vagina, and the patient made a perfect recovery. The second stone is nearly circular in shape, its long diameter being $2\frac{3}{4}$ in. and its short diameter $2\frac{3}{8}$ in., and its greatest thickness $1\frac{1}{4}$ in. It weighed two ounces, and I extracted it from a woman aged forty who had long suffered from pain supposed to be uterine. In this case the closure of the wound was not entirely successful, and she had slight incontinence when in the upright position, but declined further interference. The third stone consists of one large mass and a quantity of debris, weighing altogether three ounces and a half, which I extracted from a woman aged fifty, who made a perfect recovery.

You will thus see that there is no difficulty in extracting very large calculi from the female bladder entire, but it is in some sense a reproach to our art that stones should be allowed to attain such a size. Early detection is as desirable in the female as in the male, and the great majority of such cases can be best treated by lithotomy at one sitting.

COMPOSITION, RESOLUTION, AND ABEY- ANCE OF SECONDARY PERCEPTIONS.

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DIRECTIVE phenomena are affected by muscles influencing one another, as well as by the mechanical arrangement of their constituent fibres. Such was a cursory rejoinder to a hypothetical objection to the motor diathesis of the secondary perceptions on the ground of the multiform and incongruous distribution of the fibres of certain muscles—the pectoralis major, penniform muscles, &c.¹ It is a rejoinder meriting critical examination, since the problem of secondary perceptual currents being conducted centripetally from a voluntary muscle during its vital contraction must be incompletely verified, if not quashed, without its due acceptance. Taking it, then, as a text for the present remarks, I trust that abundant evidence will be forthcoming in its support, which will also have a practical bearing on the further proof of the problem in question.

Composition.—A very good and simple illustration of this nervous process is afforded by the following observation:—“The left eye may perceive an object eight degrees to the right of the main line of direction, and the right eye four degrees; but binocular vision will give it its correct value of six degrees by virtue of muscular co-operation and the agency of a directive composition.”² It is an absolute essential for the dynamic composition of secondary sensorial forces that the muscular fibres engaged in the operation be consensual—that is, pull in the same direction more or less. 1. Note the parallelism of the elementary fibres of a voluntary muscle in contrast to their intricate interlacements in an involuntary and non-directive muscle. They would doubtless have been perfectly parallel were it not for the convenience in packing, admirably shown by Paley, arising from thin tendinous sheets and delicate cords. Composition renders perfect parallelism unnecessary, however; the fibres agree in their general direction, and the muscle's contraction generates a single directive resultant. 2. Observe how the numerous muscles of a set (flexors on the forearm) operate sensorially as one muscle would do when unified in one particular action (flexing the hand). Many muscles are indispensable for the attainment of various distinct ends, but muscular consent originates a directive unification where it would be useful. 3. The phenomenon of single vision has been interpreted by a consensual theory; the external rectus of one eye pulls in the same direction as the internal rectus of the other eye, thereby initiating a directive composition. There is a strict analogy between this case and that of a single muscle or set of muscles. Hence an objection to the motor diathesis of the secondary perceptions, on the ground of the extremely irregular form (pectoralis major), or distribution of the elementary fibres (penniform) of certain voluntary muscles is a weak one. Should it be sought what single directive message any muscle (penniform or otherwise) transmits to consciousness, it will be necessary merely to note the relative positions of

its osseous attachments, and the direction towards which the movable segment is turned by its shortening, so that the directive message is determined by the mechanical conditions of a muscle's origin and insertion. But, mark here, nothing will be more natural than to conclude that this result could not obtain excepting the relative positions of osseous origin and insertion are known by a sort of inner consciousness; the superior rectus, for instance, rotates the ocular globe upwards, it may be concluded that the resulting upward idea has no *points d'appui* for its realisation in the absence of a recognition of the sites of origin and insertion of the muscle by a latent process of consciousness. I regard such a conclusion as erroneous, inasmuch as latent or inscrutable consciousness is incomprehensible; the directive message, although due to mechanical conditions, has no further reference to them, referring only to any sentient point or points that may be impressed *ab externo*. Thus, the biceps has a sensorial reference to any impressed sensitive point either on the hand or the forearm, and not to its bony attachments; again, the muscles rotating the body or the head may have a directive reference to an impressed retinal point. From a very simple starting-point we now find ourselves at the complex borderland where the Ego and the Non-ego meet; there is the natural cohesion of the insensate tendinous and bony origins and insertions (the Non-ego) in juxtaposition with and holding relation to an independent agency—namely, the vitalised cohesion of muscular contraction (one mainspring of the Ego). Nothing remains for us apparently but to contemplate these two stupendous forces standing thus face to face; a fair simile of the position is to be found in a pair of horses drawing a tram-car round a corner, the animals being guided as it were by the *vis a tergo* of the heavy tram with its mechanical adjustments.

