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PROGRESSIVE SPONDYLOTHERAPY 1913

A SUMMARY OF NEW
CLINICO-PHYSIOLOGIC AND
REFLEXOLOGIC DATA

WITH AN APPENDIX
ON THE PHYSIOLOGICAL PHYSICS OF THE VARIOUS
FORMS OF FORCE

BY

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REPRESENTING THE ADDITIONAL SUBJECT-MATTER
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BY

ALBERT ABRAMS

TO
SIR JAMES BARR, M.D., LL.D., F.R.S.E.,
CONSULTING PHYSICIAN, THE ROYAL INFIRMARY, LIVERPOOL, AND
PRESIDENT OF THE BRITISH MEDICAL ASSOCIATION
THIS VOLUME IS INSCRIBED
IN RECOGNITION OF HIS FRIENDSHIP AND OF HIS DISTINGUISHED SERVICES
IN THE ADVANCEMENT OF MEDICINE

PREFACE

THE first edition of *Spondylotherapy* was published in 1910 and since that time four editions of the work have been issued. To avoid the necessity of a new edition, which has become imperative, this volume is designed to substitute the latter. The subject-matter of the appendix is an attempt to further rationalize physiotherapy and to remove the stigma still associated in the minds of many with this almost empirical method of therapeutics. When *Spondylotherapy* was first published, many statements seemed incredible and only the *cognoscenti* could interpret its true significance. *Spondylotherapy* or *reflexotherapy*, was equally an attempt to rationalize crude methods practiced by the Japanese under the name *Kuatsu*, and by the Chinese as *Tcha-Tchin*.

Commenting on the latter the Abbé Grosier, at the end of the 18th century observed, "*L'efficacité de ce traitement, est prouvée par des guérisons sans nombre et qui semblent surnaturelles.*"

The data in the appendix appear equally incredible but truth is established neither by convictions nor theorization. The maneuvers suggested by the author are simple and easily executed and judgment should be reserved until they have been tried. The term force in the appendix is employed in its popular sense. Atomic energy like matter, in accordance with the law of the Conservation of Energy, is indestructible and uncreatable and must be regarded as a separate entity. Energy before association with the position of one body in reference to another is potential in contrast with kinetic energy or the energy of motion.

The fact that I have solicited physiology to contribute its share in clarifying some problems should occasion no surprise.

The laws of physical science are universal and apply equally to living organisms and so-called inanimate things.

This iatrophysical conception demonstrates the trend of unifying the various forms of force under one great principle.

A. A.

246 POWELL ST.,
SAN FRANCISCO, CAL.,
APRIL, 1913.

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PROGRESSIVE SPONDYLOTHERAPY*

CHAPTER I.

GENERAL REFLEXO-DIAGNOSIS.

SCOPE OF SPONDYLOTHERAPY — REFLEXO-DIAGNOSIS — FUNCTIONAL DIAGNOSIS — VISCERAL TONOMETRY—SPONDYLOPRESSOR—VAGO-VISCERAL METHODS—DIAGNOSIS OF INTUITIONAL ACTS—BACKACHE AND VERTEBRAL TENDERNESS—REFERRED PAIN—DIAGNOSIS OF HYSTERIA.

SCOPE OF SPONDYLOTHERAPY.

My friend, Dr. H. Jaworski, of Paris, France, first suggested the name, "REFLEXOTHERAPY" (636). He further suggests "REFLEXO-SPONDYLOTHERAPY."

Dr. J. Madison Taylor, and Dr. Louis von Cotzhausen, protest against the employment of the word spondylotherapy contending that the designation is too limited in scope to do justice to the subject which embraces not only new methods of treatment but new methods of diagnosis. Dr. von Cotzhausen, proposes the neologism, "REFLEXOLOGY."

Spondylotherapy, may suggest exclusivism to the capitious critic and so would electrotherapy and hydrotherapy but time has removed this stigma from the devotees of the latter methods of practice.

In the preface to the third edition of SPONDYLOTHERAPY and elsewhere in the same work (387), its purport has

**Numbers in parentheses refer to the pages in the last edition of SPONDYLO-THERAPY where the subject has already been discussed. When the word "page" precedes the number it refers to the present edition of progressive spondylotherapy.*

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been fully expounded. The latter is no more suggestive of an exclusive method of practice than is electrotherapy but only emphasizes the importance of the spinal cord as the center for the discharge of the majority of reflex actions.

Throughout many works on different subjects, the author has constantly referred to his vertebral reflexes but they were practically ignored until they were collated in his book, "SPONDYLOTHERAPY."

There still lingers the doctrinaire who confuses spondylotherapy with osteopathy. With like astigmatic mentality, the orthopedist could be accounted an osteopath for the reason that he treats diseases of the backbone.

Anent osteopathy, a kindly word should be said of some of the proselytes of this cult who are now recognizing certain errors in their early conception of disease.

One of the fundamental principles of osteopathy was that diseases were caused by dislocations of the vertebrae which by exerting pressure on the spinal nerves induced derangements of functions. By pushing and pulling the vertebrae into place, the "lesions" could be corrected.

Dr. J. Madison Taylor, has studied this subject from an unprejudiced viewpoint and quotes the highest authorities on anatomy to show that, except when long-standing or progressive morbid processes have been the cause (lateral curvature and tubercular disease), changes in the relationship of the vertebrae are practical impossibilities.

This authority¹ observes:—"Relaxations of the lateral and posterior spinal ligaments are due to nutritive faults. There is produced often the appearance of dislocation, but these morphologic phenomena disappear on restoration of the tonus of the shrunken tissues, chiefly through mechanical stimulation. Attempts to 'replace' these so-called 'dislocated bones' and to relieve pressure on

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nerves,—the creed of the osteopath,—sometimes result in benefit, not by accomplishing the object aimed at, but through the effects wrought upon the centers of vasomotor and lymph activities by mechanical or other stimulation. Where, as sometimes happens, undue force is used to 'pull or push' these tissues in place, harm is often wrought of which little is said, or to which other causes are assigned. Thus any agent which causes vasoconstriction in the tissues of the back contiguous to the spinal column will produce, conversely, dilatation of the vessels in the cord and of the organs and parts beyond the line of innervation.

"Any agent which produces dilatation of the vessels supplying the tissues of the back will, by compensatory action, induce constriction in the blood-vessels of the cord and parts beyond. The significance of this is at once made plain, and its value, not only as a factor in diagnosis, but in treatment, manifest.

"On inspecting the back of one who is, and has always been, perfectly sound, there will be seen (if certain attitudes are assumed to bring them into prominence) the spines of the vertebrae in normal alignment, distance apart, and degree of posterior projection. If there has been a history of long-continued or recurrent disturbances of the internal organs, these are frequently revealed by alterations in the tonus of the blood-vessels of those muscles and other tissues innervated by, or lying adjacent to, the governing segments of the cord from which the organs at fault are reflexly controlled through their vasomotor connections. The change of form exhibited is an atrophy of some, infiltration and thickening of others, and if long continued, asymmetries of the vertebrae, the spines apparently pointing in different directions. If the lesions have become chronic, the spines are found separated owing to the relaxation of the posterior ligaments, until between two or more marked depressions appear, or several are depressed below the normal line of projection. This disarrangement of the

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vertebrae is more apparent than real, the asymmetries being due to loss of tone and relaxation in the supporting ligaments, and this disappears under appropriate treatment."

Dr. Earle Scanland Willard, one of the most eminent authorities on the subject of osteopathy urges academic revision of the principles of osteopathy based on most careful research work. He observes:—"It seems that the explanation of the lesion rests upon something more than mere pressure of mal-adjusted tissue upon nerve-fiber or vascular channel; this at best can be only part of the physiological disturbance of the muscular, fascial, ligamentous, and osseous tissues which causes interference with the normal afferent influence to the spinal cord centers, *and this is more or less permanently maintained by the lack of freedom of the joint movements.*

Neither macroscopic nor microscopic findings in the tissues passing through the spinal foramen warrant the assumption that the osteopathic lesion is the result of mechanical pressure in this region."

Hippocrates must have anticipated sectarian practice with relation to the spine. I find in his chapter on "*Articulations*" that, after enjoining the physician to know the spine as requisite in many diseases, he inveighs against the practice of attributing cure to the reduction of dislocated vertebrae thus profiting by the ignorance of others. Curvature of the spine, he continues, occurs even in health from natural conformation, from habit, old age and from pains.

The osteopaths have recently protested against what they regard as an encroachment on their domain and claim that I have purloined their ideas. This abuse is couched in less elegant though in more cogent phraseology. I have shown that the primal conception of this cult has been dis-

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credited by its leaders. If the vertebral column and spinal cord have been patented then my researches must be regarded as an infringement and a *caveat emptor* should be issued. I fear however, that my detractors are in the same position as the dramatist whose manuscript was rejected. Later, he witnessed a play in which "stage-thunder" was also employed and excitedly cried, "They've stolen my thunder."

REFLEXO-DIAGNOSIS.

Many reflex acts are so perfectly coordinated that one is constrained to believe that, in the spinal cord there exists a subsidiary brain.

Man is practically an automaton and many of the phenomena of vegetative life, respiration, circulation, nutrition, etc., are produced in the subconscious state and without voluntary effort. Eating, drinking, walking, in short, the essential acts of life, are but a mass of habits, and eventually conform to the laws of habit. Their repetition eventuates in reflex actions. It is wise that this is so, otherwise the mind would be so occupied that acts requiring volitional deliberation could not be executed. Instinct is an adaptive impulse in the absence of intelligence, yet instinct is made up of reflex acts purely automatic and without the domain of the mind.

The bee constructs a perfect cell without a mathematical education, and birds migrate without chart or compass.

All diseases are manifested by a direct and indirect symptomatology; the latter embrace the reflex symptoms. There are individuals who are reflexophilic, *i. e.*, they have exaggerated reflexes.

If the life of an animal is essentially a series of reflex actions and pathology is nought else but the physiology of

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the sick, then the reflexes must assume primary importance in diagnosis. In visceral diseases, symptoms are often referred to the somatic area (411).

In other instances, the reflexes are essentially compensatory or for purposes of defense (191).

FUNCTIONAL DIAGNOSIS.

Montaigne has observed, "Even as Nature makes us to see that many dead things have yet certain secret relations to life." The time was, when the chief goal of the pathologist was to discover some morbid change for every disease but the study of the living has supplanted the study of the dead and the consequence is, the passing of morbid anatomy.

We no longer strive to make the clinical correspond with the anatomical findings and picture in our minds the pathologic conditions prevailing in disease.

Our chief aim is to make a *functional diagnosis* which takes cognizance of anomalies in the physiologic functions of the viscera. Physiologic fluctuations may be resident in an organ even before a pathologico-anatomic substratum is assumed to exist. The recent advances made in pathology and therapeutics have been mainly along the lines of functional diagnosis.

VISCERAL TONOMETRY.

I believe that, in my work on "*Diagnostic-Therapeutics*," the first systematic attempt was made to study the viscera with reference to their functional sufficiency (215). Since then, by aid of a simple apparatus which will be described later, coupled with a recognition of the visceral reflexes, it is now possible to gauge the capacity of an organ to execute its functions, *i. e.*, to measure its visceral tone. The utter helplessness of the physician to achieve such results by con-

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ventional methods only emphasizes the fact that conjecture often plays a predominant *rôle* in medical practice. Take so plebeian an affection as constipation and I venture to say that, heretofore it was impossible to recognize it objectively.

The capacity of an organ to execute its functions is determined by the tone of its musculature (409 and 451).

THE VISCERAL MUSCLE.—This is usually in the form of a membrane or sheet but in certain situations (uterus, pylorus), it is thick and well developed. Unlike the skeletal, the visceral muscle receives its stimuli not directly but indirectly through the intermediation of ganglion cells. The visceral musculature shows elasticity, tonicity, irritability and conductivity. There is a distinct periodicity in the movements of visceral muscle characterized by contraction and relaxation of the muscle-fibers.

If the latter are stimulated by the induced or constant current, the contraction takes place more rapidly than the relaxation, the two phases occupying 5 and 35 seconds respectively with a latent period of 0.25 second. In our treatment notably by aid of electricity the foregoing facts are important. The visceral musculature is plain or involuntary and does not respond to stimulation like voluntary muscle. Strong currents (notably the sinusoidal current) are necessary and the rate of stimulation to produce a tetanic contraction is slower than for cross-striped muscle. The best effects are achieved by a stimulus acting every five seconds. The slow, long-waved sinusoidal current is best to secure such effects.

THE VISCERAL REFLEXES (7, *et seq.*).—These organic reflexes are chiefly concerned with involuntary non-striated muscles which are dominated by the *sympathetic nervous system* and are incapable of direct voluntary restraint. In the norm, the visceral reflexes do not implicate conscious-

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ness. In visceral pain (415) or, when the reflex act stimulates a cerebro-spinal sensory nerve, consciousness may be reached. The latter is also evoked when voluntary muscles must supplement an organic reflex. Defecation is involuntary respecting intestinal movements but in stimulation of the rectal mucosa, the perineal muscles are brought into action and the reflex becomes conscious and voluntary.

The *scrotal reflex* is a typical sympathetic motor phenomenon and, like the other organic motor reflexes, the contraction is slow and worm-like and not brisk like the reflexes of striated muscle.

In addition to the sympathetic system described elsewhere (427, 450), there are also microscopic ganglia (*microsympathetic ganglia*), demonstrable by the microscope and located below the union of the anterior and posterior nerve-roots of the spinal nerves. The function of the latter is unknown.

MAINTENANCE OF VISCERAL TONE.—Visceral tone is practically a reflex due to a constant flow of impulses from an organ along sensory paths and the translation of such impulses into tonic discharges from the motor neurons in the cord. The foregoing represents the *neurogenic tonus*. It has been shown elsewhere (451), that, the tonus of the sympathetic fibers is maintained by the secretion of adrenalin but that a similar internal secretion is yet to be demonstrated for maintaining the tonus of the autonomic fibers which is represented by the extended vagus (450).

Meltzer and Cannon, have shown that stimulation of the peripheral end of the splanchnic augments the secretion of adrenalin which is indicated by dilatation of the pupil. The latter is hardly a sufficient criterion for adrenalin action.

In studying the action of adrenalin on the viscera by

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hypodermatic injections of adrenalin in the human, the following were noted:

1. Dilatation of the pupil (452, 522).
2. Evanescence increase of blood-pressure.
3. Constriction of the majority of blood-vessels.
Dilatation of aneurysms (457) and the pulmonary blood-vessels (607).
4. Contraction of the lungs (314, 456).
5. Dilatation of the stomach (590).

