PART III.

MEDICAL MISCELLANY.

*Electro-Physiological and Pathological Researches on the Individual Action and the Uses of the Muscles moving the Thumb and the other Fingers**. Memoir presented to the Academy of Medicine of Paris. By Dr. DUCHENNE (de Boulogne), Laureate of the Institute of France, &c. &c.

THE individual action and the uses of the muscles which move the fingers have been badly defined or utterly unknown. Such is the conclusion I came to long ago, after having observed a great number of pathological facts quite inexplicable by the present anatomical and physiological data. Thus, for example, the extensors of the fingers and the superficial and deep-seated flexors, according to the ideas generally received, are the only muscles known to extend or bend the phalanges of the fingers; nevertheless, I have sometimes seen the two last phalanges extended in cases where the extensors were paralyzed; and sometimes the first phalanges performing the movement of flexion, although both sets of flexors lost their action on the two last phalanges, and consequently on the first. At other times I have noticed, that notwithstanding the extensors and the flexors enjoyed perfect integrity, the extension of the two last phalanges was impossible or very limited, while the first phalanges could but slightly, or not at all, obey voluntary flexion.

These functional disorders were attended with serious deformity of the hand, and even with articular deformation, which arose from the faulty attitude of the phalanges carried into abnormal directions by powers certainly foreign to the action of the extensor and of the flexor muscles. There existed, in these various cases, neither muscular contraction nor primary articular injuries that could in any manner explain these phenomena. With regard to the thumb, pathology equally contradicted physiology.

It is to the observation of these pathological facts I am indebted for the idea of the electro-physiological and pathological researches

* [This important memoir has been specially translated from the original, under the superintendence of the author, for our Journal.—ED.]

forming the object of the present memoir, for those facts seemed to show that the extensors and the flexors, both deep and superficial, do not move the three phalanges with equal power, and that, physiologically, certain phalanges do not obey the action of these muscles. Was it not evident also, that other muscles, besides the extensors and flexors just mentioned, must have the greatest share in moving the phalanges, extending the one and flexing the others? Did not the same obscurity prevail with regard to the functions of the thumb?

I conceived that it belonged to localized electricity to endeavour to solve these problems.

We know that localized electricity can limit its power to each muscle,—to each of its fasciculi, while volition but rarely possesses this faculty, and I am not convinced that volition can even at times possess such power, whatever the exercise or the education of movements may be*.

The results of my electro-physiological researches have gone beyond my expectation. They have shown, and in this Paper my purpose is to prove:—1. That the extensors and the flexors of the fingers do not possess all the properties hitherto attributed to them. 2. That the movements of certain phalanges are found to be foreign to the attributes of these muscles, and that these functions are fortunately devolved on other muscles. 3. That this ingenious distribution of function amongst all the muscles moving the fingers allows the mutual independence between the extensor movement of the first phalanges and that of flexion of the two last phalanges, and *vice versa*, independence quite necessary to the mechanism of the most frequent movements of the fingers, and in the absence of which the hand would lose its lightness and dexterity. 4. That the functions of the abductor longus, and extensor longus et brevis pollicis have been wrongly defined, and that the greater part of the muscles forming the thenar eminence possess an action hitherto misunderstood, and without which the thumb would lose its principal uses.

The facts we arrive at by the means of those electro-physiological studies acquire vast importance when we come to the diagnosis and treatment of the diseases belonging to the muscles which move the fingers and thumb. I have thought proper to lay them under the control of pathology; and with this view I undertook a series of electro-pathological researches. The latter, while they establish the exactness of those new facts, enable us to become better acquainted with the degree of utility of each individual muscle throughout the various uses of the fingers and of the thumb.

Lastly, these electro-pathological researches have allowed me to determine in a precise manner the real influence over the action of the phalanges of the fingers, and on the first metacarpal bone and

* [See the paper published by Dr. Duchenne, in the twelfth volume of our present series.—ED.]

the phalanges of the thumb, of the extensors, the flexors, and the interosseous and lumbrical muscles, in virtue of their tonic contractility; these researches have, moreover, led me to understand the mechanism of certain deformities of the hand consequent on atrophy or loss of tonicity in each of these muscles; such cases having hitherto baffled every kind of explanation.

A. MUSCLES MOVING THE FINGERS.—When, the wrist being flexed, and the fingers also flexed towards the palm of the hand, electrical excitation is directed to the *extensor* muscles of the fingers, there is observed a succession of extensor movements, which take place in the following order:—The two last phalanges are extended on the first, then the latter on the metacarpal bones, which in their turn are extended on the carpus and on the fore-arm. During this movement the last phalanges are kept extended on the first until the metacarpus has reached an almost parallel direction with the fore-arm. But at the very moment, extension still continuing to proceed, the metacarpus forms an angle with the fore-arm, the two last phalanges become flexed on the first, and the more so as the hand is the more thrown back towards the fore-arm. However great at this moment may be the energy of contraction taking place in the extensor muscles, it is impossible to effect the straightening out of the two last phalanges on the first, but the latter are still more thrown back towards the metacarpal bones.

It is evident from this experiment, that the action of the extensors on the last phalanges is much limited, and that if these muscles were the sole extensors of the fingers, the latter would assume the form of claws as soon as the wrist became thrown back on the fore-arm. This flexion of the two last phalanges is caused by the tonic resistance of the superficial and deep flexors, which the extensors cannot overcome.

Pathological facts will show that the physiological action of the extensors on the two last phalanges is still less than the electrical contraction of those muscles seems to indicate. It is, therefore, necessary that other muscles should help the impotent extensors in order to complete the extension of the two last phalanges. And electro-physiological experiments will soon allow us to discover what muscles are charged with this important function.

As another result of the preceding experiment we see that the extensor muscles extend in a very powerful manner the first phalanges on the metacarpal bones.

I will show in the following paragraph how fortunately it happens for certain movements of the hand that extension of the first phalanges can be produced independent of extension of the two last.

Artificial contraction of the *flexor sublimis* and of the *flexor profundus* muscles affects the movement of flexion of the two last phalanges in the manner described by all authors; but the flexion they give to the first phalanges is very weak and secondary, because this movement generally takes place at the moment only when these

muscles are already in a shortened state. A few experiments will show the truth of this proposition.

If the electrical action be limited to the flexores digitorum at a moment when the wrist and the two last phalanges are maintained in extension, the first phalanges become flexed on the metacarpal bones with great energy; but if the fingers are left to themselves, the two last phalanges incline inwards, closing in on the first, which in their turn become flexed on the metacarpal bones, but with no great degree of strength. This movement of flexion of the first phalanges is weakened the more, as the wrist is less thrown back on the fore-arm, and it even becomes nearly completely annulled when the wrist reaches its highest degree of flexion.

The following experiment shows how far the extensors are superior to the flexors in their action on the first phalanges. Make the extensors and the flexors contract simultaneously under the influence of a current of equal intensity, and you will see the first phalanges extend on the metacarpal bones, while the two last phalanges will flex on the first.

Should these experiments appear insufficient, the electro-pathological researches I shall hereafter relate will, I trust, complete the demonstration of the proposition,—that the flexors have not sufficient action on the first phalanges to be the antagonists or moderators of the extensors. Where are, therefore, the real flexors of the first phalanges? Such is the question that electro-physiological experiment shall soon decide.

When the flexor profundus is already in a shortened state, just as it begins to contract, the action of this muscle on the last phalanx diminishes considerably, and may even be annulled; for if, the wrist and the fingers being placed in extreme flexion, that muscle be made to contract either artificially or voluntarily, we see the last phalanx scarcely flex, and still more frequently even not flex at all on the second phalanx, which alone is carried into flexion on the first. The same experiment will equally show that flexion of the second phalanx on the first is effected with little energy, and requires great efforts, contraction then becoming painful.

