatism, it is clear that those who believe in its existence must regard it as something that belongs to the body generally—a so-called constitutional state. In the two cases I have recorded, constitutionalists would see evidence of a specific diathesis, called into activity by the injury; for they would truly say, that a thousand such injuries might fall on as many individuals without producing cancer; and from this they would argue, that there must be a second factor, besides the blow, to produce such an exceptional result. All would acknowledge that some such second factor does exist; but the point I wish to raise is, What is the evidence to show that this resides in some peculiar diathesis affecting the body generally, rather than in some specific influence started in the site of the injured part?

So long as the doctrine of an inherited cancerous tendency was taught and universally accepted, it afforded strong support to the view that a peculiar constitutional condition was required, fit for the growth of cancer. In the fourteenth volume of *St. Bartholomew's Hospital Reports*, I criticised at some length the evidence upon which this doctrine of inheritance was founded; and, by comparing the various tables published on this subject with the records of cases in the hospital registration volumes, concluded that the disease was not inherited; the offspring of cancerous parents being no more liable to suffer from the disease than the children of other people.

If this tumour-forming constitutional condition really existed, it would seem that any blow struck on the patient with such a diathesis should be followed by tumour-growth; but this is not the case, for wounds, contusions, inflammations, and suppurations have frequently occurred in persons actually suffering from cancer, yet, save in the rarest instances, no second cancerous growth has resulted in the injured part, unless the injury have occurred in the immediate neighbourhood of the primary disease. It might be assumed, that when the morbid constitutional state has found expression so to speak in the primary tumour, that the diathesis vanishes, and that the body "under irritation ceases to produce further tumour formation". Such a view is entirely contradicted by fact; for secondary growths flourish and develop coincidently with the increase of the original tumour, which could not be the case if the primary growth monopolised the diathesis. These secondary growths are certainly not independent outbreaks, and are clearly derived by infection from the primary tumour. They first show themselves at exactly the points where we should expect foreign particles