This action of adrenalin may be duplicated in the human by stimulation of the splanchnic nerves (430, 434). The best effects are achieved by limiting the stimulation from the 4th, to the 8th dorsal spines.

A like effect may be noted by stimulation of the phrenic nerve at its exit (549). Here, I have assumed is another source of stimulating the secretion of the suprarenal glands: the latter being supplied by the phrenico-abdominal branches. The pancreas has probably an inhibitory influence on the secretion of adrenalin (452). In accordance with this theory aided by my method of duodenal intubation (page 85), I determined that, one may augment the pancreatic secretion by application of a stimulus to the 10th dorsal spine and that, during and for some time after, the tonicity of the sympathetic is reduced.

If dilatation of the splanchnic vessels is accepted as a criterion of an effect opposed to splanchnic stimulation, its effect can be achieved by the method cited on page 55. An overproduction of epinephrin is responsible for many symptoms notably, hypertension and glycosuria.

SPONDYLOPRESSOR.

Pressure at definite paravertebral areas will evoke specific visceral reflexes (169). Practically all the viscera innervated

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by the vagus (448) may be brought to contraction by application of the stimulus to the 7th cervical spine (467).

The vagus includes those roots formerly specified as the "bulbar part of the spinal accessory." The latter is limited to the spinal part of the accessorius and is a continuation of the vagus nucleus in the medulla.

It has been suggested (467), to make pressure for one minute. Mature experience has shown that the pressure *should not exceed one-half minute*, otherwise the reflex is exhausted.

A curious physiologic phenomenon has been noted with reference to the exhaustion of neurogenic tonus at the 7th cervical spine and elsewhere. One may stimulate the vagus reflexly from a number of situations (229).

As a paradigm, select the stomach reflex of contraction (316). Within a few seconds after pressure is made with the radicular-pressor (649), at the 7th cervical spine, the tympanic area of the stomach yields a dullness but, if the pressure exceeds one-half minute, the dullness is again supplanted by tympanicity because the reflex is exhausted. When pressure at the 7th cervical spine will no longer elicit the reflex, pressure in an intercostal space will again evoke the reflex. The deduction is evident; *only the afferent paths* (not the vagus itself) were exhausted. This phenomenon suggests the rationale of many therapeutic procedures and demonstrates how, *one may utilize other afferent paths in the excitation of centers which cannot be reached by paths already enervated*.

Visceral tonometry by aid of the spondylopressor (Fig. 1) gauges neurogenic tonus, myogenic tonus or both. With reference to the heart, if the neurogenic tonus is normal, pressure at the 7th cervical spine will not inhibit the pulse even though the pressure registers 10 kilograms.

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If, however, *vagus* tone is diminished as in *exophthalmic goitre* (page 74,) one cannot feel the pulse (during the time of pressure) when the pressure has attained 3 or 5 kilograms. In the latter affection however, the myocardium is efficient as a rule, therefore recourse must be had to another method for determining the sufficiency of the latter. Estimate the pressure in kilograms necessary to increase precordial dullness (471). As a rule, a pressure of 5 kilograms will augment the latter whereas in myocardial insufficiency, the full pressure of 10 kilograms fails to modify the percussion note.



FIG. 1.—Spondylopressor with reflexometric attachment. A, attachment for use as an *algesispondylometer*; B, attachment for use as an *algesimeter* elsewhere in the body; C, attachment for gauging the vigor of the spinal and abdominal muscles.

Atonic constipation (328) is more frequent than the *spastic* variety. If pressure is made at the 2nd lumbar spine the *tympanitic* intestines become dull if there is no constipation whereas in the presence of the latter, the full 10 kilograms of pressure will cause no change in the percussion sound.*

*For further details concerning the employment of the *spondylopressor* in the diagnosis of visceral reflexes, *vide*, pages 34 and 74.

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A minimum pressure of 4 kilograms at the 7th cervical spine is necessary to cause a descent of the normal or orthotonic lung. In the hypertonic lung (*asthma*), the lower lung-border descends with a pressure of 1 kilogram.

Aside from the employment of the foregoing apparatus as a *reflexometer*, the author has employed it for the following purposes:

1. As an *algesimeter*, to measure the reaction to pain by kilograms of pressure. The attachment (A) is employed to measure vertebral points of tenderness whereas the disk (B) is used for measuring pain elsewhere. One may also utilize this apparatus for determining the progress of a malady by the response to pain by diminished or increased kilograms of pressure.

2. As a *baresthesiometer*. Afferent peripheral impulses are conducted along distinct classes of nerve-fibers and common sensation is made up of three kinds of sensibility:

- a. *Deep sensibility* recognizes deep pressure which, if excessive causes "pressure-pain." This sensibility takes cognizance of sensations from muscles, joints and the vibration sense (66). These sensory impulses are not annihilated by division of the sensory cutaneous nerves.

- b. *Protopathic sensibility* recognizes painful cutaneous stimuli (pin-pricks) and extreme degrees of heat and cold.

- c. *Epicritic sensibility* responds to light touches (cotton-wool) and finer grades of temperature.

The foregoing differences are applicable only to the peripheral nerves (extra-spinal portion of the sensory paths).

In *peripheral neuritis*, the deep hyperalgesia and cutaneous anesthesia (cotton-wool touch unperceived) is diagnostic in contrast to the condition prevailing in *locomotor ataxia*, viz., association of superficial and deep analgesia.

Peripheral sensory impulses pass to the spinal-root

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ganglia then through the posterior roots to the cord. In the latter, there is no separation of the deep and superficial pain-fibers hence in certain diseases of the spinal cord, perception of pain as a whole is annihilated and the pain of a pin-prick or deep pressure is equally abolished.

3. For testing rigidity of the muscles of the back or elsewhere. Here, the small ring (C) rests below attachment. The pressure in kilograms necessary for the surface of the ring to attain the surface of the skin indicates the rigidity.

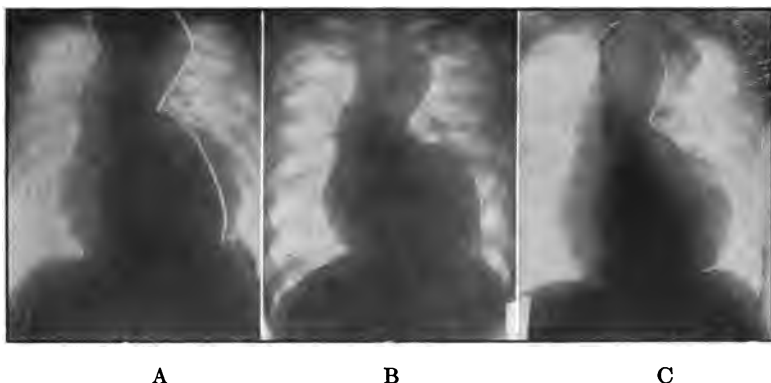


FIG. 2.—Skiagrams of an aneurysm treated by Dr. George Jarvis of Philadelphia. Also show the areas of heart and aneurysm, as determined by percussion with corroboration of the latter by the X-ray findings. A, skiagram before concussion of the 7th cervical spine; B, diminished area after concussion; C, from same patient symptomatically cured after treatment for one month.

4. For testing the tone of the abdominal muscles in splanchnic neurasthenia (427). Fix instrument on abdominal region at a pressure of 4 kilograms and observe how many more kilograms of pressure may be recorded when the patient contracts the abdominal muscles.

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VAGO-VISCERAL METHODS.

The inaccuracy of delimiting the viscera by topographic percussion by the conventional methods (359) suggests the necessity of improved methods in physical diagnosis. The viscera are dominated by the vagus and when the tone of the latter is augmented topographic percussion is facilitated. The method advocated by the author is the vago-visceral method (321). Fig. 2, illustrates the accuracy of the latter maneuver. The aneurysm and heart were primarily outlined by Dr. Geo. Jarvis, of Philadelphia, and the results of percussion were corroborated radiographically.

VAGO-VISCERAL INSPECTION.—In thin subjects and notably in children, one may observe when *intermittent* pressure is made with the spondylopressor (Fig. 1) at the end of forced expiration during suspended breathing, the borders of the heart (page 50), the lower border of the stomach and lower border of the liver (in the anterior axillary and parasternal lines). Each time pressure is made by an assistant the stomach or liver is manifested by a bulging or shadow. As a rule, in inspecting the stomach (the patient facing a window), it is best to stand to the left of the patient and look downward. To inspect the liver, look downward from the left side. Painting the skin with a saturated alcoholic solution of gamboge will accentuate the shadows but not the bulging.

The *diaphragm reflex* (550), can be seen in thin subjects in the erect posture (side of patient toward window and observer with back to light) when intermittent pressure is made between the 2nd and 3rd cervical spines. During inspection patient must suspend breathing. The foregoing methods are conducted with the *patient standing*.

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VAGO-VISCERAL PALPATION OF THE HEART.—If, during the time an assistant makes intermittent pressure at the 7th cervical spine with the spondylopressor and one follows an intercostal space toward the borders of the heart, the latter give to the palpating finger a sensation not unlike that which is felt when the finger is placed on the masseter muscle during mastication. When proficiency is acquired, it is surprising how effectually one may delimit the organ.

This maneuver acquaints us with the condition of the myocardium (471) which, if efficient gives a distinct impact to the finger. Vago-visceral inspection of the heart is described on page 50.

DIAGNOSIS OF INTUITIONAL ACTS.

An interesting brochure should be dedicated to this fascinating subject. Space forbids extensive discussion and it is merely introduced to awaken the interest of others.

Every emotion is simultaneously an instinct, and every physical reaction to an emotion is the natural expression of protection. Instinct has already been discussed on page 5.

In asthenopia, eyestrain is often intuitively relieved by stretching the neck (which increases vagus-tone) (469), by forcible closure of the eyelids or by rubbing the eyes. Pressure on the eye will augment vagus-tone (443).

In cardiac neuroses, notably tachycardia, patients instinctively execute certain maneuvers (229).

When the neck of the prize-fighter is vigorously rubbed, it augments the tone of the heart through the vagus. A veritable heart-reflex may be elicited by friction in the region of the 7th cervical spine.

To relieve an overloaded stomach the Bohemian peasantry place the knee against the back of a patient seated upon a stool and make counterpressure with the hands grasp-

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the neck. The knee-pressure is made in the region of the 5th dorsal spine which opens the pylorus (page 82).

Some prize-fighters instinctively employ the liver-blow to disable their opponents. When such a blow is struck corresponding to the lower border of the liver in the parasternal line, a paralysis of the splanchnic nerve ensues and there is an engorgement of the splanchnic blood-vessels.

The cognates of instinct are becoming rapidly atrophied from disuse and for this reason the intuition of animals is superior to that of man.

In making pancreatic fistulæ in dogs, the after-treatment is handicapped by the tryptic digestion of the skin around the wound. One dog suffering in this way kept on tearing down mortar from the wall to lie upon and thus relieve the condition. This intuitional act on the part of the dog suggests a remedy in the treatment of such fistulæ. Many lessons may be derived from the study of animals.

We have always known that the secretion of saliva is a reflex act but only recently do we know that the secretion of gastric juice is effected through afferent impulses from the senses (smell, sight, taste) passing reflexly down the path of the vagus. What has been revealed in animals respecting the secretion of gastric juice may be utilized in practice. Thus, careful investigations have convinced me that, when stimulation of the vagus is executed (7th cervical spine), gastric juice is increased and diminished, when the vagus is depressed (472). Section of the vagi in animals prevents and their stimulation augments the flow of gastric juice after an interval of several minutes. Empirical knowledge has been substituted by scientific facts by animal observations. Food served in an inviting way stimulates the gastric juice and its quantity is determined by the character of the ingested food.

Backache and Vertebral Tenderness

A meat diet provokes the most powerful and a milk diet, the weakest secretion. Many vaunted remedies like alcoholic preparations, acids, alkalies and bitters have no greater effect when swallowed in exciting the flow of gastric juice than has water, in fact, in many instances they inhibit the flow. They act reflexly in increasing the juice by their taste and A. Randle Short, suggests that these time-honored remedies should be used as a mouth-wash, without swallowing them.

BACKACHE AND VERTEBRAL TENDERNES.

Despite the fact that, this subject has already been discussed (71, 83, 422), its importance in diagnosis demands additional data.

Tenderness in the spine is practically always associated with localized or more diffused rigidity and must be regarded as a protective reflex to give rest to the implicated part.

The tissues involved may be:

1. Skin and subcutaneous tissues (wounds, abscess);
2. Muscles, fasciae or nerves (gout, rheumatism, neuralgia, traumatism);
3. Vertebrae (128, 137), vertebral joints (osteo-arthritis) and sacro-iliac joint;
4. Cord and meninges and spinal nerve-roots.

Visceral diseases and backache also demand consideration.

Pain with tenderness on pressure emphasizes the presence of local disease. In *referred pain* (56), firm pressure evokes less pain than a light touch (showing skin-hyperesthesia).

Reaction of the vertebrae to pain may be tested by striking the spinous processes with a percussion-hammer.

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Reaction of the vertebral-joints may be determined by executing certain movements (41).

In *vertebral tuberculosis*, tenderness is associated with deformity and rigidity of the affected part and the rigidity is accentuated by movements. The pain is aggravated when the shoulders or legs are jarred or when the cathode of a Galvanic current or a hot sponge approaches the deformity.

In *rickets* (143), there is no decided spinal tenderness and the spinal curvature evanesces when the child is suspended by the head or arms.

Secondary *malignant growths* often implicate the vertebrae.

The Roentgen rays are often imperative in diagnosis but it is in the interpretation of the skiagrams that the greatest skill is displayed.

We shall now consider briefly the tissues involved in backache.

1. SKIN.—Reference has been made to cutaneous hyperesthesia which is common in the rachialgia of neurasthenic and hysterical subjects (70). Unlike the pain in lumbago which is diffused laterally, in rachialgia the pain spreads upward in the line of the spine. The pain develops gradually and is influenced by various maneuvers (70). The pains from which the patient suffers may be reproduced by pressure over the sensitive area. Deformity is absent and mobility is not compromised. When the eyes of the patient are closed, localization of pain and response of tenderness to varying degrees of pressure with the spondylopressor (page 9) is characteristic.

Many neurasthenics revel in their valetudinarianism and though desirous of counsel do not take it. Instruct such patients to take a dose of potassium iodid or other drug (which can be detected in the urine) during a paroxysm of

Muscles, Fasciae and Nerves

pain and on the same day determine its presence in the urine.