It is, no doubt, with the view of preventing this shortening of the flexors, and in order to place the latter in the most favourable condition of strength, that the extensor muscles of the first phalanges contract synergetically as soon as volition sends a nervous discharge to these flexors of the last phalanges.

The study of the mechanism of voluntary flexion of the two last phalanges shows that during this movement of flexion the first phalanx places itself involuntarily in extension, provided this phalanx happens to be previously flexed on its metacarpal bone. The degree of contraction of the extensors is then in direct proportion with the force producing flexion of the phalanges.

These movements of the phalanges in inverse directions are rendered necessary by most of the uses of the hand. They are ob-

served, for instance, when the fingers direct a pen, a brush, a pencil, &c. I shall revert to the mechanism of these divers movements when I come to speak of the interosseous and lumbrical muscles and of the muscles moving the thumb.

Electrical excitation of each of the *interosseous* muscles of the hand produces, in succession, three movements:—1. With a moderate current the finger is brought into adduction or abduction (according to the special position of the muscle undergoing electrization). 2. With a current of greater intensity, the third and second phalanges are extended on the first. 3. While the latter movement is effected, the first phalanx flexes on the metacarpal bone.

The contraction of the *lumbrical* muscles produces the two latter movements,—viz., extension of the two last phalanges, and flexion of the first.

Out of the four lumbrical muscles the first is the only one effecting abduction of the finger, and this movement even is very limited.

The interosseous muscles, which cause the fingers to bend away from the ulnar side of the hand, produce this movement of abduction in a more effectual manner than the muscles whose action is to make them incline to that side; the interosseous adductor muscles, on the contrary, which produce adduction of the fingers with less energy, extend to a higher degree, and with greater strength, the two last phalanges on the first. Extension of the two last phalanges by the two interosseous muscles of one finger is, therefore, effected on each side in an unequal manner,—that is to say, that the abductor has a less part in that extension than the adductor. Is it with the view of reconstituting an equilibrium of the powers which are necessary to the production of this extensor movement of the fingers, that the lumbrical muscles (those energetic extensors of the two last phalanges, without being abductors) come in to join their action with that of the interosseous abductor muscles?

I have experimentally laid down, in the first paragraph, that the power of the extensor muscles of the fingers is limited to extension of the first phalanges, and is inadequate to overcome the tonic resistance which the flexor muscles oppose to the extension of the two last. To the interosseous and to the lumbrical muscles alone it has been given to overcome that resistance; these small muscles effect extension of those phalanges with such an amount of energy that we are bound to consider them in future as their real extensors, and the extensor muscles rising from the fore-arm as their very feeble accessories. Here is a conclusive experiment, proving the fact in an incontestible manner:—

Having placed the wrist of an individual (and it will be desirable to select for all these experiments an individual whose upper extremity is completely paralyzed) in a forced extension on the fore-arm, and keeping his first phalanges extended on the metacarpus; if then the extensor muscles are electrified to the maximum of intensity, no movement whatever is observed in the two last phalanges;

but if we place the exciters alternately on the points corresponding to the interosseous or lumbrical muscles, each of these muscles is instantly seen to extend the two last phalanges.

It is easy to prove by electrization that the interosseous and lumbrical muscles flex the first phalanges of the fingers with greater energy than the flexors; for the latter have but a weak action in producing this movement. Indeed, pathology alone can give us an idea of the importance of this function belonging nearly exclusively to the interosseous and to the lumbrical muscles, with the view of counterbalancing the tonic power of the extensors, as they tend to throw back the first phalanges on the metacarpal bones.

The interosseous and lumbrical muscles cannot extend the two last phalanges without flexing the first, and *vice versâ*. There must exist an unknown anatomical disposition, and a very ingenious one, to allow these muscles to effect simultaneously two opposite movements with such a great power. It is not by our present anatomical notions this physiological fact can be explained.

I have already remarked, that the manual uses requiring those movements in inverse directions of the first and of the two last phalanges are very numerous, and that they are of the utmost importance to the writer, the draughtsman, the painter, &c. &c. If we observe, for example, the movements performed by the draughtsman when he holds his pencil between his thumb and his two first fingers, we see one movement leading the line antero-posteriorly, and the other drawing it in a contrary direction to the first. I will analyze these two movements, and lay down the mechanism thereof.

1. *Movement leading the line antero-posteriorly.*—The two last phalanges of the fingers which have to lead the pencil are at first extended on the first phalanges, and the latter are flexed at right angles with their metacarpal bones. If, then, the artist wishes to trace the line antero-posteriorly, the two last phalanges of the fore and middle finger become flexed on the first, while the latter extend on the metacarpus.

The maximum extent of this line is, on an average, two inches in adults. It is due, for the greater part, to the movement of extension of the first phalanges, for if we prevent the latter movement by maintaining the first phalanges flexed on the metacarpus, the extent of the line does not exceed from half to three-quarters of an inch.

The movement I have just analyzed is produced by the synergic contractions of the flexor profundus and the extensor digitorum muscles. If the latter muscle acted, as it has been thought hitherto, on the three phalanges with equal energy, or if the superficial and deep flexors bent the three phalanges with equal power, the synergic contraction just alluded to, could not take place without having to overcome considerable antagonism: the extensor digitorum could not extend the first phalanx without being opposed to the flexion of the two last, and the flexion of the latter would impede extension of the first.

The foregoing considerations fully demonstrate, that if these

muscles had really possessed the action attributed to them, the use of the hand would have been considerably restrained.

2. *Movement leading the line postero-anteriorly*.—The mechanism of the movement leading the line postero-anteriorly, is contrary to that just described; that is to say, in order to perform this movement the first phalanges, which are extended, become flexed on the metacarpus, and the last phalanges, being flexed, become extended on the first ones. What I said above of the length of the line traced during the preceding movement is perfectly applicable to the movement of which I am now describing the mechanism. The flexor and extensor muscles of the fingers are completely foreign to the movement which leads the line postero-anteriorly; the interosseous and lumbrical muscles perform it.

The following-electro-physiological experiment exhibits the fact incontestibly. The last phalanges of the fingers and thumb holding the pencil, &c., being flexed to the utmost degree, the exciters are alternately placed on the interosseous or on the lumbrical muscles of the index or of the middle finger, and the fingers are seen to propel the pencil irresistibly forward, each phalanx performing the movement I described above. If, in this experiment, the muscles of the thenar eminence are electrified at the same time as the interosseous and lumbrical muscles, the thumb follows exactly the movements of the fingers. If, on the contrary, the pencil being held fast between the fingers, as in the preceding experiment, the extensors alone are excited, or the extensors and the flexors simultaneously, the first phalanges are directed backwards towards the metacarpal bones, while the last become more flexed, and the pencil is let fall from the fingers.

B. *MUSCLES MOVING THE THUMB AND METACARPAL BONE*.—If, the thumb and the first metacarpal bone being brought into proximity with the second metacarpal bone, contraction is produced in the *abductor pollicis*, we see the first metacarpal bone carried obliquely outwards and anteriorly, while it flexes on the carpus. During these movements of the first metacarpal bone, the phalanges of the thumb are slightly flexed when the muscle has attained its utmost stretch.

If the contraction of the abductor continues, the hand flexes on the fore-arm, and is slightly carried into abduction. Lastly, in whatever position we place the fore-arm or the hand during the contractions of this muscle, supination can never be produced; the hand, on the contrary, has a tendency to place itself in pronation.

If, placing the thumb as in the preceding experiment, the *extensor brevis pollicis* muscle is made to contract, the first metacarpal bone is carried directly outwards, while the first phalanx is extended on the first metacarpal bone, and the second phalanx flexed on the first. And if the contraction of the extensor brevis pollicis be continued, the hand follows this movement of abduction of the first metacarpal bone, but it is not carried either into flexion or supination.