Resolution.—It is an almost axiomatic observation, where one finds composition there one may search for resolution; and it would seem that the latter process is in operation to produce the visible directions of the peripheral portions of the retina. Before entertaining this subject, however, let us consider the direct proofs that visible direction is a motor physiology in the following condensed argument:—

1st. Peripheral retinal points are equally sensitive with the axial point, noticeable in the observation of minute stars; therefore, on the theory that the special nerve of sight is a directive agency, the centre of visible direction will correspond with the centre of the retinal concavity (ocular centre). Sir David Brewster has promulgated this view.

2nd. Prof. Volkmann and Dr. Griffin have shown, each by an independent investigation, that the centre of visible direction is situated at a point considerably anterior to the centre of the retinal concavity; therefore visible direction is not effected by the retina.

3rd. Every object before the single eye, whether median or lateral, is seen accurately in position; therefore the centre of visible direction coincides with the eye's optical centre. The latter is at a point in the crystalline lens near its posterior border—that is, anterior to the centre of the retinal concavity.

4th. Every object appears to be fixed during the rolling of the eyeball (Brewster); therefore the optical centre and the centre of visible direction both coincide with the centre of rotation of the eyeball. Hence (*nisi prius*) visible direction results from the motions of the eye—i.e., its muscular apparatus.

Reference being now made to the following figure, *C* being the optical centre, the straight line, *mM*, will represent the median and main line of monocular visible direction. This line is regarded as being originated by the recti pulling the eyeball evenly backwards by their normal tonicity. Muscular tonicity, according to this view, is a directive agent as well as volitional contraction, and the opinion is corroborated by the directive phenomena resulting from the erect position of the body and the head, both postures being referable to tonicity. The balance of the recti is destroyed when the eye is directed laterally. If the eyeball be turned towards the right, the rectus so rotating it is in a more active state of tension than its fellows, and consequently the axial point, *m*, will now perceive the image depicted on it along a line of direction inclining to the right. But the lateral points *a*, *b*, *z*, or *y* are each equally affected by the greater tension of a given rectus, as is point *m*. How is it that the images impressing these points are not perceived along a line of direction that is parallel to, or identical with,

¹ Vide THE LANCET, July 29th, 1882.

² Ibid., October 22nd, 1881.

that of the image on point m ? Herein consists the paradoxical problem of visible direction. I hold that the main direction, mC , is resolved into the oblique visible directions aC , bC , zC , yC , &c.

Such resolution appears to be warranted when we consider the instability of peripheral retinal points as compared with the stability of the axial point, and that said instability is progressively greater in the direct ratio of the distance of any peripheral point from the axis. Assuming the eye to be looking forwards, it will be manifest that the backward pull of the entire recti operating on the axial point, m , would draw the eyeball backwards, whilst if operating on

any oblique point, a or z , it would tend to rotate the eyeball. Again, the mobility of this rotatory influence will be greater as exerted on point b than on point a , on point c than on point b , and so on. Further, the tendency of the muscular action to pull the eyeball backwards will be inversely as the tendency towards its rotation; hence the forward direction, mC , originating with the backward pull, will be modified accordingly. A visible direction corresponding to any oblique point, a or z , will not originate such a forward idea as the point m —that is, it will be inclined to right or left in addition to forwards; neither will a visible direction corresponding to points b or y originate such a forward idea as the less oblique points a or z —that is, it will be more inclined towards the right or left. Thus the causation of the progressive scattering of visible directions from retinal centre to circumference, as with other directions, is determined by a mechanical condition (the globular shape of the eyeball). The backward pull (the forward idea) will be very slight at the peripheral points c and x , but it is still there; in other words, the main direction, mC , is resolved into the dotted lines indicated in the diagram.