In hysteria, spinal points of tenderness (like peripheral points) are painful to the slightest touch, whereas deep pressure if the patient is diverted may be painless. Such pressure may excite (hysterogenic areas) or inhibit (hysterofrenic areas) an hysterical attack.

2. MUSCLES, FASCIAE AND NERVES.—The sole supports in maintaining the spine erect are the muscles of the back and trunk without which support the spine would collapse. The region between the 9th dorsal and 3rd lumbar vertebrae is the weakest part of the spine. Sprains of the column never assume any magnitude owing to the compact formation of the spine and a force necessary to lacerate the ligaments would result in fracture and dislocation of the vertebrae. The latter condition without a fracture is extremely rare. Sprains are most frequent in regions enjoying the greatest mobility (cervical and lumbar) whereas fractures occur in less mobile areas of the spine.

There is perhaps no disease in our nosology more frequently abused than "*rheumatism*."

Even *lumbago* (84, 92) is most often a lumbo-abdominal neuralgia and freezing over the vertebral exits of the implicated spinal nerves will at once arrest the pain.

Lumbago is bilateral and its diagnosis in cases of some duration should not be made until the nervous system is tested insomuch as it may be essentially a symptomatic condition. Lumbago may be associated with sciatica but more often it is a simultaneous implication of the spinal nerves.

Lumbago in a woman demands an examination of the pelvic viscera, and of the rectum in both sexes.

In a number of patients complaining of backache, I have

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found at the insertion of the gluteus maximus large movable nodules suggesting lymph-glands although anatomists do not record their location in this region. Lymphatic drainage from the lower part of the back is through the inguinal glands (about Poupart's ligament).

3. VERTEBRAE, VERTEBRAL JOINTS AND SACRO-ILIAC JOINT.—The vertebrae may be painful from traumatism, erosion by an aneurysm, tuberculosis, malignant disease infections (gonorrhea, pyemia) and spondylitis.

The rôle played by *uric acid* in muscular and articular pains (158) should be decided in several days by the use of *atophan* which facilitates the elimination of uric acid from the organism in all gouty and rheumatic affections. Doses of 2 to 3 grams are said to eliminate within 24 hours, double and treble the amount of uric acid and occurs independently of the fact whether purin or purin-free food is taken. The spleen is a well-known reservoir of uric acid and after concussion to elicit the spleen reflex of contraction, one can increase the output of uric acid in the urine.

One may estimate the excretion before and after treatment by Gubler's method. Stratify urine upon a layer of nitric acid (volume of former to latter as 3:2). At the line of junction of the two fluids a cloudy ring of uric acid will separate out in 5 minutes or less if uric acid is increased but if diminished, it will not appear until later. Phosphotungstic acid solution is a delicate test for uric acid in the blood.³

The movements of the spine are chiefly due to the 23 intervertebral cartilages which constitute nearly one-fourth of the entire spine.

No examination of the back is complete without determining the mobility of the spine. Thus, when the back is bent forward, the lumbar spines separate and if the distance

Vertebrae and Vertebral Joints

in the erect posture between the 1st lumbar and 1st sacral spine is 10 cm., when the back is bent forward it is 15 cm.

Osteo-arthritis (105,401) is an affection frequently overlooked notwithstanding its frequency.

Some contend that rheumatoid arthritis is a disease distinct from osteo-arthritis. In the former, the synovial membranes and periarticular tissues are affected and in the latter, the cartilage and bone. Others hold that both are varying forms of the same disease.

Radiographs are valuable in diagnosis. Hypertrophy and overgrowth of bone are noted especially in the spine.



FIG. 3.—The Stretcher of Cropp, with patient in the prone posture.

The cartilage is eroded, disappears, or is replaced by fibrous tissue or bone, notably at the edge. The overgrowth of bone corresponds to the small hard knobs at the sides of the distal phalanges known as *Heberden's nodes*.

Osteo-arthritis is often the cause of many intractable spinal neuralgias, torticollis, lumbago and sciatica.

The pains of this affection are more frequently caused by a neuritis than a neuralgia due either to an extension of the inflammation to the nerve or by pressure on the latter by the overgrowth of bone. Here, suspension (478) gives at least temporary relief.

A convenient and excellent substitute for suspension is "The Stretcher" (Fig. 3) devised by David Bertram Cropp.

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With this apparatus traction can be made in the prone or recumbent posture.

Pain in the sacral region (sacralgia) is frequently caused by relaxation of the sacro-iliac joints (111). In the norm, motion in these joints is scarcely perceptible and any considerable motion is abnormal. Motion may be tested with the patient in the prone posture with the straight-leg raising test which tilts the pelvis forward or backward upon the sacrum.

Motion is also determined by having the subject support the body alternately on one and then the other leg. The pains are not strictly local but often diffused owing to the relation of the joint to the lumbo-sacral cord. From pressure on the obturator nerve, the pains may be referred to the hip or knee (supplied by same nerve).

While *coccygodynia* (95), is in the majority of instances a neurosis due as I believe to some anomaly of Luschka's gland (in front of the tip of the coccyx), it may also be caused by some disease of the uterus and adnexa which drag on the broad ligaments with drain on the coccygeal gland (sacral portion of the gangliated cord).

Faulty posture (186) is also responsible for pains. Any deviation from a well-balanced position strains the muscles and ligaments and alters the relationship of the viscera. Cure can only be effected by exercises and the use of proper shoes and corsets. An effective corset may also correct the abdominal ptosis. In connection with faulty posture, there is sacro-iliac strain and enfeeblement of the long plantar arches.

The outlines of the abdomen and back may be easily determined and preserved for reference by permitting light to fall on a large piece of ground-glass in such a way that a silhouette of the body-contour can be drawn with chalk and



FIG. 4.—Normal or neutral type of posture. Distinguishing features are: (1) Line of gravity of body passes through important pivotal points; (2) the pelvis is balanced in equilibrium on the heads of the thigh bones; (3) this relation of important pivotal points with the line of gravity and this balance of the pelvis prevents muscle and ligament strains, and (4) the rear perpendicular touches the middle back and the buttocks.

(After Dickinson and Truslow).

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then transferred to paper. This method is the one I employ in tracing a struma (page 73). In the norm, the posterior perpendicular line touches the buttocks and the middle back (Fig. 4) and the abdomen does not protrude beyond a perpendicular line drawn upwards from the anterior surface of the thighs.

4. CORD, MENINGES AND SPINAL NERVE-ROOTS.—In *cord-lesions*, analgesia includes deep as well as superficial pain whereas in a peripheral nerve-lesion, superficial may be accompanied with deep hyperalgesia (page 12). In cord-lesions, if there is any loss to thermal stimuli, all degrees of heat and cold will be lost. Again, if the lesion implicates the posterior columns, there may be a loss of the sense of passive position and movement without loss of tactile, painful or thermal stimuli.

In cord and nerve-root lesions, the distribution of sensory disturbances is quite different than in implication of the peripheral nerves.

A zone of hyperesthesia may be found just above the area of anesthesia, in growths of the spinal meninges, spinal caries and herpes zoster due to pressure or irritation of the posterior root-fibers. According to the theory of *diaschisis*, only a few symptoms are the result of the lesion itself, the balance are due to diaschisis, *i. e.*, functional shock-like inhibition of uninjured distant areas produced by the dynamic influences of a lesion anatomically connected with such areas. The symptoms due to diaschisis can disappear and are therefore in principle temporary.

The spinal cord only extends to the 2nd lumbar vertebra. Lesions of the lower part of the cord may implicate the *cauda equina* (lumbar, sacral and coccygeal nerve-roots) or the *conus medullaris* (that part of cord below 3rd sacral segment).

Referred Pain in Visceral Disease

In the diagnosis of the foregoing consult the table of localization of the functions in the segments of the spinal cord (32 *et seq.*).

REFERRED PAIN IN VISCERAL DISEASE.

This subject has been discussed (74).

Recent investigations⁴ have modified our conception of visceral pain (415) with special reference to the peritoneum.

Franke, shows that the autonomic system (411) of the abdominal organs is derived from the central nervous system in the mid-brain, the medulla, the dorsal cord, and the upper part of the lumbar cord. He divides the system into four parts: (1) The mid-brain autonome, represented by the third cranial nerve; (2) The bulbar autonome, the seventh, ninth, and tenth cranial nerves; (3) The sympathetic, and (4) the sacral autonomes. Each fiber is provided between the spinal cord and its peripheral end with one ganglion cell. They only possess a centrifugal conduction power, and when the organs supplied contain sensory nerves the latter are derived from the cerebro-spinal system and have no connection with the autonomic system. The abdominal organs are innervated by the vagus, the sacral autonome and the sympathetic. Under ordinary conditions the abdominal organs do not reveal the least sensation, but under certain circumstances they may be the seat of severe pain, which, according to Fröhlich and Meyer, is due to the stimulation of ordinary spinal nerves issuing from the posterior spinal roots. The vagus, the splanchnics, and the hypogastric nerves are free from any sensory fibers. Approaching the subject from the experimental side, he finds that some difficulty is experienced when utilizing animals for the purpose. Local anaesthetics have to be avoided, as they induce a general insensitiveness, and it is obvious that cold air produces a loss of sensibility in regard to the abdominal

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organs. He, however, came to the conclusion from the reliable evidence available, that mechanical stimuli to the intestines produce pain in the lower animals, but not when applied to the liver, spleen, or pancreas. Dogs are more susceptible than cats or rabbits. It appears, further, that the stomach of these animals is insensitive, but tying of vessels in connection with the organ is associated with pain. Turning to the human subject, the experience of local anaesthetics permits of a number of deductions. The parietal peritoneum is extremely sensitive, and has the power of localization to some extent. The liver is absolutely insensitive to mechanical stimuli, which explains the painlessness of hepatic affections until the process involves the surface, and thus the peritoneal covering. He could not find any records with regard to the sensibility of the human spleen or pancreas. The esophagus possesses sensation for pain, warmth, cold, and for pressure. This sensibility decreases downwards. Further, he had no hesitation in stating that pain is felt in the mesentery, right up to the intestine. He discusses at some length the question whether the intestine is sensitive or not, and comes finally to the conclusion that normally the gastro-intestinal canal is insensitive, in contrast to the case of animals. He shows that the pain of supposed hyper-acidity of the stomach is in reality due to a gastric ulcer. He follows this up with an analytical discussion of the pain of colic, etc., and referred this pain to pulling on the mesentery, giving a detailed account of the mode of production. He states that the gall bladder is wholly insensitive to mechanical stimuli, but that the pain associated with biliary colic, etc., is due to the pulling on the nerves in the neck of the bladder; this is supported by the fact that ligature of the cystic artery and the neck of the gall bladder are painful procedures. The same is true of the kidneys. The urinary bladder is sensitive, especially in the trigone, and the floor is certainly sensitive to heat.

Referred Pain in Visceral Disease

It is often difficult to say whether an area of vertebral tenderness (71) is due to a *neuralgia of the spinal nerves* or to *visceral disease*. One must of course exclude all other factors in the production of pain and remember that tenderness in the back may implicate the skin, muscles, joints, bones, meninges or cord.

In vertebral tenderness of visceral origin the following data are available in diagnosis:

- a. An electric current (68) or persistent friction of the skin over the tender area causes a red spot to appear which is more persistent than in the surrounding area.
- b. Absence of typical *points douloureux* (185).
- c. Accentuation of vertebral tenderness by manipulation of the suspected viscus (75).
- d. Elicitation of dermatomes (58).
- e. Segmental-analgesia of the viscera (376).
- f. Tenderness is superficial and if the skin is pushed to one side, deep pressure causes little or no pain.
- g. Unlike the pain of a neuralgia, rubbing the part does not provoke a localized spasm of the muscle.

In all true neuralgic affections, the muscles innervated by the nerves show a decided weakness almost tantamount to a paresis.

Vertebral tenderness of visceral origin is unaccompanied by rigidity (diffused) or deformity of the vertebral column and accentuated movements (avoiding tender area) are not associated with pain. In affections of the heart and aorta, vertebral tenderness or backache is accentuated by active movements and they are mitigated by diuretin or nitroglycerin, notably if the pains are due to an aneurysm or coronary disease.

In esophageal disease, pains are accentuated by repeated acts of deglutition.

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In gastric ulcer, the pains are worse after eating.

Thus a number of data may be elicited from the anamnesis and the execution of certain maneuvers. We must also search for tender points which are almost characteristic of certain affections of the viscera:

1. *Sub-mammary tenderness*.—Present in the left breast in the 4th or 5th intercostal space and is a reflex effect of some pelvic affection (uterus and adnexa).

2. *Renal disease*.—The posterior root of the 12th nerve is associated with the renal ganglia of the sympathetic, in consequence of which, a tender spot at the tip of the 12th rib or soft tissues contiguous thereto is found in pyelitis and nephrolithiasis. In affections of the renal pelvis and ureter, painful areas are found in the course of distribution of the 11th dorsal to the 2nd lumbar nerves. The contraction of the cremaster muscle in renal colic suggests stimulation of the cord at the level of the 1st and 2nd lumbar nerves. In *testicular affections*, there is a tender area where the cord passes into the external ring.

3. *Gall-bladder*.—Localized tenderness at the junction of the upper and middle thirds of a line drawn from the 9th rib to the umbilicus (location of fundus of gall-bladder). Enlargement of the latter occurs in the direction of this line. In the norm the neck of the gall-bladder is opposite 9th costal cartilage but it may be as low or lower than the umbilicus when the liver is enlarged (597).

4. *Pancreas*.—Tenderness in the mesial line one inch above umbilicus (Robson's point) is present in pancreatitis.

5. *Appendix*.—There may be several points of tenderness in appendicitis and ceco-appendicitis;

a. McBurney's point, one and a half inches from the

D i a g n o s i s o f H y s t e r i a

anterior superior spine of ileum on a line toward the umbilicus (except when appendix is not in normal position);

b. Monroe's point, at margin of rectus on the same line as the former (location of ileocecal valve);

c. Morris's point, on the same line one and a half inches from umbilicus.

In chronic appendicitis the point of Morris is usually tender, that of Monroe slightly and that of McBurney rarely. In acute appendicitis the condition is reversed. A tender point to the left of the umbilicus corresponding to the point of Morris on the right side is often present in chronic *salpingitis*.