The two phalanges of the thumb being flexed, and the first me-

metacarpal bone being carried obliquely outwards and forwards, if the *extensor longus* be made to contract, two simultaneous movements are observed, viz., a movement of extension of the two phalanges on the first metacarpal bone, and an oblique movement inwards and backwards, performed by the two extended phalanges. At the maximum of contraction the *extensor longus* throws back the first metacarpal bone, and with it the two phalanges, towards the carpus, to such an extent that the first metacarpal bone forms, anteriorly with the latter, a projecting angle, and the last phalanx is found to be on a plane posterior to the metacarpus. In no instance can supination be effected by the contraction of the *extensor longus pollicis*.

The *flexor longus pollicis* has no real action but on the last phalanx of the thumb. It is only at its maximum of contraction that the first phalanx is brought into flexion; and even then this movement of flexion is extremely limited and effected without force. No movement is detected in the first metacarpal bone, let the contraction of the *extensor longus pollicis* be ever so energetic.

The electro-physiological experiments I have just laid down show that the muscles, the *abductor longus*, and the *extensor brevis* and *longus pollicis*, determine in the first metacarpal bone, and consequently in the two phalanges of the thumb, important movements, some of which were never described, and others wrongly defined.

Abduction of the thumb really belongs to the *extensor brevis pollicis*, while the *abductor longus pollicis* carries the thumb as much forwards as it does outwards. Thus, the *extensor longus pollicis* not only extends the two phalanges on the first metacarpal bone, but bears another most important and powerful action on the first metacarpal bone, viz., it throws it into adduction, and in the meantime places it in extension on the carpus, in a direction nearly opposite to the action of the *abductor longus pollicis*, and of the principal muscles of the thenar eminence, as we shall soon see.

Lastly, these three muscles act powerfully on the hand, which each muscle carries into the direction it imparts to the first metacarpal bone. The *abductor longus pollicis* is a flexor muscle of the hand, while the *extensor longus* has the contrary effect, and the *extensor brevis pollicis* turns the hand outwards.

Published physiology used to attribute to the *abductor longus pollicis* the power of producing supination. Electro-physiological experiments induce me to doubt the correctness of this opinion, for it is not possible, as we have seen, to effect supination by artificial contraction of that muscle. Pathological cases will enable us to establish the fact that the muscles moving the thumb are entirely foreign to supination.

Isolated contraction of the *abductor longus*, or of the *extensor brevis* muscle, carries the hand also into the direction given by these muscles to the first metacarpal bone. We can well understand, therefore, to what a degree those movements of totality would be troublesome and contrary to the uses of the thumb, if they were necessarily produced by the voluntary moving of the first

metacarpal bone away from the second. Now in the normal state voluntary abduction of the thumb cannot be effected without the synergetic contraction of the ulnar muscles, which are adductors of the hand, instantaneously taking place. The result is, that the hand is solidly fixed during this movement of adduction. The hand is even seen, in this case, to be slightly directed inwards, and the more so when the first metacarpal bone is farther distant from the second, or when the contraction of the abductors of the thumb is effected with greater strength.

The muscular fibres which constitute the muscles *abductor brevis*, *flexor brevis*, and *adductor pollicis*, have been divided into three muscles, and I am of opinion that this is quite an arbitrary division in an anatomical as well as in a physiological point of view; for it appears evident to me, from my electro-physiological researches, that all the fibres inserted on the external side of the first phalanx of the thumb have the same action on the first metacarpal bone and on the two phalanges of the thumb, and that the fibres converging towards the internal sesamoid bone equally possess one sole action, and are almost antagonists to the first.

The whole mass of these muscular fibres constitutes, in a physiological sense, but two muscles, the functions of which I will now lay down.

I.—*Muscular fibres converging towards the outer side of the first phalanx of the thumb, and comprising the abductor brevis muscle, and a portion of the flexor brevis pollicis.*

When by electrical excitation we bring into contraction the fasciculus of the abductor brevis, or that of the flexor brevis pollicis, we observe three different movements in the first metacarpal bone, and in the first and second phalanx of the thumb; for if at that moment the thumb be in its natural attitude^a, free from all muscular action, the first metacarpal bone is directed forwards and inwards (in flexion and in adduction). During this movement of the metacarpal bone the first phalanx becomes flexed, while it inclines sideways, and performs on its axis a slight movement of rotation from within outwards, which brings its anterior surface opposite the palmar surface of the fingers. Lastly, the second phalanx is extended on the first, if it happened to be flexed previously. If the first metacarpal bone be abducted at the moment of the experiment, the adductor movement it performs is greater and takes place by a kind of circumduction. Then again, if the same bone is found brought up by the side of the second metacarpal bone, so as to form anteriorly a protruding angle with the carpus, it is seen to flex on the latter, and form with it a hollow angle anteriorly.

^a It is known that the natural attitude of the thumb and of its metacarpal bone differs from that of the other fingers: that the palmar surface of the former is turned inwards while the similar surface of the fingers is always directed forwards; that the first metacarpal bone forms externally a hollow angle with the carpus, and that anteriorly it is on the same plane as the radius; and that the first and second phalanges are in a state of slight flexion.

II.—*Muscular fibres terminating at the inner sesamoid bone of the thumb, and comprising a portion of the flexor brevis and the adductor pollicis.*

Under the influence of the electrical contraction of the fibres terminating at the inner sesamoid bone, the first metacarpal bone is drawn towards the second, and becomes external and anterior to it.

This movement of the first metacarpal bone takes place in different directions, according to the position this bone occupied at the moment of the contraction. If the first metacarpal bone was placed in abduction, it moves from without inwards; if it was flexed on the carpus, it performs a movement of extension; lastly, if it was found adducted, it becomes external to the second metacarpal bone.

We see, therefore, that the muscle called adductor pollicis is either an extensor, an adductor, or an abductor, and that the name under which it is known was given to it in an arbitrary manner, and imparts a false idea of its real functions.

The thumb follows in a passive manner the movements of the first metacarpal bone, but at the same time the first phalanx is flexed on the metacarpal bone, while it inclines inwards, and the second phalanx is extended on the first.

III.—*Opponens pollicis.*

The opponens pollicis bends the first metacarpal bone on the carpus, while at the same time it brings it into adduction. It has no action whatever on the phalanges of the thumb. At the height of contraction of this muscle, the thumb, if not acted on by any other muscle, is found on the same level with the index, and its palmar surface is turned inwards, as in the natural attitude.

All these experiments show that there exists a great analogy between the action the muscular fibres going to the outer and inner sides of the first phalanx of the thumb bear on the phalanges of the latter, and the action of the interosseous muscles on the phalanges of the fingers; for all these muscles bend the first phalanges by causing them to incline sideways, that is, in bringing them either into abduction or into adduction; and they extend the last phalanges, which also follow the first in the lateral movements.

In order to appreciate fully the movement of abduction or of adduction of the phalanges of the thumb, it is necessary to maintain the first metacarpal bone flexed on the carpus, the thumb resting in its natural attitude, and then to carry the exciters alternately on the fibres going to each side of the first phalanx of the thumb.

At the moment when the fibres going to the outer side of the first phalanx begin to contract, the first phalanx flexes, and meanwhile the thumb inclines laterally outwards, and its extremity traces a curve, the chord of which measures from an inch and a half to nearly two inches. If then, the thumb remaining in this movement of lateral inclination, the fibres ending at the inner sesamoid bone are made to contract in their turn, the thumb is seen to per-

form a lateral movement in the contrary direction to the preceding one, resumes its natural attitude, and then is slightly inclined on its internal side. In the latter experiment, as in the preceding, the first phalanx is flexed, while the last is extended.

It will also be remarked, that the adduction of the phalanges of the thumb is very limited when compared to their abduction.