In what manner the site of the centre of visible direction is fixed at point C , correspondent with the eye's centre of motion, is a less abstruse inquiry. That the progressive scattering of visible directions must cause them to intersect at a common point eventually, will be evident on considering that the directions are different on either side of the median line mC , and that the eyeball is globular. Why, then, at point C , or how are the visual angles mCa , aCb , &c., generated? Confining our attention to the images m and a of the objective entities, M and A with visual angle mCa :—(1) Retinal points are impressed by light for one-eighth of a second. (2) The glances of the eye must be considerably more rapid than this, since even the movements of the hand are more rapid; an ignited piece of charcoal revolved in the hand deceives the retina by producing the semblance of a fiery circle. (3) Therefore, in directing the eye rapidly from object M to object A , the retinal points m and a will be impressed by the images of these objects simultaneously for a definite period. (4) Therefore the visual angle mCa will be identified by perception, and this angle will be formed at point C , the eye's centre of motion. (5) Therefore every single visible direction into which the main visible direction is resolved will have a fixed value for a certain retinal point; thus, aC for the lateral point a . Let it be understood that muscular traction reacting on the mechanical sphericity of the retina generates visible resolution, whilst ocular rotation effects monocular visible direction.

Other phenomena that are probably determined by directive resolution may be briefly alluded to: I refer to the visible area correspondent to the punctum cæcum, and to the resolution of main tactile directions correspondent to the manifold sentient points on the skin's surface. The latter forms a fit subject for reflection and analytical investigation.

Abeysance.—There are two varieties of this process—viz., the subordinate and the insubordinate. The directive and positional perceptions of the sense of touch are subordinated to those of vision, as indicated in the following original experiment: Holding the thumb and forefinger midway between and a few inches before the eyes, let them be rubbed together. Looking now with both eyes at a remote and median position, two spectral thumbs and forefingers will be seen, and with these singular results: When the optical axes (still divergent) are inclined to the right side, the forefinger will feel the thumb at the site of the right spectrum; on inclining the axes leftwards, the thumb will be localised on the left side. The same tactile abeyance may be proved by studying one's face in a distorting mirror; however much the forehead is seen to recede abnormally, its parts will be accurately felt by the fingers just wheresoever they may be seen. Brewster's well-known experiment with the cane-chair,³ in which the octagonal perforations of the seat are felt in a different position to which they are seen, does not invalidate the above statement; this is apparently an example of single vision, but really one of double vision with a sensorial antagonism operating between the ocular muscles. Is it possible that a tactile positional perception can be in abeyance to visual positional perceptions that are at variance so as to neutralise each other? Certainly not; in such an event, as a result of the first experiment, the thumb would be felt by the forefinger at the sites of both the visible spectra simultaneously.

Another example may be instanced in viewing objects behind by bending the body forwards and looking between the legs; the superior rectus now localises objects below and the inferior rectus above, because these muscles are in abeyance to those bending the trunk. Muscular abeyance exhibits many manifestations in the upper extremity, concerning which it may be said generally that a given distal segment is subordinated to any given proximal segment—the fingers to the hand, the fingers or hand to the forearm, and this to movements of the arm. The index finger indicates direction or position only through the abeyance of the indicator muscle to wrist, elbow, or shoulder movements, which clearly modify its indications. Analogously taking a natural skeleton of the upper extremity, the phalanges may be moved independently of the metacarpal bones, but not *vice versa*; and the carpus may be moved independently of the humerus, but not *vice versa*. Hence a practical illustration is afforded of a statement made elsewhere that “the muscular organism of the secondary perceptions is correlated to the mechanical forces of nature in like manner as that of the primary perceptions is correlated to the sense essences of nature”;⁴ other facts endorsing the same doctrine are contained in the present thesis.

A single instance of insubordinate muscular abeyance must suffice—namely, it is the usual province of the right external rectus to give rise to a rightward perception; but, rotating the face over the right shoulder, the resultant perception of this muscle is a backward one. In this experiment the rectus is not in abeyance to the rotatory muscles of head, but it co-operates with them, whilst remaining *per se* an efficient factor throughout. The result is due to an absence of inconsistency or antagonism between rightward and backward directive perceptions. A mechanical equivalent of the process is afforded by two rulers that are fixed end to end at right angles, and that rotate on the free extremity of one of the rulers as on a centre.

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³ Brewster on the Stereoscope, p. 95, 1856.

⁴ Vide THE LANCET, July 29th, 1882.

THE Visiting Committee of the Holborn Infirmary at Highgate have reported that, in order to meet the demand for admission at the present time, they have made arrangements to provide fifty-two additional beds, and instructed the clerk to write to the district medical officers, calling attention to the crowded state of the infirmary and asking them to treat cases as far as practicable in their own districts, and send only urgent cases to the infirmary.