DIAGNOSIS OF HYSTERIA

So much excellent philosophy has been wasted in arriving at a conception of hysteria, that the writer hesitates to express his viewpoint of this psychoneurosis. Among the chief conceptions of the disease are the following:

1. A state in which ideas control the body and produce morbid changes in its functions (Möbius).

2. A psychosis in which morbid states are induced by ideas (Charcot).

3. A mental condition with certain primary phenomena and certain secondary accidental symptoms. The essence of the primary phenomena is that they may be produced by suggestion and may be made to disappear by persuasion or technically pithiatism (Babinski).

4. Unconscious fixed ideas in which a sexual factor is concerned and, by translating the unconscious to the conscious, the impulses which dominate the patient may be eliminated. The sexual factor arouses an emotion which is associated with some bodily or verbal expression.

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The original emotion may pass from view, but the expression of the emotion lives and recurs in consciousness (Freud).

From the foregoing, the following factors demand brief analysis: ideas, emotions, and suggestion.

IDEAS.—I have employed the term *ideopath*, to designate an individual whose apparently sole affliction is some morbid fixed idea. A morbid idea may persist even after the cause which brought it into existence has passed away. The ideogenic factors may be many but there is no idea in the mind which was not before in the senses. "The idea of a disease produces disease in direct proportion to its definiteness and in inverse proportion to the strength of the idea opposing it." An idea "generates its actuality." If an individual has only one idea, the latter will express itself in some kind of external motion. The brain-cells concerned in idea-formation will discharge their force without restraint. Man is not only an ideo-motor but an ideo-idea being. Thus with two ideas, one can inhibit the action of the other idea. Thought like force pursues the path of least resistance, and with the repetition of thought a habit is engendered which so masters the mind that the idea becomes pathologic, and is awakened into activity by the most trivial suggestions.

EMOTION.—This is a state of feeling—fear, grief, anger, joy—which is initiated like a brain-storm, and in its tumultuous force creates energetic disturbance of the entire organism. The emotions are physiologically manifested by:

1. Muscular expression.
2. Bodily expression.

An idea is so associated with emotion that no absorb-

S u g g e s t i o n

ing idea can be entertained without a change of the entire body to harmonize with it.

Our emotions have a rhythmic undulation dependent on the state of body raising or depressing the standard of vitality. All feeling is necessarily mental, yet there are physical feelings originating from sensations derived from the tissues and organs of the body.

One may objectively demonstrate the influence of emotions on the viscera (203).

Emotions are often an expression of fatigue or are fatigue-producing.

The Lange-James theory refers the origin of our emotions to an organic disturbance reflexly aroused by the stimulus of the object; in other words it is not the object, but the bodily commotion which the object excited.

In hysteria one often finds physical or emotional shocks or a combination of both as exciting causes.

SUGGESTION.—An emotional reaction and susceptibility to suggestion exist in varying degrees even in the norm. In children, this condition is referred to as the “physiological hysteria” of childhood. If, however, this condition of suggestion and reaction to emotions should appear in adults, it would be regarded as a manifestation of hysteria.

If auto-suggestion is a peculiarity of hysteria according to Babinski, then no one is exempt from the disease. If a physician dwells too long on the examination of an organ, it is not unnatural for him to create fixed ideas which graduate into obsessions, so that the patient carries his organ in his head, and from the latter citadel, viscerosensorial reflexes emanate. All hysteric symptoms are made conspicuous by the fact that they depend and react

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to psychic influence and the term "impossible" must be "erased from the pathology of hysteria."

The symptoms of the disease show mobility, variability and incertitude. The disease, observed Lasègue, is a basket into which we throw the papers that we do not know how to classify.

Hysteria counterfeits organic disease to such a degree that often the only thing you can positively exclude in hysteria in a female is an enlarged prostate and in a male, a diseased uterus.

When a symptom can neither be willed nor simulated, it speaks for organic against functional nervous diseases. Such unwilled phenomena are: lost knee-jerk, reaction of degeneration, Babinski toe-sign, changes in optic nerve, hemianopsia, decided pupillary changes, unilateral vocal cord paralysis, facial paralysis, ankle clonus and incontinence of urine and feces.

Suggestion is common to all psychoneuroses and is not limited to hysteria. The latter is, however, *facile princeps* the paragon of simulation. Let us not assume for a moment that it stands alone in its majesty, completely isolated from other diseases; on the contrary, it permeates in various dilutions every pathologic picture, and no morbid tableau is complete without it. There is such a disease as hysteria but there are also hysteroid diseases. Organic diseases may parade in the guise of hysteria and before the diagnosis of hysteria is justified organic factors must be excluded. It is sufficient evidence of our ignorance to make the diagnosis of hysteria but it is worse when it doesn't exist.

The symptomatology of hysteria implicates chiefly tissues innervated by the sympathetic system.

A characteristic feature of the disease is a lack of inhibi-

tion, the patient reacting to stimuli, is excessively emotional and changeable in disposition.

Investigations show that emotional excitement augments adrenal and thyroid secretion which by depressing the tone of the vagus (the nerve through which the emotions play their chief *rôle*) stimulate the sympathetic nerves.

There is a certain inconsistency in our conception of hysteria when we recognize it as a disease in which *will* evokes morbid changes in function and expect patients to control their symptoms by exercise of the will. The fact is, that the hysterical symptoms are caused by irritation of the sympathetic system and are not under the influence of the will.

Man is an automaton with a dual mentality. The mind is one, but a part of it is always conscious and another part is never illuminated by consciousness. The two minds have been differentiated into objective and subjective minds.

The former or supra-conscious mind takes cognizance of the objective world through its media of observation, the senses, and represents the supreme function of reasoning; it is the mind of intelligence. The subjective or subconscious mind perceives by intuition independent of the senses and is the abode of memory and the emotions. In this subconscious or subliminal mentality, the phenomena of vegetative life, respiration, circulation, nutrition, etc., are produced without voluntary effort.

When the sympathetic nervous system is irritated, it is the subconscious mind which perceives the irritation and it is likewise this mind which is amenable to suggestion. When these subconscious sensations are translated into consciousness, there is a reaction on the part of the cerebro-

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spinal system which reaction assists in completing the picture of the hysterical condition.

Let us draw on positive data in support of our viewpoint of hysteria. In the norm the vagal and sympathetic fibers are in physiologic antagonism. Vagus tone is diminished by sympathetic stimulation and conversely, sympathetic tone is diminished by vagus stimulation.

The ever changing bizarre and protean pictures of hysteria and other affections are due to the state of psychovagus tone (466).

In every organism there is a vulnerable point and it is in the latter that symptoms predominate (*Vide* also exophthalmic goitre, page 71).

By aid of the spondylopressor (Fig. 1), it may be shown that in hysteria, the tone of the vagus is depressed. This depression may involve individual organs or it may compromise all the branches of the vagus. This condition may be reproduced temporarily in susceptible subjects by adrenalin (page 9). Pilocarpin (451), by increasing vagus-tone may arrest a paroxysm of hysteria or ameliorate symptoms of this affection. Barotherapy may likewise improve (469) or accentuate (472) the symptoms.

I have frequently noted in children during attacks suggestive of hysteria, an enlarged thyroid.

Amblyopia, narrowing of the visual field and disturbance or loss of the vision of colors (dyschromatopsia) are often encountered among hystericals and they may be reproduced as I have shown (496) by diminishing vagus-tone. The same refers to audition (499).

When symptoms embrace the cerebro-spinal system without tangible reason for their existence the presence of an irritable segment of the cord made so by viscerosensory reflexes may be surmised.

Let us suppose that, in consequence of diminished vagus-tone, there is a dilatation of the heart and aorta and the patient suffers from pains along the ulnar border of the arm with cutaneous hyperesthesia in the same area. Here, one must assume an irritable cord-segment and the pains which are essentially radicular are referred to the first and second dorsal areas.

Viscero-motor (417) and other reflexes may be similarly explained.

Many of such reflexes are really protective and may account for the so-called deception, mimicry and simulation of hystericals. This protective mimicry is a nervous instinct not unlike that observed in insects which when resting resemble the leaves of plants or those which appear dead in the presence of animals who prey on them but eschew their inanimate bodies.

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CHAPTER II

GENERAL REFLEXO-THERAPY.

IRRATIONALITY OF EXCLUSIVISM—PSYCHROTHERAPY—REINFORCEMENT
OF THE VERTEBRAL REFLEXES—PHARMACOLOGIC REINFORCE-
MENT—CALCIUM THERAPY—EXERCISES.

It must be again emphasized although I have done so repeatedly that, vertebral reflexo-therapy or centrotherapy, if one desires to so call it is only one of many methods for curing disease.

If there weren't many paths leading to cure, there wouldn't be hydropaths, allopaths, homeopaths and other kinds of paths. One may enumerate seventy varieties of tuberculin, yet the sponsor claims sovereignty for his particular variety. In treatment, the old rule of "*curare, cito, tute et jucunde*" (to cure, to do so quickly, safely and pleasantly) must be conciliated and above all, "*Nur nicht schaden*" (only do no harm). The average patient is not so much concerned about what he has, as by what he thinks he has. In imaginary diseases he believes too much and does not believe enough in real diseases. There is always a psychic factor in treatment and the judicious physician combines psychics and physics.

The iconoclasts in medicine are usually extremists who substitute nothing for what they destroy.

Cure signifies nothing when unaccompanied by scientific proof, but cure is a good thing and the patient wants it. In a recent editorial on "*Suggestion in hyperthyroidism.*" cures are cited which were effected by nasal operations, despite the fact as the writer assumes, the reports "do not

serve to alter the status of hyperthyroidism or its connection with some definite disturbance of glandular metabolism."

It is quite true that many remedies and methods of treatment when first employed are effective and later prove useless. It is equivalent to saying that the calomel of one physician is more effective than that of another. To deny that a nasal operation is theoretically ineffective is to deny the important *rôle* played by reflexes in the etiology and cure of disease. Reference on page 74, to the author's method of diagnosing and treating exophthalmic goitre is an attempt to place our methods on a mathematical basis.

Exclusive methods of treatment suggest charlatanry.

*PSYCHROTHERAPY

The employment of cold (also known as *crymotherapy*) as a remedial measure has already been discussed (172, 182, 186). It is one of our most expeditious curative agents but unfortunately least employed. In our method of freezing, the reaction does not exceed capillary-dilatation and erythema. There may be noted microscopically, a diapedesis of leucocytes with some swelling of the connective tissue-cells. No doubt phagocytosis plays an important part in cure. The tremendous edema and destruction of tissue when liquid air or carbon dioxid snow is used is never observed.

There is hardly a week that one does not see some unfortunate patient who has resisted all methods of treatment and yet, after a single freezing at the *proper area*, immediate relief is obtained. It is true, that in some cases

*The employment of cold as a remedial measure in the treatment of pain was first reported in 1882, in my inaugural dissertation. I observed its use in the extraction of teeth during the time I was engaged in the study of dentistry.

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freezing is employed but always at a point remote from the site of the lesion. Two recent incidents may be cited:

Patient had her ovary and later, her Fallopian tube removed for severe abdominal pains which had persisted for three years. The condition was a lumbo-abdominal neuralgia which yielded at once to several freezings over the vertebral exits of the implicated nerves.

Patient had severe pains in the left arm for two years. Skiagrams demonstrated a cervical rib to which the pains were attributed and an operation was advised. It was a case of cervico-occipital neuralgia and yielded to two freezings.

To illustrate the results of freezing, in the practice of other physicians, I shall cite several instances reported by Dr. W. T. Baird, of El Paso, Texas, in a recent paper read before "*The American Association for the study of Spondylotherapy*:"

Case I. Suffered for two years with excruciating pain in toe. "My treatment gave no relief until Abrams' method of congelation was brought to my attention." A sensitive point at the sacro-sciatic notch was frozen with complete relief after two treatments.

Case II. Constant and severe pains in left mammary region. Diagnosis made of phthisis. Intercostal neuralgia found and cure after two freezings. Gained 10 pounds in one month. Pseudo-phthisis is not infrequent (439).

Case III. Excruciating pains in frontal region for sixteen years. Had all kinds of treatment including removal of a supposed abdominal growth without relief. With the radicularpressor one could reproduce the pains from which the patient suffered. Twelve treatments by freezing over the sensitive vertebral exits of the upper cervical nerves sufficed to cure. Before treatment she was kept con-

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stantly stupefied by morphin. In this, as well as similar cases, the cervical muscles were rigid.

Case IV. Patient with pain in left mammary region. Has a valvular cardiac lesion for 10 years, to which pain was attributed. Speedy relief followed freezing. The interest in this case lies in the fact that a tachycardia from which she suffered was equally cured

Dr. W. T. Baird, employs the following method of freezing: A piece of ice terminating in a conical point is held in the hand by aid of a towel. The conical point is

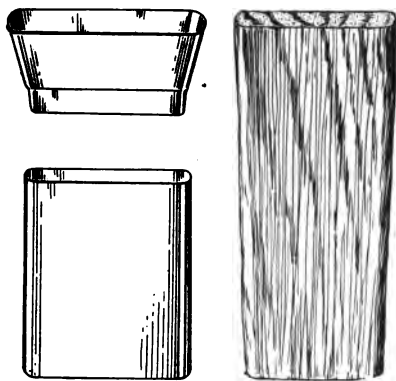


FIG. 5.—Appurtenances necessary for executing freezing according to the method of Dr. G. Baert: brass-box, tin-funnel and wooden-plunger.

dipped into common salt and then it is pressed against the vertebral point of tenderness for about three minutes. After its removal, a cup-shaped depression is left and this is frozen with commercial ether for 3 minutes longer. This method is tantamount to reinforced freezing (173).

Dr. G. H. Baert, of Grand Rapids, who could not obtain satisfactory results from freezing with ether owing to the absence of compressed air in his office devised the following method. Finding that carbon dioxide snow as convention-

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ally employed was too severe, he found that by confining it in a metallic box (Fig. 5), he was able to keep it under perfect control.

The snow is first collected in a chamois skin-bag from a cylinder in the usual way. Then it is poured into the brass-box through the tin-funnel. Next the snow is compressed with the wooden-plunger by hand (compressed by hammer, the snow loses its freezing properties). Now wet a towel and press it against the bottom of the box containing the snow. The towel freezes to the box in 2 seconds at which time it is ready to press against the sensitive vertebral points. By placing a dry towel over a portion of the freezing surface, one can limit the freezing to any point desired.

For deep freezing, a dry towel is interposed between the skin and box and pressure is made for $\frac{1}{4}$ to $\frac{1}{2}$ minute, *i. e.*, until the deeper tissues are cooled, after which a moist towel is used according to the former method. No vesication nor other untoward effect follows either method.