Under the influence of the muscular fibres which are attached externally to the first phalanx, the thumb is also seen to rotate on its axis from within outwards; while the fibres going to the inner sesamoid bone give it a rotatory movement in the opposite direction, thus bringing it back to its normal site. These movements of rotation, the importance of which I shall by-and-by elucidate, are not observed, or at least are not appreciable in the fingers when the latter are under the influence of the interosseous muscles. Lastly, if the first metacarpal bone, being held as in the preceding experiments, the fibres attached to each side of the thumb are simultaneously excited, the first phalanx is flexed without performing either any lateral or any rotatory movement, while the second phalanx is extended.

I will endeavour to show the utility or the degree of importance of each of the movements of the metacarpus or of the thumb, as they are effected under the influence of the muscles of the thenar eminence.

Three muscles of this region are adductors and flexors of the first metacarpal bone,—viz.: the *opponens pollicis*, the *extensor brevis pollicis*, and a *fasciculus of the flexor brevis*. The first appears to be the least adductor of the three; but supposing these three muscles to produce this movement in the same degree, let us examine the position of the thumb when its metacarpal bone is arrived at its maximum of adduction and of flexion, and when its phalanges are not solicited by any power whatever^a.

The thumb is placed on the level of the first finger only, and its palmar surface looks inwards and very slightly backwards, so that it is not in opposition to the fingers. In this position the thumb cannot go to meet the other fingers, a circumstance which would render the uses of the fingers and thumb very restrained, if the phalanges of the latter could not be carried more inwards.

Now, it is shown by my experiments that this is the limit of the *opponens pollicis*, the least opposing as it is evident, and the least useful of the muscles of the thenar eminence. But if the first phalanx of the thumb comes to perform its movement of lateral inclination and of rotation on its longitudinal axis by the contraction of the fibres going to the external side of the first phalanx, the extremity of the thumb will successively meet each of the fingers by opposing to them its palmar surface, and this will be the more easily

^a This experiment can be made on one's self by getting the metacarpal bone held in adduction and in flexion. Volition could not produce this isolated movement of the metacarpal bone without acting at the same time on the phalanges of the thumb.

effected, as the power producing this movement of abduction^a will simultaneously bend the first phalanx and extend the last.

Of the two fasciculi which incline the thumb laterally, the one constituting the abductor brevis effects this movement with less energy, and less completely than the fasciculus belonging to the flexor brevis. The movements of lateral inclination performed by the muscular fasciculi, ending at the inner sesamoid bone, are destined, as will be understood, to bring the thumb into proximity with each of the fingers.

The last phalanx of the thumb has three extensors unable to fulfil mutually the functions of one another in the divers uses of the thumb, for each of these muscles acts in a contrary manner on the first metacarpal bone and on the first phalanx. Thus:—1st. The same muscle (extensor longus) extends the two phalanges of the thumb and the first metacarpal bone. 2nd. The same muscle (adductor pollicis) brings the first metacarpal bone near to the second by bending the first phalanx, and by causing it to incline on its external side, while it extends the second phalanx. 3rd. Lastly, the same muscle (abductor brevis, flexor brevis pollicis) bends the metacarpal bone and the first phalanx by inclining the latter on its external side, while it extends the last phalanx. These latter movements of the thumb and of the first metacarpal bone are the most frequently met with in the uses of the hand. To be able to explain their mechanism it was necessary to admit that the extensor longus pollicis extended the last phalanx during flexion of the first and of its metacarpal bone. But this intervention of the extensor longus would have created an antagonism for the muscles, producing flexion of the first phalanx and of the first metacarpal bone, and the result would have been a great impediment to the ease of these movements.

From the *ensemble* of the preceding facts and considerations, it is clear that none of the muscles of the thenar eminence can justify its name, drawn from the functions attributed to it.

Thus, for instance, the *opponens pollicis* muscle is the least opposing one among the muscles which bring the first metacarpal bone into flexion and adduction.

The *abductor brevis pollicis* inclines, it is true, the first phalanx on its external side, and consequently produces abduction of the thumb; but the muscle called *flexor brevis* effects a similar action, and moreover, produces at the same time adduction of the first metacarpal bone and extension of the last phalanx:

The *flexor brevis* bends the first phalanx, but it also extends the last one; it must, therefore, be termed *flexor* and *extensor*, and additionally, *abductor* and *adductor*.

We have seen that the *adductor* muscle can be abductor and ex-

^a In this attitude of the first metacarpal bone the external side of the thumb inclines towards the internal side of the hand, and consequently performs an adductor movement; but it is agreed that every movement of the thumb on its external side must be termed one of abduction.

tensor of the first metacarpal bone, adductor and flexor of the first phalanx, and extensor of the last one. From which of all these actions should this muscle derive its name?

In order that the mechanism of these movements should be better understood, I will give the analysis, as I did for the fingers, of the movements performed by the thumb and its metacarpal bone during the operation of writing or drawing, &c. For drawing the line antero-posteriorly the last phalanx of the thumb is flexed, and the first one extended, while the first metacarpal bone is abducted. The contrary takes place if the line be conducted postero-anteriorly. This mechanism is absolutely the same as that of the movements of the fingers guiding the pen or the pencil. We find also the same independence in these movements when made in inverse directions, for the abductor longus and the extensor brevis pollicis, while they effect abduction of the first metacarpal bone and extension of the second phalanx, are not antagonist to the flexor longus pollicis; on the other side the same muscles (abductor brevis and flexor brevis), acting in the manner of the interosseous muscles, produce at the same time and at the same moment flexion of the first phalanx, extension of the second, and adduction of the first metacarpal bone. The extensor pollicis longus might have deranged this ingenious mechanism, but fortunately that muscle remains quite foreign to the movements just analyzed.

To complete these electro-physiological studies I ought to lay down the action of each of the muscles of the hypothenar eminence; but I have found in that region only one new physiological fact deserving notice,—viz., that the abductor and short flexor muscles of the little finger act on the phalanges in the same manner as the interosseous, abductor brevis, and flexor brevis pollicis,—namely, that they bend the first phalanges while they extend the two last. I must, however, observe that their action on the two last phalanges has appeared to me to be a little less decided than that of the other muscles.

[Want of space compels us to hold over until our next Number the concluding and most interesting portion of this paper, comprising the pathological facts in support of Dr. Duchenne's experiments.—ED.]

Observations on the "Réducteur à Air" of M. Favrot. By CHARLES HALPIN, M. D., F. R. C. S. I., Cavan.

In a notice of the instrument of M. Favrot contained in the Number of this Journal for May, 1852, reference is made, at page 387, to a paper of mine on this subject, which was read before the Obstetrical Society of Dublin on the 2nd of January, 1840, and which was published in the Number of the former Series of the Dublin Journal for March, 1840. The "*Réducteur à Air*" has therefore been before the profession in this country for upwards of twelve years, and has been em-

ployed with success by some distinguished members of the profession. The instrument I used before the Obstetrical Society to demonstrate the action of air on the retroverted uterus was an Indian-rubber bladder attached to the tube of a stomach-pump. It served my purpose on that occasion, but I have doubts that it will be found to answer in practice. The drawings of M. Favrot look very well on paper, but when we come to deal with a case of retroverted uterus, especially if the misplacement has continued for some days, we shall, most probably, encounter difficulties that those diagrams convey no idea of; and it will very frequently be found that the sphincter ani is in such a state of irritation that the introduction of one finger, even with the utmost gentleness, produces an amount of distress and pain not easily to be borne by the patient. A caoutchouc bladder, with walls thick enough to bear a pressure of air that may be necessary to restore the uterus to its normal position, will be found too clumsy to admit of its easy introduction into either the vagina or rectum. This is my experience. Again, a practitioner may not always be prepared with one of these Indian-rubber instruments, whilst a bladder may be procured in every locality, which, with the aid of a tube of any description, may be prepared for use in a moment.

The bladder may be introduced into the vagina without causing the slightest pain, and will bear any amount of pressure that can possibly be required.

In February, 1847, I was called to visit a lady living about fourteen miles from Cavan; on arriving at her house I found her to be labouring under retroversion of the uterus, which had existed for four days. She was suffering intense pain in the region of the pelvis; her stomach rejected all food; there was also present that extreme anxiety of mind which is found to attend cases of this affection. On leaving home I had no idea of the nature of the case; and on discovering the condition of the patient I was too far from home to send for my instruments. Under these circumstances, the case being very urgent, I procured a bladder and a male catheter from the family apothecary, and with the simple apparatus these enabled me to construct, I found no difficulty whatever in getting the uterus out of the pelvis. The empty bladder, attached to the catheter, was introduced into the vagina, as in my former case, and was then inflated by the mouth through the catheter. A recent bladder, if procurable, is to be preferred, but if this cannot be had, a dried bladder will answer the purpose very well; but previous to introducing it into the vagina it should be soaked for some time in warm water, which will render it soft and pliable. I have been apprized that this simple process has been successful in many cases in these countries. I am not personally acquainted with the distinguished surgeon from whom I received the following note:—

“DUNDALK, 18th Oct., 1844.

“SIR,—As I am sure you will be gratified to hear of the success of the mode of treatment proposed by you to remedy a retroverted

uterus, I beg to inform you that I tried inflation of the vagina in a patient in the County of Louth Infirmary a few days ago, whose case was a very urgent one, and I am happy to say with almost immediate success, and relief of all the urgent symptoms,—though *all* the usual manœuvres to rectify the uterus were diligently made use of previously, with no avail. I certainly should not hesitate at once to inflate the vagina in a similar case, without having recourse to any other expedient.

“ Your obedient servant,

“ E. G. BRUNKER, M. D.,

“ *Surgeon to Louth Infirmary.*”

To Dr. William Hunter belongs the merit of having first called attention to this disease as “retroversion of the uterus”^a; but the affection had been previously noticed, and accurately described, by Smellie in his “Treatise on the Theory and Practice of Midwifery”^b, where he gives details of the symptoms of four cases very carefully, together with the treatment, which consisted in “repeated blood-letting and glysters, with the assistance of the catheter.” They all recovered.

Case of Undetected Injury of the Orbital Plate of the Frontal Bone, terminating fatally. By RICHARD MONTGOMERY, M.B., F.R.C.S.I., Surgeon to the Ardee Dispensary.

ON the 28th of April 1852. John Clarke, fifteen years of age, was accidentally struck in the inside of the left eyelid, as he was stooping, by a fellow-labourer, with a three-pronged fork curved at the point, called a grope, which is used for loading dung-carts. He did not fall, and was able to walk home, a distance of about two miles, after the accident; his eye was washed, and as he did not complain much, nothing was done for him except bathing the injured part.

On the 1st of May he presented himself at the Ardee Dispensary, when there was considerable inflammation of the upper lid of the left eye: it was tense, and of a scarlet redness. On partially raising the lid, which was done with difficulty, a slight appearance of a wound of the lining membrane was visible near the external canthus; this was clean, and the eye itself uninjured; there was apparently no external wound, and there was no symptom of internal inflammation, or of injury of the brain. Four leeches were applied in the neighbourhood of the eye, and the parts were afterwards well fomented. An active purgative was also prescribed for him.

May 4th. I was informed that the symptoms continued as when I saw him, and that the swelling had not abated; a lead lotion was ordered, and the purgative repeated. After this day I received no account of the boy at the Dispensary.

^a “ Medical Observations and Inquiries,” vol. iv. 1771.

^b Vol. ii., Collection x., Cases Nos. 1 and 2. 1754.

10th. He was visited at his own house by another medical man. Symptoms of pressure on the brain were then evident, the pupils of the eyes were dilated, but the eye was not inflamed; he complained of acute headach, yet spoke coherently and rationally; there were no convulsions, and his breathing was natural; some redness remained on the outside of the eyelid, but the external appearances of the injured part were not such as to attract much attention, and he had been able to get up and walk about every day. His death took place on that night, he spoke to his father a short time before, when he turned on his side, and expired calmly.

A post-mortem examination, 42 hours after death, revealed a wound of the orbital plate of the frontal bone, large enough to admit the point of a dissecting forceps; three spicula of bone were detached and loose in it. The point of the fork had passed obliquely upwards and inwards, penetrating the orbital plate about an inch from the base of the orbit. More than a teaspoonful of pus was seen on raising the brain, and pressure on the eye caused it to well up through the aperture in the orbit as well as behind the eyeball; the brain itself was uninjured, but there was considerable and extensive inflammation of the membrane.

In this case, until the very day of the boy's death, danger was not apprehended by his family; and when seen by me, no symptom calculated to excite alarm existed.

I think the case worth placing on record as constituting an interesting addition to those cases of undetected injury of the brain which were published in the Number of this Journal for May, 1851.

On the Use of Iodide of Sodium in the Treatment of Constitutional Syphilis. By-Dr. PIETRO GAMBERINI, Assistant Physician to the Hospital of Saint Orsola, in Bologna.

DR. UBALDO DAVERI, Chief Physician of the Hospital of Saint Orsola, was induced to employ the iodide of sodium instead of the corresponding salt of potassium, in consequence of some remarks on the subject contained in Ruspini's Eclectic Manual of New Remedies, where the use of the former preparation is suggested, not only because it is probably more directly assimilable to the human system,—soda being found in almost all the animal fluids,—but also because it is less repugnant to the palate, and entirely free from the acrid and ley-like taste of the potassium salt. The iodide of sodium employed by Dr. Daveri was prepared according to Ruspini's directions, by placing three ounces of filings of iron in two and a half pounds of distilled water, and gradually adding, with constant agitation, a pound of iodine; as soon as the mixture had acquired a greenish colour, it was filtered, and quickly treated with a solution of carbonate of soda until all the iron was thrown down. The carbonate of iron thus formed was separated by filtration, the filtered fluid eva-

porated to dryness, and the residuum again dissolved, filtered, and evaporated until a pellicle had formed. By this method, fourteen ounces of iodide of sodium were procured in the form of white rhomboidal prisms, deliquescent, and having a saltish taste less disagreeable than that of iodide of potassium.

The iodide thus prepared was found to answer much better than that made from iodine and caustic soda, the salt procured by the latter process being not only disagreeable to the taste, but giving rise to a burning sensation in the fauces, to weight and uneasiness in the stomach, and to gastro-enteric pains,—effects attributed by the author to an excess of iodine which the salt was, by analysis, found to contain.

The dose administered at the commencement of the treatment was always a scruple of the iodide dissolved in three ounces of distilled water, and given in three equal portions in the course of twenty-four hours. The salt was likewise employed, in the form of ointment, in the proportion of half-a-drachm or a drachm to the ounce of lard. In the administration of the iodide of sodium, the same rules and precautions are to be observed as apply to the use of the potassium salt. Although the author, for reasons and facts set forth in his *Manual of Venereal Diseases*, repudiates the distinction of constitutional syphilis into secondary and tertiary, he divides the 116 cases, on the observation and treatment of which his present paper is based, into the three following classes:—

1. Cases of constitutional syphilis in which so-called secondary and tertiary phenomena co-existed.
2. Cases of so-called tertiary lues in which the use of mercury preceded the treatment by iodide of sodium.
3. Cases of so-called tertiary lues in which iodide of sodium alone was employed.

Of the first class, twelve cases, in which the symptoms were pains in the bones or periostitis, united with some manifestly constitutional affection of the skin, generally of a papular or pustular form, were treated with iodide of sodium. In eight of these cases the use of the salt alone effected a cure; in the remaining four it was necessary to have recourse to mercurial frictions to remove the cutaneous affection which remained after the tertiary symptom had yielded to the administration of the iodide. The minimum quantity which succeeded in curing the disease was three drachms, the maximum, three ounces; the quantity which was usually required ranged from two to three ounces: the shortest time in which the symptoms were removed was nine days, the longest three months, the average was about a month.