The brass box (covered with a wet towel) should be pressed on the selected spot for about 4 seconds, then removed until the whiteness due to the freezing is replaced by hyperemia and the process may be repeated several times.

The author finds no difficulty in freezing with an ordinary atomizer with metallic fittings provided a good preparation of ether is obtainable (173).

REINFORCEMENT OF THE VERTEBRAL REFLEXES.

In the spinal cord, there are centers for the contraction and dilatation of viscera. In the norm, these centers are in physiologic antagonism. When neither reflex predominates a reflex equilibrium is established. The moment one reflex gains the ascendancy over its antagonist, they become dis-

Reinforcement of the Vertebral Reflexes

equilibrated. Each segment of the cord is connected with fibers from the brain which subserve the function of *reflex inhibition*. The inhibitory fibers run in the pyramidal tracts (Fig. 6).

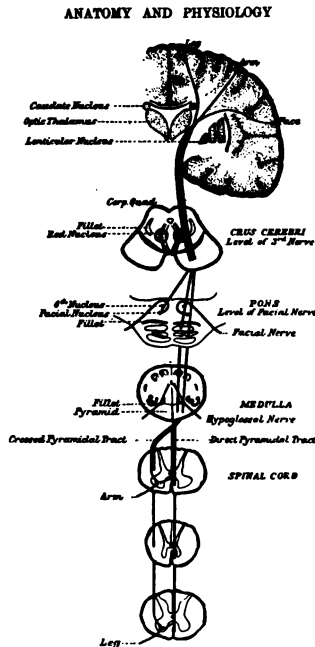


FIG. 6.—Diagram of Pyramidal Tract and its course through the brain and cord (after Stewart).

The latter convey voluntary motor impulses downward from the motor cortex toward the anterior cornua.

If the inhibitory fibers are irritated, the reflexes are impaired owing to stimulation of inhibition and if destroyed, the reflexes are accentuated.

Clinically, one may observe that, when one reflex is pathologically exalted, stimulation of its counter-reflex does not show the same effects as obtained in the norm.

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It occurred to me that, if one could temporarily put one reflex out of commission, stimulation of the counter-reflex would prove more potential in its effects.

Let us take the *pupil* as a paradigm. Its sphincter is supplied by the myotic tract which has its origin in the oculomotor nucleus. If this tract is stimulated the pupil contracts (myosis) and, if divided, the pupil dilates (mydriasis).

Opposed to this, is the mydriatic tract supplying the dilator pupillæ (Fig.19). Stimulation of this tract causes mydriasis and if divided, myosis.

The antagonistic tonus of these two tracts belonging to the autonomic system (412) maintains the balance of the pupil. Concussion or pressure at the 7th cervical spine stimulates the autonomic system through the vagus but such stimulation does not contract the pupil owing to the antagonistic action of the dilator fibers. If one inhibits the action of the dilator tract (pressure between the 3rd and 4th dorsal spines), concussion of the 7th cervical spine will cause the pupil to contract.

Pressure not exceeding one-half minute stimulates but when the pressure exceeds one minute the opposite action ensues.

One may make pressure with the radicularpressor (649), with the instrument shown in fig. 7 or a special apparatus (478). The latter (Fig. 7) is only available for pressure from the 3rd dorsal spine downwards.

Suppose we are dealing with a disease caused by vagus-hypertonia (479). Let us take *asthma*. If the vagus is depressed in the norm by concussion between the 3rd and 4th dorsal spines (495), a retraction of the lower lung-border may be determined by percussion. If, however, pressure exceeding one minute is made at the 7th cervical spine, there

Reinforcement of the Vertebral Reflexes

is no longer any opposition to the lung reflex of contraction. Now again make brief pressure or concussion between the 3rd and 4th dorsal spines and it will be found that the retraction of the lung-border is accentuated.

In the treatment of asthma, pressure is maintained for 5 minutes at the 7th cervical spine before brief *séances* of stimulation are executed in the paravertebral region between the 3rd and 4th dorsal spines.

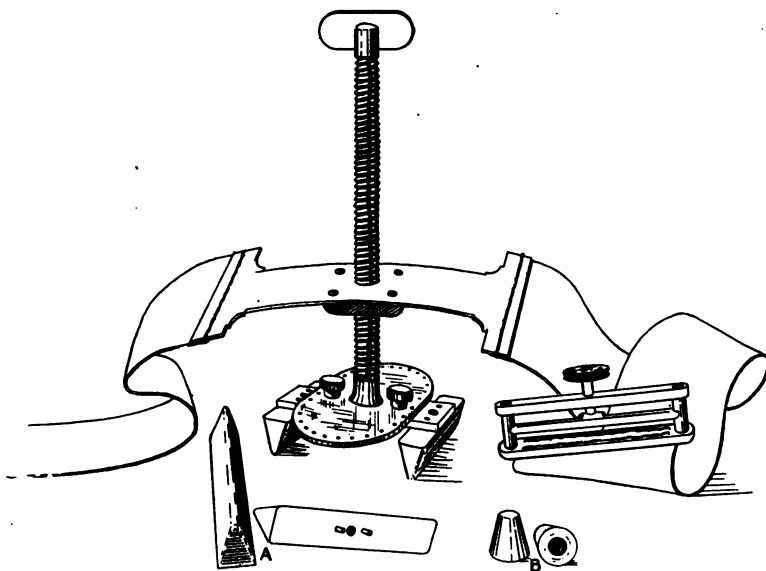


FIG. 7.—Apparatus available for pressure from the 3rd dorsal spine downward and used for reinforcing reflexes. A, attachments for diffused, and B, for localized pressure.

One fact deserves mention in asthma. *Adrenalin chlorid* (314) is only employed to check paroxysms. Having determined its action (314), I employ it as a curative agent as well by giving daily hypodermatic injections in the inter-paroxysmal periods.

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Suppose the disease is caused by vagus-hypotonia (500), for instance, an aortic dilatation. Pressure for 5 minutes is made between the 3rd and 4th dorsal spines before stimulation of the 7th cervical spine is attempted.

PHARMACOLOGIC REINFORCEMENT OF THE REFLEXES.

It has already been observed (page 41) that the brain exercises an inhibitory influence on the spinal reflexes. We know that, the mind can inhibit or disturb certain habitual and unconscious actions. Conscious attention in disturbing reflexes is illustrated by the story of the centipede. The latter was asked how he could walk with all his hundred legs and in attempting to explain its simplicity became so involved that he was unable to move at all.

In lateral sclerosis, the lateral columns including the pyramidal tracts degenerate so that the inhibitory path from the brain to the cord is destroyed. Reflex irritability is so accentuated that slight stimulation, as the movement of the bed-clothes suffices to evoke convulsive spasms of the legs.

By aid of *scopolamin anesthesia*, cerebral inhibition may to a certain extent be eliminated.

Even when small doses of the drug are given, one may elicit the Babinski reflex (15).

In non-hypnotizable subjects, I have often employed scopolamin. Suggestions made in this state are realized after awaking, as in hypnotism.

To accentuate the spinal reflexes, it is not necessary to give the drug to produce amnesia or unconsciousness: only give enough to produce drowsiness or sufficient to elicit the Babinski reflex which is accomplished with comparatively small doses. In the majority of cases it may be given *per os*

C a l c i u m T h e r a p y

combined with morphin (scopolamin, $\frac{1}{16}$ grain, morphin, $\frac{1}{4}$ grain).

CALCIUM THERAPY.

My only excuse for discussing this subject is to direct attention to an important phase of medicine ignored in our text-books, and because this therapy may be used as an adjuvant measure in aneurysms and exophthalmic goitre.

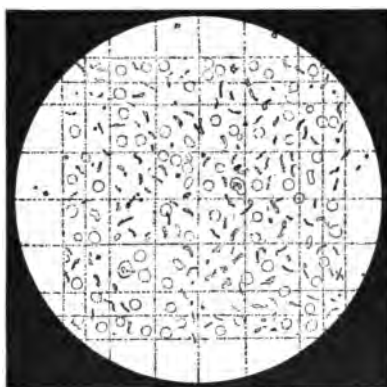


FIG. 8.—Normal human blood showing crystals, prepared with the calci-meter, x 450.

Sir James Barr, and Dr. W. Blair Bell, of Liverpool, have been prominently identified with the recent development of this therapy. The essential bio-chemical processes in calcium metabolism are little understood. Our calcium supply is furnished with food and water and abnormally from what is stored in the tissues, especially, the bones.

Calcium subserves the following objects:

1. Building up of skeleton and tissues;
2. Maintaining the movements of involuntary and preserving the normal irritability of voluntary muscles;
3. Controlling nervous excitability;
4. Influencing the functions of reproduction;

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5. Promoting the coagulation of blood;

Calcium is excreted by the alimentary tract and the urinary and genital systems.

One determines calcium metabolism by estimating the relative quantity of calcium in the blood (Fig. 8) and the excretory ratio by the amount in the urine.* Thus, if the blood calcium index is high and the urinary calcium excretion is high, too much is absorbed or if the blood shows a low and the urine a high index, too much is excreted.

Calcium chlorid increases the coagulability of the blood and is indicated to check profuse menstruation, hemorrhages and other conditions demanding an hemostatic.

Chilblains, urticaria and many other affections have yielded favorably to calcium therapy. Tetany, laryngismus stridulus and infantile convulsions are favorably influenced.

Lime salts have also been used in exophthalmic goitre and aneurysms (page 71). Headaches and neuralgias due to deficient coagulability of the blood are relieved by calcium salts. In such cases, potassium citrate will precipitate an attack for it is known that citric acid diminished blood-coagulability.

Coagulation time of the blood may be determined by placing several drops of blood upon slightly warmed microscopic slides which at varying intervals are tilted upward until they appear as in fig. 9. In the norm coagulation by this method should occur in from $2\frac{1}{2}$ -5 minutes.

Observations indicate that pregnancy is terminated when the fetus ceases to absorb or receive calcium salts from the mother's blood.

Calcium salts have been discredited because given in

*Estimation of calcium salts in the blood and urine is effected by Blair Bell's calcimeter.

unabsorbable form. The "*Mistura Calcii lactatis recentis*" of Bell, is the best method of administration;

Pure concentrated lactic acid, 200 grs., Precipitated calcium carbonate about, 75 grs., to which are added 8 minims of chloroform in 8 ounces of distilled water. Each fluid ounce contains 29 grains of hydrous calcium lactate.

The dose is one and one-half to three ounces every night or every other night and should be taken on an empty stomach before retiring.



FIG. 9.—A, incomplete coagulation (tear-shaped drop); B, complete coagulation (convex drop).

EXERCISES.

Exercises are employed for developmental or educational purposes, to maintain physical vigor and to correct special pathologic conditions.

The latter is known as corrective or therapeutic physical training.

My real object in considering this subject is to direct attention to a neglected field in the study of exercises on visceral tone (479).

Definite movements of the vertebral column make traction on specific spinal nerves and such movements may be utilized for weal or woe (547).

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My time has been too limited to classify my results concerning such vertebral action and I trust that, having made the suggestion, it may be exploited by another to some advantage.

It has already been shown how one may augment vagus-tone by exercise of the neck-muscles (228, 477).

To decrease vagus-tone in diseases caused by vagus-hypertonia, traction must be made on the spinal nerves corresponding to the 3rd and 4th dorsal spines which depress vagus-tone.

Thus in asthma, which is caused by vagus-hypertonia, the patient leans far forward with arm extended and hand grasping a support, whereas the other arm is forcibly extended in a lateral direction by an assistant (Fig. 10).



FIG. 10.—Exercise for reducing vagus-tone.

To avoid exhausting the reflex, the exercise must be of short duration and frequently repeated.

As an index of its proper execution, there should be a retraction of the lower lung-border (473).

To evoke the intestinal reflex of contraction in atonic constipation (330), have patient stand with hands on hip

E x e r c i s e s

and lean backwards and forwards alternately so as to arch the lumbar region forward as much as possible. The latter maneuver makes traction on the lumbar nerves. The index of correct execution is indicated by the conversion of the tympanitic intestinal sound into dullness.

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CHAPTER III.

THE CIRCULATORY APPARATUS.

INSPECTION OF PRECORDIUM—TESTING HEART—ANGINA PECTORIS—
ENDOCARDITIS—TACHYCARDIA—BLOOD-PRESSURE—ANEURYSMS—
VASOMOTOR NEUROSES—EXOPHTHALMIC GOITRE.

INSPECTION OF THE PRECORDIUM.—Reference has already been made on page 14, to vago-visceral methods and particularly to vago-visceral heart-palpation. If the identical method is employed, each time pressure is made, the area of the heart may be defined. This, like other shadows is accentuated by gamboge (page 14).

The vago-visceral reflex is readily exhausted, therefore if not properly seen after pressure is made several times, one must wait until vagus-tone is restored. The patient while seated faces the window and the physician views the precordium from above downward.

During the time pressure is made, the chest should be in the position of forced expiration and breathing suspended.

The outlines of the right, are less easily demonstrable than those of the left heart.

After a little experience, the shadow is easily recognized even in moderately obese subjects. The same method is available in inspecting *aneurysms*. Here, a bulge in lieu of a shadow is often seen. Inspection must be from above.

TESTING THE EFFICIENCY OF THE HEART.—Heart-sufficiency (215, 510), is a neuro-muscular question and its correct estimation demands an investigation of vagus-tone and the condition of the myocardium.

Testing the Efficiency of the Heart

Vagus-tone is determined by the method described on page 10.

With the spondylopressor, myocardial tone is estimated by the intermittent impact of the heart against the palpating finger (page 15) each time pressure is executed with the spondylopressor.

Attention has been directed on page 10, to an important clinico-physiologic investigation which is available in visceral-toning.

Physio-therapy is essentially a matter of eliciting reflexes and if the visceral reflexes are ignored, the scientific value of the treatment in most instances cannot be gauged and the results must be empirical.

Visceral reflexes may be evoked in many ways (7) therefore there are many ways of achieving results.

One must remember however that, although one afferent channel may be exhausted by overstimulation, another channel may be solicited to provoke like reflexes.

Pituitrin, is a most efficient agent for increasing vagus-tone.

After injecting 1. c. c. of the preparation of Parke Davis, the following average result was noted:

Recession of stomach.....	3 cm.
“ “ heart (left border).....	2.3 cm.
“ “ liver.....	1.8 cm.

Descent of lung-border.....	2.6 cm.
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Pituitrin has a more marked action on the heart than pilocarpin (454).