The author thinks it possible that the four cases in which the iodide of sodium thus appeared to fail might have yielded to a longer perseverance in the use of the salt. This was, however, precluded by the circumstances of the individual cases.

The cases of the second class, or those of so-called tertiary lues, in which the use of mercury preceded the treatment by iodide of

sodium, were seventeen; in some of these, six or seven ounces of stronger mercurial ointment had been rubbed in; the average quantity was from four to five ounces. The minimum quantity of iodide of sodium administered was three drachms, the maximum, four and a half ounces, the average from one to two ounces. It is most important to observe, that those patients who had derived no benefit from a protracted course of mercurial treatment, were cured after the administration of a small quantity of iodide of sodium; while this remedy had to be given to the extent of four and a half ounces in cases in which only a limited number of mercurial frictions had been used: the patients who resisted the long-continued employment of the ointment laboured under osteocopic pains, which subsequently gave way to a small quantity of the iodide; while those who practised without benefit a moderate number of mercurial frictions suffered either from syphilitic rheumatism, or from a mixture of syphilis and scrofula. This fact of the iodide being required in the inverse ratio of the amount of mercury previously employed arises, the author thinks, from this,—that in the first case the use of mercury had in a great measure overcome the syphilitic element, which was then entirely removed by the administration of the iodide; while in the second, the elimination of the constitutional venereal principle commenced by the mercury was, for the most part, reserved for the iodide of sodium; and he points to a therapeutic consonance between the two agents, corroborating an opinion formerly advanced by him that the iodides of sodium and potassium are the best substitutes for mercury, as they are about equally efficacious with it in the treatment of so-called tertiary phenomena.

In support of this view, the author quotes the following cases:—

CASE I.—Vincenzo was admitted into hospital on the 20th November, 1850, labouring under *ostalgia*: he first used two ounces, one drachm and eighteen grains of iodide of potassium; then five ounces and five scruples of iodide of sodium; the pains continuing, he had eleven inunctions of two drachms of mercurial ointment each, and twenty-two vapour baths, to which treatment the symptoms completely yielded.

CASE II.—Antonio, admitted for pains in the bones, 15th August, 1851: two ounces of iodide of sodium having been given without producing any relief, mercurial inunctions with vapour baths were had recourse to, and the *ostalgia* was completely removed after the use of two ounces of ointment.

The cases belonging to the third class, comprising those of so-called tertiary lues, in which the iodide of sodium was the only medicine administered, were eighty-five in number; of these, thirty-seven were cases of *ostalgia*, in the treatment of which vapour baths and iodide of sodium were employed; the minimum quantity of the latter given was from one to seven drachms, the maximum from eight to twelve ounces, the average from two to four ounces. Of *rheumatalgia* the cases were seventeen—likewise treated with vapour baths and the iodide; the minimum dose of the latter being from

two to four drachms, the maximum nine ounces, the average two to four ounces. Of arthralgia nine cases were similarly treated, the minimum quantity employed having been seven drachms, the maximum two ounces. Of the other varieties of tertiary disease, the numbers were too limited to require special mention, or to justify the deduction of conclusions from them.

The inconveniences which frequently attend the use of the preparations of iodine, and amongst them of iodide of potassium,—such as derangement of the stomach, iodic eructations, ptyalism, and affections of the throat, were seldom met with from the time the iodide of sodium was substituted for the potassium salt; consequently the remedy could be more steadily persevered with, and its dose more rapidly increased; circumstances directly promoting the cure of the diseases for which it was administered. In the few cases in which ptyalism occurred, it totally ceased on suspending the medicine for two or three days. In but a single case did it appear to be obstinate; and in this instance the mouth was, on examination, found to be pale, free from swelling, and very slightly painful; as the patient lay in a ward with many syphilitic patients under mercurial treatment, it was thought the salivation might be owing to mercurial vapour present in the atmosphere, a suspicion which was verified by the result; for on removing the patient to another apartment free from mercurial contamination, the salivation entirely ceased in two days.

At the time the author drew up the report of the first experiments with this salt, Dr. Lesi, Assistant Physician to the Hospital of Saint Orsola, had noted that the mean time required for the cure of nineteen patients treated with the iodide of sodium was about twenty-eight or twenty-nine days, while with the potassium salt, likewise exhibited in nineteen cases, the average time was from thirty-four to thirty-five days. Many cases which had either not got entirely well, or were proceeding but slowly under the use of the iodide of potassium, were rapidly cured by the substitution of the corresponding salt of sodium.

Several of the cases, however, treated with iodide of sodium relapsed, and the disease again yielded sometimes to a repetition of the remedy, sometimes to the use of mercurial frictions. But this circumstance cannot be urged against the iodide of sodium alone; for the same is equally true of every other anti-venereal remedy,—one of the leading features of lues being its tendency to present periods of lull and of relapse, whatever be the therapeutic means employed to combat the constitutional taint from the first moment of its manifestation to the last evidence of specific disease.

The author concludes his paper with the following *resumé*:—

1. Soda being a very common ingredient in our organism, the iodide of its base appears best suited to the human system.
2. The taste of the iodide of sodium is much less disagreeable than that of the iodide of potassium.
3. It is less likely to occasion iodism.

4. It is better borne than the potassium salt, and in consequence of this its dose can be almost daily increased, and it thus becomes a more efficient remedy.

5. It has sometimes succeeded where the iodide of potassium had failed.

6. We may commence by giving daily, in three equal doses, a scruple of the salt dissolved in three ounces of distilled water, increasing the strength of the solution every two or three days by six grains. Some patients have in this way been able to take more than two drachms a day without suffering the slightest inconvenience.

7. The iodide of sodium is admirably adapted to cases in which the corresponding salt of potassium is indicated.

8. The iodide of sodium is the best substitute for mercury.—*Corrispondenza Scientifica di Roma*, No. 32. 1852.

On Suppuration in the Mastoid Process in Children. By Dr. RIECKE, of Berlin.

THE formation of pus in the ear is not unfrequent in scrofulous children, but the extension of the suppuration to the mastoid process of the temporal bone is rare. I shall here describe some cases in which the mode of this occurrence appears to me to be still more interesting than the occurrence itself.

M. v. E., a weakly child of scrofulous tendency, and excitable nervous system, in January, 1835, while playing in stormy weather in the open air, was seized with most violent pain in the right ear. She became somewhat feverish, and the attack appeared to consist merely in a slight cold affecting the ear. Mild diaphoretics, little bags of warmed herbs laid upon the ear, a warm bed, and a small blister to the nape of the neck, soon gave relief. After some days a brownish-yellow thin discharge took place from the right ear, which in the course of a few days more became whitish and thicker, and lasted a fortnight. It then entirely ceased for a fortnight, the patient being in other respects well; nevertheless the violent pain increased, without external cause, and the secretion from the ear subsequently set in again. The discharge did not diminish under the employment of stronger derivative measures, such as blistering and purgatives, the pain, however, disappeared. In the beginning of April, the skin covering the mastoid process behind the right ear began to swell, to be tender, and to assume a reddish colour. Pain and fever again set in. Leeching and the application of mercurial ointment gave relief; a greater discharge again took place from the ear, and the patient hawked up, especially on awaking in the morning, much purulent matter. Alterative medicines were exhibited, and the case was going on well. The swelling and pain in the mastoid process diminished. Fourteen days after, a swelling again suddenly took place, while the discharge from the ear ceased. The tumour was so large that it threatened to break, and I thought I could distinguish with the touch through the soft swelling the ex-

panded laminæ of the bone. I now meditated opening the tumour, but at one time the dread of the knife manifested by the little patient and her friends, at another the apprehension that the probably unfavourable result would be attributed, as it so often is by the ignorant, to surgical interference, prevented me doing so, a policy not blamable in a young practitioner, especially where there is no pressing indication to use the knife. Injection into the ear and the application of warm emollient poultices to the parts were now repeated in order to re-establish the discharge. At length the discharge from the ear suddenly recommenced; during the following night the little patient again brought up a quantity of bloody pus, and the great external swelling of the mastoid process as suddenly disappeared. The discharge from the ear continued until the middle of May, it was reported to have been fetid during the entire of one day; with this exception it was free from smell. On a sudden a swelling of the mastoid process took place within a few hours, attended as before with a cessation of the discharge from the ear. It was easy to feel fluctuation under the laminæ of bone covered by the thin integuments, and the tumour appeared this time to be decidedly about to open. Nevertheless, a purulent discharge was again established from the ear and throat; the mastoid tumour quickly diminished; and by the end of May the discharge had entirely ceased both from the ear and throat. Hearing continued unimpaired, so that in the month of June the patient's recovery was complete.

This was one of the rarer cases of affection of the ear in which the pus flows through the Eustachian tube to the throat. It may certainly often occur without being observed, for in the day-time the discharge is generally swallowed by the little patients; it is only in the morning, when it collects in greater quantity, that it is brought up. The case should also teach us not to be overhasty in opening such tumours externally, a proceeding which might induce the establishment of a tedious caries, and leave behind it a disfiguring scar. The following affords an additional illustration of the truth of this view.

In the April of the same year, the wife of a wind-miller brought me her son, aged four years, who was suffering from caries of the mastoid process. On inquiry into the history of the case I ascertained that he, likewise in the month of January, 1835, was attacked with pain in the ear, otorrhœa, and swelling of the mastoid process, which finally burst, without medical assistance having been sought. The child being otherwise in good health, the sore healed in a few months without other treatment than attention to cleanliness. A year subsequently his head was crushed by the sail-beam of the windmill, and he died in an hour after the injury. On dissection I examined the mastoid process. There was a deep tortuous canal of the size of a crowquill, which involved the internal layers of the temporal bone, and was lined by a thin membrane covered with a brown greasy, fatty matter. The cells of the mastoid process

which were not touched by this canal were in their normal condition; those situated in its neighbourhood had grown into union with it.

It is remarkable that in the month of April a third patient, the son of a brick-burner, was brought to me with a fistula in the mastoid process, which dated its origin from an attack of acute earache, caused by exposure to severe weather in the preceding January. All three patients, it was proved, had brought on the attack on a very stormy day; the first, in a play-ground adjoining a highly located church; the miller's son in the neighbourhood of the mill, likewise in an elevated situation; the son of the brick-burner in the exposed locality of the tiler's hut. It appears to me remarkable that, although I have during thirty years had much experience, no similar case should have occurred to me either before or since those I have detailed. Three cases of an undoubtedly rare affection arising at once, and, so to speak, even in one day, almost point to an epidemic origin. Acute and violent earache in children, who pass from a warm room into a severe and piercing January wind, is a frequent occurrence, but it is certainly rare and remarkable that in each of these three patients, the affection should have had the same unusual termination in suppuration of the mastoid process. I may also observe that my case-book at that time contains no history of any affection of the ear but the three given above.

It would not be uninteresting in reference to the theory of the origin of epidemic diseases, if other physicians had experienced something similar at that period, and would record their observations. Since we now know that the air is at times impregnated with matters (ozone) which have an irritating effect on their respiratory passages, a strong current of air pressing into the ear may, if it contains an irritating principle, excite in this organ very peculiar affections. In natural science every observation is of value, and often finds its explanation only after the lapse of years, or even of decennial periods. For this reason it may be useful to have recorded the foregoing cases; besides they afford instructive proof that in abscess of the mastoid process we should not hastily have recourse to the knife, and they also show that we need not very much dread the occurrence of caries if we take care to avoid employing means which may be productive of injurious consequences. My patients recovered under simple treatment.—*Journal für Kinderkrankheiten*, March and April, 1852, p. 180.

On the Laws which influence the Secretion of Sugar in Diabetes. By
DR. MORITZ TRAUBE.

It has hitherto been thought sufficient to determine the quantity of sugar contained in the urine, either by analyzing that passed in the morning, or by extracting the saccharine matter from the entire amount evacuated during the twenty-four hours. There are, however, various circumstances in the diurnal life of the patient which may exercise a marked influence on this pathological secretion, the

effects of which cannot be observed by following either of the above plans. Led by these considerations, Dr. Moritz Traube has in his researches pursued a method different from that adopted by other observers, and has thus obtained results which deserve to be briefly explained.

The patient on whom his observations were made was a young man of 28, who had for a short time laboured under diabetes. Of the ordinary symptoms of the disease, the best marked were the excretion of highly saccharine urine, extreme thirst, great increase of appetite, irregularity of the bowels, and disturbed sleep. Emaciation, however, had made but little progress, nor was there much perceptible dryness of skin. His regimen was so directed as to exclude as much as possible all amylaceous food. The urine was analyzed twenty-five times from the 1st to the 7th of January, and the following are the principal conclusions deduced by the author from his experiments:—1. The proportion of sugar contained in the urine was very different, according to the period of the day at which it was passed, varying from 225 grains to 26 grains in 100 cubic centimetres (39.3708 cubic inches, equal to 22 fluid ounces and 6 drachms nearly). This fact proves how little can be inferred of the intensity of a case of diabetes from analyses conducted in the ordinary mode. 2. The quantity of sugar secreted was liable to remarkable oscillations,—the maximum was 88 grains in the hour, the minimum rather more than $2\frac{1}{2}$. 3. The amount of sugar was very sensibly augmented for a few hours after a hearty meal. 4. If the patient remained eleven hours without taking nourishment, it decreased so rapidly that during the last seven hours of this period a very insignificant quantity only could be found,—less than 3 grains, for example, instead of upwards of a drachm, in the hour. 5. Usually no sugar was excreted during the latter hours of the night; that is to say, at as long an interval as possible after a meal. 6. Almost all the sugar was derived from the meals, and disappeared after digestion was completed.

Five months subsequently, the patient, very much emaciated, and with greatly increased suffering, placed himself under the treatment by the Carlsbad water, and adopted a stricter regimen. The effect of this double plan was to produce a considerable improvement; his thirst and appetite were again restrained within nearly natural limits, and the excretion of urine was much diminished. Except that sugar was still proved to be present, the patient no longer presented any of the symptoms of diabetes. The analyses, repeated from the 26th June to 16th July, furnished the following results:—1. The proportion of sugar varied from 2 drachms to 17 grains in 100 cubic centimetres (22 fluid ounces and 6 drachms, nearly) of urine. 2. The quantity of sugar excreted was greater than in the preceding experiments,—the minimum being $24\frac{1}{2}$ grains, the maximum rather more than three drachms. 3. It increased in proportion as the urine was examined nearer to a meal, and diminished according to the length of time which had elapsed after one;

but no urine was now found, as formerly, free from sugar. 4. When a long time had elapsed without the patient having taken nourishment, the oscillations already described were no longer observed; the quantity remained stationary at about 45 grains. 5. There are two stages in diabetes: during the first, all the sugar contained in the urine is furnished directly by the ingesta; during the second, the sugar is not derived solely from the food, but is the result of a peculiar secretion of the liver. 6. In order to estimate the intensity of a diabetes, the urine must be analyzed in the morning, before a meal has been taken: if it is free from sugar, the disease is in the first stage; if it contains saccharine matter, the diabetes is in the second stage, and is advanced in proportion to the quantity of sugar voided in each hour. 7. As to treatment, the alkaline carbonates, administered in the form of Carlsbad water, while they modified certain symptoms, did not exercise any influence on the intensity of the disease.—*Archiv. für Heilkunde, von Virchow. Nouvelle Encyclographie des Sciences Médicales*, April, 1852, p. 262.

On the Hemostatic Effects of the Eau Pagliari. By Professor SÉDILLOT.