The *heart reflex* (199) is absent in the presence of pericardial adhesions and apparently so in pleural exudates. A few months ago, I was attempting to elicit the reflex for Prof. Einthoven, who was the first to employ electrocardia-

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grams which show electrical variations due to the heart contraction. No reflex was obtainable. It was subsequently determined that the subject had just recovered from pericarditis with adhesions.

In another case seen in consultation, the apparent absence of the reflex was due to the pleural fluid following the recession of the heart.

ANGINA PECTORIS.—Dr. George Jarvis, has directed my attention to an important clinical observation which he has made, viz., that in two cases of angina pectoris he was unable to elicit the heart reflex of contraction during a paroxysm. This observation I have since confirmed. These observations would seem to confirm my heart reflex theory of angina (222).

ENDOCARDITIS.—During several years, I have observed three cases of chronic endocarditis which were apparently cured by injections of fibrolysin (108) coupled with concussion of the 7th cervical spine to elicit the heart reflex of contraction. The latter is practically a method of cardiac gymnastics. I would not have reported these apparently incredible results were it not for the fact that Dr. Jaworski, in a personal communication reported that Dr. Haffner of Zurich had achieved like results in two cases.

TACHYCARDIA.—This is often difficult to relieve and the physician must experiment to determine which method is most effective in influencing the chronotropic fibers. In some instances, I have achieved results by concussing the 7th cervical spine, striking one blow per second. In other instances, I have directed stimulation on either side of the 7th cervical spine so as to influence either the right or left vagus (page 75). Some physicians have obtained good results by concussing the 6th cervical spine.

Dr. E. W. Cox (Monroe, Washington), reports a case of

B l o o d - P r e s s u r e

paroxysmal tachycardia requiring morphin for the attacks which was cured by concussion of the 7th cervical spine.

BLOOD-PRESSURE.—There are some data with reference to this subject that have not been fully emphasized.

In the employment of the excellent “Brown Sphygmomanometer” (Fig. 11), one estimates (to get accurate results), the *diastolic* as well as the systolic pressure.



FIG. 11.—The Brown sphygmomanometer. The mercury cannot be lost and the cuff is 12 cm. in width, and 23 cm. in length.

When the slightest wave is felt by the operator, this is the systolic and, when the full, normal beat of the pulse is first noted, that is the diastolic pressure.

The auscultatory method is more accurate. One places a stethoscope over the radial artery just below the bend of the elbow and allows the air to escape from the valve. The systolic pressure is noted the moment a thump is heard. Allow more air to escape and the moment the thump is no longer heard, we have the diastolic pressure. By subtract-

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ing the diastolic from the systolic pressure, the remainder is the pulse pressure.

The difference between the systolic and diastolic pressure in the norm is from 25 to 40 mm. Among the common factors influencing the readings are:

1. Digestion, for 3 hours after a repast;
2. Altitude (increases);
3. Exercise (rise of 20 to 40 mm. which resumes its previous level in about 15 minutes);
4. Tobacco, when used to excess;
5. Pain and emotions (augment pressure).

HIGH-BLOOD PRESSURE (Hypertension).—The term *hyperpiesis*, refers to simple high pressure without any evidence of cardio-vascular disease.

Hypertension is caused by a multitude of diseases (234). If possible, one should always ascertain the cause including emotional factors, intestinal toxemia, anomalies in the splanchnic area and augmented secretion of pressor products by the adrenals.

If the latter condition is present, there must be a dilation of the stomach and contraction of the lungs (page 9). We also determine that, if by increasing the secretion of the adrenals (page 9), we still further augment blood-pressure.

Conversely, if there is hypotension (250), stimulation of the phrenic or splanchnic nerves will raise the pressure. Reduction of blood-pressure is best effected by concussion, pressure or other methods of stimulation applied between the 3rd and 4th dorsal spines (461).

At the latter point, we stimulate the *depressor nerve* (468).

If, coincident with the pressure or other stimulus, percussion of the lower abdomen is executed, areas of dullness

caused by dilatation of the splanchnic vessels may be elicited (433).

The physiologist knows that stimulation of any centripetal nerve augments blood-pressure and the essential factor in this reflex rise is vasoconstriction in the splanchnic area.

The only exception to the foregoing rule, is *stimulation of the depressor nerve*, which lowers pressure by dilating the splanchnic vessels.

The latter have the greatest effect on blood-pressure and the vessels in question are sufficiently capacious to hold practically the entire blood-volume of the body.

Another fact must be emphasized in the diagnosis of arteriosclerosis by palpation of peripheral arteries.

A thickened artery is not necessarily atheromatous but is often caused by an *hypertrophy* of the muscular coat of the artery.

ANEURYSMS.—In a discussion following an address before the "Los Angeles County Medical Association," one of the disputants discussed a patient with an aneurysm who was treated according to telegraphic instructions received from me. He hadn't any faith in my method, he argued, for the reason that although the method was employed the patient died three weeks later. I replied that the gentleman evidently had more faith in the methods of spondylotherapy than I. I did not hope to resuscitate the dead and if the patient had died three weeks later, he was practically moribund when treatment was commenced.

This directs our attention to the importance of an early diagnosis and I am almost inclined to believe that, by my method of treatment of aneurysms, *Aneurysma primis in stadiis semper curabilis*. Aneurysms are by no means infrequent (551).

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Ever since Chiari⁵ and Marchand⁶, described mesaortitis (552) in syphilitics, much evidence has accumulated notably, the statistics of Goldscheider⁷, to justify the correctness of their conclusions. Among the early symptoms of *syphilitic aortitis* are; pains of the upper-chest accentuated by exertion, constriction of the chest, palpitation, modification of the first aortic sound or the presence of systolic and diastolic murmurs or, in the absence of the latter, a ringing second sound.

An increased area of dullness over the aorta is practically constant but owing to its late detection, it is regarded as a late sign.

An important sign, is the intensification or reproduction of symptoms by elicitation of the aortic reflex of dilatation (256).

Relief by energetic antisyphilitic treatment (including salvarsan or neosalvarsan) is diagnostic. The iodids alone have little action.

Implication of the aorta, even in the absence of a syphilitic anamnesis and with a negative Wassermann, should suggest nevertheless, a syphilitic aortitis.

Percussion, is unquestionably the most important early sign of a dilated aorta, but such percussion must conciliate every possible aid (558).

Not long ago, the writer saw a patient in consultation with several skilled diagnosticians. The case was diagnosed as one of asthma. No increase in area of the aorta was noted by the usual method of percussion but when the vago-visceral method of percussion was employed, an increased area of dullness was demonstrable. It was shown that, by artificial dilatation of the aorta (256), asthmatic symptoms could be evoked and at once relieved by artificial contraction of the vessel.

A n e u r y s m s

The subjective symptoms of a dilated aorta are paroxysmal.

Orthodiagraphic tracings made by myself at different times during the day have convinced me that the aorta is not constant in caliber and one can understand why a temporary increase of aortic dilatation may precipitate a medley of symptoms which disappear when the lumen of the vessel is restored.

The foregoing is equally true of the heart. Recently, in Philadelphia, I saw a patient with Dr. S. Solis Cohen. The patient had cardiac asthma and it was possible to provoke or inhibit the symptoms at will by decreasing or increasing vagus-tone.

Attention is directed to the X-ray pictures of Dr. Jarvis (Fig. 2), showing the accuracy of vago-visceral percussion.

I want to call attention to certain errors of interpretation which may attend aortic-percussion.

In splachnoptosis, ptosis of the heart (529) is often a concomitant condition which conduces to a dislocation of the thoracic aorta (*aortoptosis*). Percussion shows an extension of dullness beyond the norm and fluoroscopy demonstrates an extended silhouette of the aorta.

Unlike an aneurysm, the shadow between pulsations recedes behind the sternum.

A pathognomonic test is to have an assistant raise the abdomen, at which time percussion and fluoroscopy show a recession of the dullness and shadow.

The shadow of an *intrathoracic goitre* may be misinterpreted as an aneurysm. This is likely if an adjacent blood-vessel notably the aorta communicates pulsations. In examinations with the fluoroscope one must remember that the thyroid shows an up-and-down-movement synchronous

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with deglutition and the respiratory phases whereas the shadow of the aorta is immobile.

Before deciding that a dullness of the *abdominal aorta* responding to the aortic reflexes (262) is caused by an aneurysm, have the colon thoroughly cleaned. It has been found that, the descending colon will respond in a like manner to these reflexes and the presence of fecal matter may lead to an error in diagnosis.

Disregarding the latter fact, I have made the egregious mistake in two instances of diagnosing an aneurysm of the abdominal aorta. The diagnosis of aneurysms of the thoracic aorta by inspection is facilitated by the vago-visceral method (page 50).

By aid of surgery we may anticipate much respecting the treatment of aneurysms. There is the ingenious operation of aneurysmorrhaphy of Matas, and the wonderful work of Carrel, which leads us to anticipate the substitution of a "cold-storage" healthy vessel for the resected diseased portion of the vessel.

There is practically nothing that I can add to my method of treating aneurysms (257, 568) which embraces aneurysms of the innominate, carotid and thoracic and abdominal aorta.

Reference however to page 68, shows that the method of executing the treatment will influence results. *Concussion* and not vibration must be used. An efficient concussor recently perfected is shown in Fig. 12.

Dr. C. B. Kolhousen, of New Mexico, has sent me a report of an advanced case of aneurysm of the thoracic aorta treated by my method of concussion.

He says, "After the first treatment lasting 10 minutes, I was utterly amazed at the change of the condition of the patient and after six days all his symptoms had disappeared and he was symptomatically well."

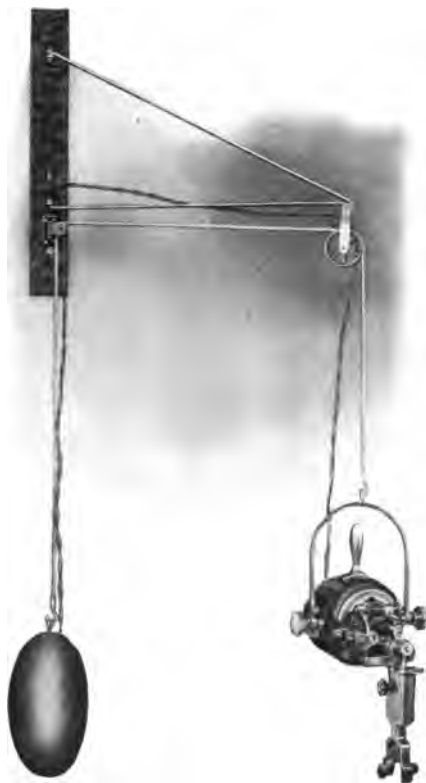


FIG. 12.—Dr. Abrams' concussor.

One of the important advantages possessed by this apparatus is the pair of rubber grips which are placed vertically on the vertebra and which confine the application to the exact spot indicated, preventing slippage of the concussor-applicator with consequent abrasions of the skin.

The Sliding Sleeve surrounding the concussor shaft serves as a convenient handle to guide the application. This sleeve may be adjusted upwards or downwards by means of a set screw, thus regulating the duration of contact of each concussive-stroke. By adjusting the distance of the eccentric at end of transmission-shaft the stroke may be varied from zero to one inch.

By a unique method of speed control consisting of a pair of inverted cones with a sliding belt held taut by an idler-pulley with spring automatically taking up the slack, the frequency of stroke may be varied from 600 to 3600 per minute. The change of speed is effected by turning the milled set-screw so that the idler-pulley is drawn forward, giving a low speed; or backward, giving a high speed.

The motor is of ample power to produce concussion capable of eliciting every reflex of the spine and for giving prolonged treatment without heating or over straining in the least. The motor is suspended from a bracket by cord and pulleys with counterweight, enabling the operator by the handle to swing the concussor back and forth from the cervical spine to the sacrum with perfect ease and facility of application. The bracket can be attached easily to a door-jamb, window frame or can be firmly anchored to a studding or a plastered wall or by suitable attachments to tile-wall.

For the operator who has no available wall space two pulleys can be furnished whereby the concussor can be suspended from the ceiling.

For those who desire an apparatus which can be moved about from one room to another, the entire apparatus including bracket can be mounted upon a substantial pillar and tripod with casters which can be readily rolled about.

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When in 1911, I reported in "*The British Medical Journal*" and in "*La Presse Médicale*," 40 cases in my own practice of thoracic and abdominal aneurysm symptomatically cured within a few weeks by the concussion-treatment with absolutely no other adjuvant measure, not even rest, there was no break in the continuity of results. The cases were all advanced. Up to that time other physicians have reported in the journals and through correspondence equally good results. Since then several cases have come under my observation in which the results were modified by *complications*.

One, referred to me by Dr. Minaker, died from parenchymatous nephritis which existed at the time of consultation, although up to the time of her death, the aneurysmal symptoms did not recur.

The same was observed in a patient referred to me by Dr. Voorsanger, who, at the time of consultation had tuberculosis.

In a case reported by Dr. L. St. John Hely (571), treated for about 10 days, he wrote me 18 months later, that it was indeed marvelous that after this period of time, the once moribund patient was without a single symptom. One week later, he informed me that the patient had suddenly died from rupture of the aneurysm while *lifting a heavy trunk*.

Prompted by my early results, I believed that a symptomatic cure of aneurysms could be achieved in about two weeks.

Time however has discredited this outburst of enthusiasm.

Several months ago there came to my office a patient with an immense aneurysm (Fig. 13). He had been treated by Dr. Chas. E. Atkinson, of Los Angeles, who had employed

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my method. No results were achieved for *one month*, after which time, the patient resumed his occupation. Dr. Atkinson had enjoined him to take the usual precautions but without avail, for later, in lifting a heavy automobile, the aneurysmal symptoms recurred.



FIG. 13.—Patient of Dr. Atkinson with an aneurysm of the thoracic aorta.

When I saw the patient, he was using morphin ($\frac{1}{4}$ grain, hypodermatically, three times a day). After the first treatment by concussion, he discontinued the drug of his own accord as he no longer suffered from pains.

About two months later, Dr. Atkinson, informed me of the death of the patient. At the necropsy, the ascending portion of the aortic arch was 6 inches in diameter and the rest of the aorta was very much dilated.

Still another case demands citation.

Dr. A. C. Ackerman, of La Fayette, Indiana, requested me to see with him in consultation a patient with an aneur-

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ysm whom, he said, was practically moribund. This patient was treated by Dr. Ackerman, for 3 weeks without any result.

The case was nevertheless interesting and emphasized a very pertinent fact. It was impossible to correctly locate the 7th cervical spinous process owing to a spinal deformity. Its location was effected after this manner; after percussing the area of dullness of an enormous aneurysm, different spinous processes were successively concussed until one was found which produced a decided reduction in the area of dullness (aortic reflex of contraction). The latter was marked and concussion executed at this point.