THE formula for the preparation of the styptic water, invented by Signor Pagliari, an apothecary at Rome, and which has attained a high celebrity on the Continent, is thus given by Professor Sédillot, to whom it was transmitted by the inventor:—

Take of benzoin, eight ounces; sulphate of alumina and potassa, one pound; water, ten pounds. Boil together in a glazed earthen vessel for six hours, constantly stirring the resinous mass, and supplying the loss by evaporation by successive additions of hot water, so as not to interrupt the ebullition. Finally, filter the liquid, and preserve it in well-stopped glass vessels. The portion of benzoin which remains undissolved will be found to have lost its odour and inflammability.

The hemostatic water thus obtained is limpid, resembles champagne in colour, has a slightly styptic taste, and a sweetly aromatic odour. It leaves, on evaporation, a transparent deposit, which adheres to the sides of the vessel.

The following are the conclusions deduced by M. Sédillot from his experience of this and other styptics:—

1. There are fluids which instantaneously coagulate the blood, and convert it into a thick, homogeneous and consistent clot.

2. The eau Pagliari enjoys this remarkable property, and does not exercise any injurious action on the tissues with which it comes into contact.

3. Theory, experience, and clinical observation equally concur in demonstrating its efficacy as a styptic.

4. The object of compression, in the application of hemostatic liquids, is to permit the coagulation of the blood, as well as the adhesion of the clot to the mouths of the wounded vessels.

5. In all cases in which recourse cannot, without serious incon-

venience, be had to ligature, as well as in those in which the alteration of the blood prevents its coagulation, and renders hemorrhage dangerous, the eau Pagliari may be advantageously employed, and deserves to be classed among the valuable resources of our art.—*Gazette Médicale de Strasbourg*, May, 1852.

Special Pharmacopœia for Diseases of the Skin. By ALPHÉE CAZENAVE, M. D., Physician to the Hôpital St. Louis, Paris.

(Continued from p. 256.)

BATHS.—Baths constitute some of the most valuable means in the treatment of simple or syphilitic diseases of the skin. They may all, or almost all, be employed in various ways, from the liquid bath of pure or medicated water to the dry or moist vapour-bath.

Emollient Baths.—Emollient herbs^a, four pounds; flaxseed, half-a-pound; water, five quarts;—boil, strain, and express. To be poured into the water for the bath. This bath is indicated in all cases of acute eruption, in the treatment of the exanthemata, of eczema, and of lichen agrius; and it will also prove serviceable whenever an exacerbation or relapse occurs in the course of a chronic eruption. The temperature should be about 95° Fahr.; the duration from half-an-hour to an hour. It is sometimes useful to continue it for several hours. **Gelatine Bath.**—Gelatine (size), eight ounces; hot water, one pint; dissolve with constant stirring, and add it to the water for the bath. The uses are the same as those of the emollient bath. **Bath of Bran.**—Bran, four pounds; water, six quarts;—boil for a quarter of an hour, strain, and add it to the water for the bath, or the bran may be put in a bag and plunged into the bath. **Use**, the same as of the preceding two. **Alkaline Bath.**—Carbonate of soda of commerce, four ounces; water sixty-six gallons. Dissolve the salt in a little warm water, and pour the solution into the water for the bath. This bath is used in the greater number of cutaneous diseases, such as lichen, psoriasis, prurigo, &c. **Vichy Bath.**—Bicarbonate of soda, thirty-two ounces; chloride of sodium, one ounce; chloride of calcium, sulphate of soda, of each five ounces; sulphate of magnesia, one ounce and a half, sulphate of iron, half-a-drachm—mix, for a bath of sixty-six gallons. The salts are to be kept in a bottle, and added to the water immediately before the bath is required. The uses of this bath are similar to those of the foregoing.

Dr. Lugol's Ioduretted Baths.

For Adults:—	I.	II.	III.
Iodide of potassium, . . .	15	20	24 parts.
Iodine,	8	10	12 „
Water,	625	625	625 „

^a Equal parts of the herbs of the mallow and melilot, chamomile flowers, marsh-mallow root, and flax-seed.—En.

For Children:—

	I.	II.	III.
Iodide of potassium, . . .	5 . .	6 . .	8 parts.
Iodine,	2.5 . .	3 . .	4 „
Water,	300 . .	300 . .	300 „

This bath requires a wooden vessel. *Bath of Iodide of Potassium* (Dor-vault).—Iodide of potassium, one ounce and five drachms; distilled water, fifteen ounces; make a solution which is to be poured into a bath full of water. This is intended for adults; it is not absolutely necessary that the vessel for this bath should be of wood. *Bath of Ioduretted Iodide of Potassium*.—Iodine, two and a half drachms; iodide of potassium, one ounce and two drachms; distilled water, fifteen ounces; to be made in the same manner as the preceding bath. This solution requires a wooden bath. These baths are useful in cases of lupus of the limbs, in the treatment of scaly diseases, and of secondary syphilitic affections. *Mercurial Bath*.—Corrosive sublimate, from two to four drachms; distilled water, sixteen ounces; dissolve and pour into a wooden bath containing a sufficient quantity of water. It has been most frequently employed in chronic affections of the skin, whether simple or syphilitic, and incorrectly as a general alterative. It is an uncertain remedy, and one which can never produce more than a local action. *Soap Bath*.—White soap, thirty-two ounces; water, three quarts; dissolve and add to the water for the bath. It is useful in the treatment of scabies, prurigo, and psoriasis. *Bath of Sea-salt*.—Common salt, thirty-two ounces; water, a sufficient quantity. This bath may be advantageously used in scrofulous diseases, in lupus, in the hypertrophie, in scrofulous ulcers, and in the sequelæ of syphilis. *Gelatino-saline Bath of Plombières*.—Carbonate of soda, 58.5 parts; sulphate of soda, 37.8; chloride of sodium, 10.9; chloride of calcium, 17.7; gelatine, 17.6. The salts for these baths are generally sent in the form of a limpid solution, the gelatine separately in a small flask. The gelatine is to be dissolved before being added to the water for the bath. I often employ this bath as a discutient in the treatment of diseases of the skin. It is particularly efficacious in the forms attended with pruritus, and with slight oozing, as eczema, lichen, and pityriasis. *Sulphur Bath*.—Sulphuret of potassium, four ounces; water, sixteen ounces; dissolve, filter, and keep until required in a well-stopped bottle. This bath is one of those most frequently employed in the treatment of cutaneous diseases; it is admissible only in chronic affections, and is especially useful in scabies, prurigo, chronic psoriasis, lepra, eczema, and impetigo. *Gelatino-Sulphurous Bath*.—Sulphuret of potassium, four ounces; water and gelatine, of each sixteen ounces: the gelatine should be previously dissolved in three or four quarts of warm water. This bath is used in the same cases as the preceding. *Artificial Baréges Bath*.—Crystallized hydro-sulphate of soda, chloride of sodium, and crystallized carbonate of soda, of each two ounces, water ten ounces; dissolve. *Uses* similar to those of the preceding. *Vapour Bath*.—This is either administered in an apparatus adapted for

the purpose, and which excludes the head, or, still better, in a small apartment furnished with steps, and into which the generator sends the vapour. It is one of the most frequently employed and most useful means in the treatment of the majority of chronic diseases of the skin, whether simple or syphilitic; above all, it is a powerful auxiliary in the management of dry eruptions, psoriasis, and lepra vulgaris. The vapour bath in a special apartment is much to be preferred. The temperature should not exceed 104° F.; nor should the patient remain in the bath for more than a quarter of an hour. Douches of vapour, or partial vapour baths, are also frequently employed. The vapour is directed to the parts affected by means of a tube, which is brought more or less close according to the sensibility of the surface, and the effect it may be desirable to produce. The uses, and the length of time they should be applied, are the same as those of the vapour bath. *Alkaline Foot Bath*.—Carbonate of potash, four ounces; water, a sufficient quantity. Used in plantar, psoriasis, and in pruritus affecting the toes.—*Annales des Maladies de la Peau et de la Syphilis*, tom. iv. 1852.