The same method of procedure is indicated in treatment of other affections. There may be some anomaly even in segmental localization.

Thus, in *asthma*, if pressure between the 3rd and 4th dorsal spines does not cause an evanescence of the *râles*, make pressure at other points until one is found which yields results.

There is yet another matter demanding citation which may account for some of my results in aneurysm.

A *limited* number of observations show that, concussion of the 7th cervical spine appears to increase the coagulability of the blood.

The effect of concussion at this point on the number of erythrocytes has already been established (617).

VASOMOTOR NEUROSES (275, *et seq.*).—The vasomotor mechanism is deserving of brief consideration. Vasomotility is under the direct influence of the sympathetic system. The *vasoconstrictor fibers* arise from the sympathetic chain of ganglia and the *vasodilator fibers* from the collateral ganglion system.

Vasomotor Neuroises

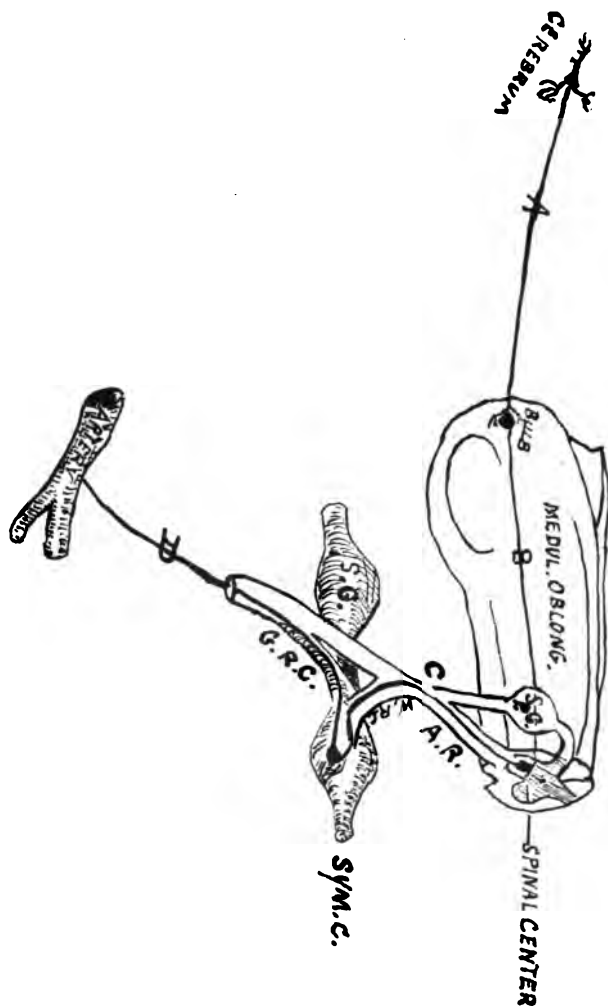


FIG. 14.—Mechanism of vasomotility (after Bing). A, cerebro-bulbar vasomotor tract; B, bulbo-spinal vasomotor tract; C, spino-sympathetic vasomotor tract; D, sympathetico-muscular vasomotor tract; G. R. C. and W. R. C., gray and white *rami communicantes*; S. G., sympathetic ganglion of spinal nerve; Sym. C., sympathetic chain; A. R., anterior root of spinal nerve.

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The vasoconstrictors are found in the mixed spinal nerves which they reach by the grey *rami communicantes*.

The spinal-centers for vasoconstriction lie in the ventral horns and pass from the cord through the anterior roots along the white *rami communicantes* to the sympathetic chain.

The spinal vasomotor centers are governed by a bulbar and a cerebral center. The implication of the latter is noted when blushing or pallor follows psychic emotions.

Fig. 14, reproduces schematically the mechanism of vasomotility with the following neurones; cerebro-bulbar, bulbo-spinal, spino-sympathetic and sympathico-muscular.

Vasodilator fibers exist only in special nerve-trunks, e. g., *nervi erigentes* and the sciatic. Their clinical significance is not established. It is assumed that loss of vascular tone is caused by paralysis of the vasoconstrictors and an increase of vascular tone to a stimulation of the vasoconstrictors.

By some, the *mechanism of perspiration* is conceived to be similar to that of vasomotility and, if one substitutes a sweat-gland for the blood-vessel (Fig. 14), the mechanism of perspiration may be understood. The cells for the spinal sweat-centers are located in the ventral horns in proximity to the motor ganglion-cells and if destroyed, perspiration is diminished (hyphidrosis) or abolished (anidrosis).

The diagnosis of cutaneous vasomotor neuroses is not difficult.

The difficulty only arises in the visceral angioneuroses and the latter may be thought of in the presence of bizarre symptoms in individuals with the vasomotor temperament (424). By aid of spondylotherapeutic methods which enable us to contract or dilate blood-vessels, the pathology of some neuroses should be solved.

V a s o m o t o r N e u r o s e s

Thus, in *epilepsy*, the paroxysmal unconsciousness is supposed to be associated with sudden cerebral anemia, the tonic stage of a major epileptic fit, with cortical anemia and the clonic stage, with return of arterial circulation.

Some physicians have informed the writer that they have successfully treated epilepsy by my method of mechano-vaso-dilation.

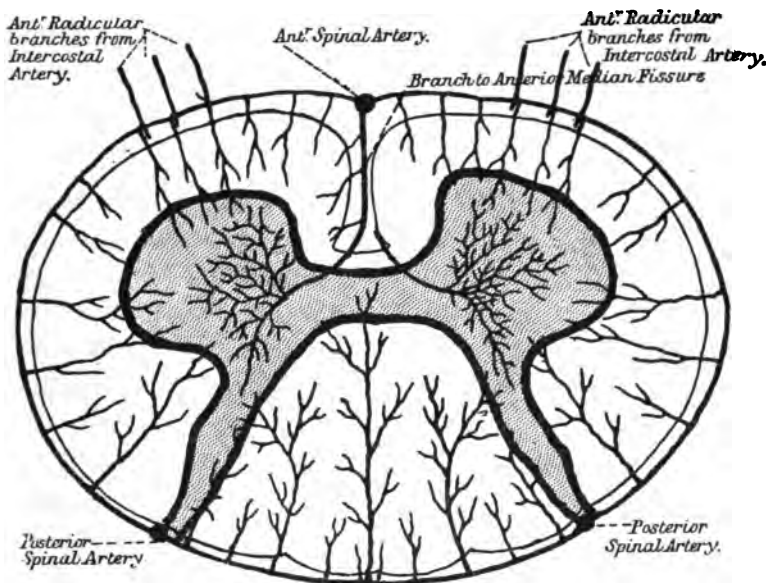


FIG. 15.—Illustrating the course and distribution of the terminal arteries of the spinal cord (after Van Gehuchten).

Blood-vessels, notably arteriosclerotic vessels respond to all reflex influences. Thus, in cerebral arteriosclerosis, spasm of the vessels may lead to transient attacks of vertigo, aphasia, monoplegia or hemiplegia. In the *intermittent limp* or *dysbasia angiosclerotica*, a cramp-like pain appears when the individual attempts to walk. In such cases, the skin of the lower extremity is cold and purple or mottled

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red and no pulse is felt in the posterior tibial or the dorsalis pedis artery (225).

Such phenomena are due to a temporary spasm of the arteries of the lower extremity. They have also been observed in the upper extremity.

In the so-called cases of *family gangrene* which resemble Raynaud's disease and in the *family periodic paralysis*, there is probably a paroxysmal vasomotor spasm of the anterior spinal artery which supplies the anterior cornua of the spinal cord (Fig. 15).

The pains and visceral crises in *tabes* are in my opinion often caused by a temporary spasm of the spinal vessels, a sort of an intermittent claudication of the spinal cord.

In the diagnosis of these spasmodic angioneuroses, I make constant use of *amyl nitrite* and a rubber bandage. The former is employed by inhalation. Its action (flushing of face and cutaneous blood-vessels including veins) is manifested within 15 seconds and symptoms disappear within 3 minutes.

Any phenomena associated with angiospasm yield, at least temporarily to the action of amyl nitrite. Conversely, symptoms (headache, neuralgia) caused by hyperemia are accentuated.

HYPEREMIA TEST.—If an extremity is rendered anemic by a rubber bandage for about 5 minutes and after its removal the hyperemia is observed, it will be found that in the norm, the latter reaches the toes or fingers within a few seconds.

In arteriosclerosis however, the return of blood may require several minutes or if the vessels are diminished in caliber or the capillaries are obstructed, the hyperemia is arrested at a definite point.

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This same method may be employed in a modified way for treatment.

Thus, in Raynaud's disease a tourniquet is applied around the extremity above to occlude all the vessels for several minutes. After removal, the temporary vasomotor paralysis causes a diffused flushing.

If, after the foregoing method, the symptoms are relieved, or if a pulse previously impalpable becomes palpable, the character of the lesion is probably a vascular spasm.

Contractures of muscles may be caused by shortening or distortion (passive or permanent contractures) or they may be spasmodic (temporary or active contractures).

If the contracture implicates an extremity, the application of a rubber bandage (not exceeding 20 minutes) will like narcosis, cause *active* contractures to disappear but the bandage is without influence on the passive contractures.

All active contractures yield temporarily to the application of the bandage hence hysterical cannot be distinguished from non-hysterical contractures. Junod's blood derivations and Bier's hyperemic method (*hemo-spasia*) are likewise available in the diagnosis and treatment of angioneuroses.

Vasoconstriction of the blood-vessels is best attained by concussion or the use of the rapid sinusoidal current applied at the 7th cervical spine and *vasodilation*, by concussion or slow sinusoidal current to the last four dorsal vertebrae (279).

In the latter maneuver, the maximum effect is secured at the 10th dorsal spine (604).

Vasoconstrictor or vasodilator effects may be accentuated by recalling an established physiologic observation. If a nerve containing vasoconstrictor and vasodilator fibers is

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stimulated with frequently repeated induced currents, the *constrictor effect* is the more pronounced but if stimulation is effected with slowly repeated induced currents, the *dilator effect* is the more pronounced.

In practice, when one desires the maximum vasoconstrictor action (as in aneurysms), only *rapid concussion-blows* must be used whereas vasodilator effects are secured when the blows are delivered at a rate of stimulation of one per second.

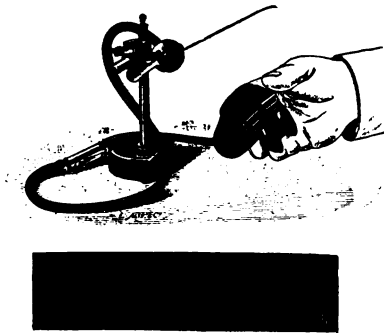


FIG. 16.—Plethysmograph of Hallion and Comte, with tracing.

To effect the latter result, the plexor and pleximeter may be used in lieu of a concussion-apparatus and time may be measured by a metronome.

The action of the sinusoidal current on visceral muscle has been discussed on page 7.

By reinforcing the reflexes (page 40), further aid in treatment is achieved. Let us assume a case of Raynaud's disease. Concussion or sinusoidalization of the 10th dorsal spine is ineffective in restoring an impalpable pulse of the leg. An attempt is then made to put out of temporary commission the subsidiary vasoconstrictor center (at the 7th cervical spine) when concussion is again executed at the 10th dorsal spine.

By employing a simple plethysmograph (Fig. 16) and connecting it with the finger or toe according to whether the angioneurosis is located in the upper or lower extremity, one may ascertain by the amplitude of the registered curves, the most available spine and the best stimulus for augmenting the circulation. Thus, in some instances, the author has found that concussion (2 blows a second) between the 3rd and 4th dorsal spines is very effective in dilating the peripheral vessels.

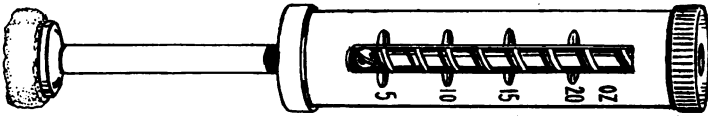


Fig. 17.—Capillary Dynamometer.

The author frequently employs a sphygmomanometer in lieu of a plethysmograph for the same purpose the object being to ascertain the diastolic pressure which represents the maximum pressure of the arterial-wall. The auscultatory method (page 53) is available for this object. The best site is determined by noting the maximum diastolic pressure after stimulation.

Still another method is occasionally employed by the author in intermittent claudication to secure vasodilator effects and that is, interrupted concussion blows on the sciatic nerve.

An excellent method for demonstrating the capillary circulation is the *capillary dynamometer* (Fig. 17). The padded button is placed on the skin at a constant pressure for a definite time (usually 3 seconds). After removing pressure determine the time it takes in half-seconds for the blood and color to return—capillary reflux or C. R.

Time of pressure and return of color should be measured by a metronome beating half-seconds.

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OFFICIAL METHODS.—In therapeutics, there are no exclusive methods of achieving results. This fact I have emphasized repeatedly.

When my friend Dr. Jaworski, of Paris, secures benefit to his tabetics by urethral dilatation (639) he does so by promoting reflex vasodilation.

When Dr. E. H. Pratt, of Chicago, dilates the rectum he effects the same object (638).

The remarkable results achieved by Dr. Pratt, in his rectal work appeals to the writer with special reference to vasodilation.

Dr. Pratt, has shown that dilatation of the sphincters, especially the rectum, exerts a powerful stimulating effect notably on the circulation.

This stimulating effect on the capillaries he designates as "*flushing of the capillaries.*"

Anal dilatation flushes the capillaries universally, equalizing the circulation and relieving local congestions.

By careful dilatation of the internal sphincter to the point of suspending respiration and then releasing the sphincter, respiration begins and continues and must be regarded as one of the most potential means for resuscitation from collapse caused by an anesthetic, loss of blood or surgical shock.

Long continued dilatation, has on the contrary a pernicious effect. I have carefully controlled the effects of anal dilatation by plethysmographic and stethometric tracings and can corroborate the observations of Dr. Pratt. It is difficult by these methods to exclude the action on the *coccygeal ganglion*. When the latter is stimulated by the finger *per rectum*, there is often lightning pains through the abdomen, a desire to defecate, fullness in the head and occasionally flushing of the face.

E x o p h t h a l m i c G o i t r e

EXOPTHALMIC GOITRE.—The author's treatment of this disease has already been discussed (280, 482).

The study of the internal secretions constitutes one of the most important epochs in revolutionary and evolutionary medicine.

The glands of internal secretion not only detoxicate certain products of metabolism, but furnish hormones which stimulate anabolic and catabolic processes and furnish tone to the autonomic and sympathetic systems.

In 1859 Schiff, noted fatal results in dogs after thyroidectomy, and a *cachexia strumipriva* was observed by Kocher, after the same operations in humans.

Gull and Ord, demonstrated the relation of the thyroid gland to myxedema, and Murray, showed that the latter and cretinism yield to thyroid feeding. Others noted the relief of symptoms in thyroidectomized animals following subcutaneous transplantation of the gland.

Symptoms, notably *tetany*, following thyroidectomy are due to injury or removal of the parathyroid glands (two small pairs of glands situated behind the lateral lobes of the thyroids in juxtaposition to the trachea). The parathyroids are supposed to regulate calcium metabolism (page 45).

Revivescency of the thymus gland has been noted in exophthalmic goitre, and implantation of this gland in dogs has been followed by tachycardia and exophthalmos. Exophthalmic goitre is probably caused by hypotonia of the vagus.

The symptoms are supposedly caused by a hypersecretion of the thyroid gland conducing to a species of chronic intoxication (*thyrotoxicosis*). The enlarged glands show increased vascularity and secreting epithelium. There is practically always some hyperplasia of the gland. The

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anatomic changes are not pathognomonic. The symptom-complex of the disease is associated with conditions of the gland ranging from the norm to hyperplasia, atrophy and the presence of benign and malignant growths.

The thyroid provokes symptoms from deficiency or excess of its internal secretion or from irregular functional activity (*dysthyroidism*).

The most important principle isolated from the gland is *iodothylin*. The iodine in the gland was first demonstrated by Baumann in 1896. Iodine is practically absent in other tissues, and its amount in the thyroid varies with the species and the individual.

Vegetables contain iodine and it is therefore most abundant in herbivora and least in amount in carnivora.

The iodine content is increased by the administration of potassium iodide, and decreased by a diet of meat.

Iodoform poisoning suggests thyroid intoxication and in animals dosed with iodoform, the iodine content of the thyroid is augmented.

In all goitres, excepting exophthalmic goitre, the quantity of iodine in the gland is reduced.

Good and bad results have been reported from the use of iodine in this disease. Kocher, found in a series of 160 thyroid examinations in those known to have received iodine that there was a definite storage in the gland which was associated with an *involution of the hyperplasia*.

The normal thyroid contains arsenic and thyroidism may be prevented or alleviated by the concurrent use of Fowler's solution (3 minims, three times a day).

Hyperthyroidism is not always expressed by a typical symptomatic picture and a persistent tachycardia may be the only evidence of augmented activity of the gland.

In other instances, the frontier symptoms may be ema-

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ciation, amenorrhea, irritability, or some mental anomaly.

Kolb, in a recent communication maintains that, in *diarrhea* without a palpable cause, one should always think of a masked incipient exophthalmic goitre. Cases of acute hyperthyroidism are characterized by rapid emaciation, pyrexia, and spleen-enlargement and tachycardia. The thyroid gland may not be enlarged but auscultation of the gland shows nearly always the presence of arterial-murmurs.

Uterine myomata may provoke cardiac symptoms suggestive of hyperthyroidism.

To facilitate exploration of the thyroid the method of Woodbury is to be adopted; the neck is extended and the chin rotated nearly over to the opposite shoulder, with the side of the head slightly flexed on the chest.

Search must also be made for aberrant and accessory thyroids, notably at the root of the tongue. This lingual thyroid is not uncommon.

To estimate the degree of struma and exophthalmos, I make tracings on a piece of ground glass which is approximated to the neck and head in a dark room with light at a fixed point and properly adjusted.

One may make an immediate diagnosis of hyperthyroidism by bearing in mind the fact that, increasing the tone of the vagus will ameliorate, whereas a decrease of the tone of the latter will accentuate the symptoms.

For this purpose the radicularpressor (468) is used. Brief pressure (not exceeding 30 seconds) at the 7th cervical spine increases and between the 3rd and 4th dorsal spines decreases vagus-tone. This barodiagnostic maneuver is illustrated in fig. 18.

All the human emotions may be expressed through the vagus. The tone of the entire nerve may be compromised but the brunt of increased or diminished tone may be borne

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by an individual branch (452). For this reason we can understand why certain visceral symptoms predominate. The great physicist Clerk-Maxwell was sponsor for the truism that, progress was symbolized in the clock, the balance and the foot-rule thereby implying if we could weigh, measure and time, we could offer facts in lieu of theories.

By aid of the *spondylopressor* (page 11), we can gauge objectively with almost mathematic certainty the degree of tone of a given viscus receiving vagal-innervation. When pressure is executed at the 7th cervical spine the pulse may be inhibited. The more the tone of the vagus is diminished



FIG. 18.—Eyes, illustrating the effects on the exophthalmos in exophthalmic goitre, by increasing and diminishing vagus-tone; A, before; B, during time vagus-tone is diminished; and C, when vagus-tone is increased. (Compare by looking at depression in bridge of nose, caused from the wearing of eyeglasses.)

(referring to the cardiac branches) the weaker is the stimulus necessary to elicit cardiac inhibition.

Thus we can recognize an orthotonic, hypertonic, hypotonic or even an atonic vagus.

In the norm, in orthotonia of the vagus, cardiac inhibition does not occur when the pressure exerted is less than 10 kilograms. I have found that, in exophthalmic goitre (notably, when cardiac symptoms prevail) that the pulse may be inhibited at very low pressure (2 to 8 kilograms) and with improvement more and more pressure is necessary to inhibit the pulse.

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This clinical fact is in accord with physiologic observations. If a frog's heart is connected with a heart-lever by the suspension method and a 1 per cent. solution of Merck's thyro-iodin is dropped upon the heart and one determines the threshold at which the minimal stimulus is effective in slowing the heart, it will be found that less intensity of current is necessary to produce slowing.

Hyperthyroidism then, like thyro-iodin in the experiment, augments the sensitiveness of the terminal end-apparatus of the vagus.

Experiments on dogs show that there is a qualitative difference in the action of the two vagi. Thus, stimulation of the right vagus causes arrest of the chambers of the heart whereas stimulation of the left vagus has a slight negative chronotropic action on the auricles. With the spondylo-pressor using the small attachment (Fig. 1), a difference will be noted in the pulse even in the norm according to whether pressure is made on the right or the left side of the 7th cervical spine.

It is often possible to get chronotropic effects in *tachycardia* on one side. I have also observed the curious fact that, on the side where the struma is more enlarged or the exophthalmos more pronounced, the vagus on that side responds to smaller degrees of pressure as shown by inhibition of the pulse.

In exophthalmic goitre, I assume that, diminished vagus-tone causes the sympathetic fibers to become dominant in action.

Stimulation of the sympathetic roots of the 2nd to the 4th thoracic segments of the cord will cause dilatation of the pupil, exophthalmos and tachycardia. The ocular symptoms of exophthalmic goitre (490) can easily be understood by referring to fig. 19.

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The cervical part of the sympathetic chain containing oculo-pupillary fibers innervates the dilator pupillae, Müller's muscle and the non-striated portion of the levator palpebrae superioris. There are also fibers to the hypoglossal nerve and sweat and vasomotor fibers.

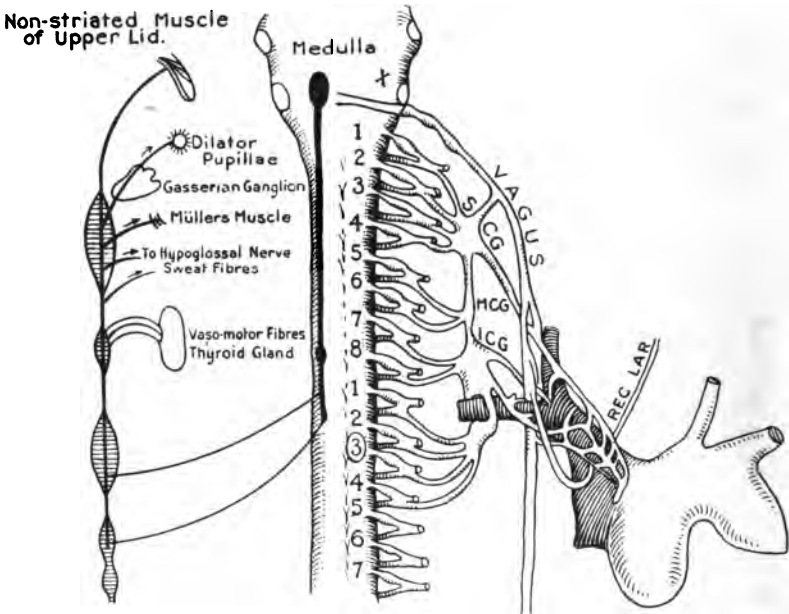


FIG. 19.—Diagram of course of oculo-pupillary fibers of the cervical sympathetic. The pupil-dilating fibres arise from the pupil-dilating center in the medulla, and descending in the lateral column of the cord they emerge in the anterior roots of the first and second thoracic segments. Entering the inferior cervical ganglion by white *rami communicantes*, they ascend in the cervical sympathetic to the Gasserian ganglion and pass to the orbit along the ophthalmic division of the trigeminal. The other half of the diagram shows the origin and course of the cardiac nerves. The stimulus applied at the seventh cervical spine corresponds to the third dorsal segment of cord and approximately to the 2nd and 3rd dorsal nerves.

The fibers to the heart emerge from the cord in the anterior roots of the 2nd and 3rd thoracic nerves.

If pressure is made between the 3rd and 4th dorsal spines to depress the vagus, one may reproduce or accen-

E x o p h t h a l m i c G o i t r e

tutate the ocular symptoms of exophthalmic goitre in susceptible subjects or in those having this disease.

An antithetic effect is noted by augmenting vagus-tone (and consequently depressing sympathetic tone) by pressure at the 7th cervical spine.

Insomuch as the *cervical sympathetic* is accessible to clinical observation, it may serve as an index to the condition of the general sympathetic system and should be tested as a routine method.

By pinching the skin of the neck, the ciliospinal reflex of pupillary dilatation ensues on the same side. The cervical sympathetic may be stimulated by conjunctival instillation of a few drops of cocain-solution and as a result (even in the norm) there is slight exophthalmos, mydriasis and retraction of the upper lid (in the eye in which the drug had been instilled).

One may employ *pharmacologic reactions* in larvated cases. Ten minims of adrenalin chlorid solution (1-1000) given hypodermatically will at once accentuate the exophthalmos and diminish the size of the thyroid. Pilocarpin will ameliorate both conditions. One may also have recourse in diagnosis to biochemical tests.

Thyroid-extract antagonizes adrenalin in its pupillo-dilator action on the frog's eye, and this fact may be employed in the clinical recognition of hyperthyroidism. This reaction is obtainable with the blood in exophthalmic goitre, but is negative with blood from neurasthenic and hysterical subjects.

The blood in hyperthyroidism increases the resistance of mice to poisoning with morphin and acetone-nitrite, thus making it possible to double the lethal dose. The blood findings in this disease (488) can no longer be regarded as characteristic insomuch as the same blood picture has also been found in simple goitre.

The leucopenia is probably caused by an excess of thyroid secretion.

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I have found that thyroid feeding in a few normal subjects will eventuate in a blood-picture not unlike that found in exophthalmic goitre.

Nothing can be added to my method of treatment of this disease (490).

In some rebellious cases, reinforcement of the reflexes (pages 40, 44) may be tried.

It is impossible to cite the favorable reports in the treatment of this disease by my method received from many physicians.



FIG. 20.—Illustrating the results achieved by Dr. S. Edgar Bond, by the author's method of treatment.

I shall content myself by reporting the cases of Dr. S. Edgar Bond, of Richmond, Indiana, insomuch as they are accompanied by photographs.

Brothers. Belonging to a family of seven, all of whom have goitres excepting a daughter. Family came from the mountains of Tennessee.

William, was refused work on account of an immense

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goitre (*Vide* photograph). He was treated by concussion of the 7th cervical spine for about 3 months.

Other methods had failed.

The other brother Oscar, had in addition to a very large goitre, dyspnea, slight tachycardia and other symptoms of hyperthyroidism.

The results of treatment are noted in the photographs. Fig. 20.

Several failures to get results were found on investigation to be due to the use of vibration in lieu of concussion.

The inutility of a vibration apparatus to elicit reflexes cannot be sufficiently emphasized. One cannot evoke the knee-jerk by vibration and no more can be expected in the elicitation of the vertebral reflexes by the same maneuver.

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CHAPTER IV.

THE DIGESTIVE APPARATUS.

ESOPHAGUS — STOMACH — PYLORUS — DUODENAL ULCER — DORSAL
GASTRIC NUCLEUS OF RESONANCE — DUODENAL INTUBATION
SIGMOID FLEXURE — INTUBATION OF COLON — CONSTIPATION—
SACRO-ILIAC PERCUSSION — CIRRHOSIS OF THE LIVER — GALL-
BLADDER—PANCREAS.

ESOPHAGUS.—In cardiospasm, my methods as cited (589) have been useful, but it is well to take into consideration recent experimental work which shows that, stimulation of the peripheral ends of the cut vagi contracts the entire esophagus but *dilates the cardia* whereas section of the vagi, without stimulation, dilates the lower part of the esophagus and contracts the cardia which corresponds to the condition known as *cardiospasm*. Therefore the vagi control the esophageal musculature and furnish a dilator branch to the cardia.

In accordance with the foregoing, cardiospasm of neural origin would be inhibited by pressure or concussion of the 7th cervical spine.

This discrepancy between my clinical and the experimental results cited is easily decided in favor of the former. To the end of an ordinary stomach-tube, I attached a balloon and to the other end a V-shaped tube connected with an inflating apparatus and manometer (Fig. 21).

Whether the balloon was inflated in the esophagus or at the cardia (40 cm.), the result on concussion at the 7th cervical spine was the same, *viz.*, contraction of the esophagus and cardia. On the contrary, concussion between

the 3rd and 4th dorsal spines (to depress vagus) resulted in dilatation of the esophagus and cardia.

STOMACH.—An unbiased and careful analysis of the various methods for outlining the stomach convince the author that the vago-visceral method (321, 584) is unquestionably the best.



Fig. 21.—Stomach-tube with inflatable balloon, manometer and pump for gauging the contractility of the stomach and esophagus.

Auscultatory percussion is unreliable. Surgery has added nothing because the stomach in the operating room like in the dissecting room is examined in the horizontal position and an anesthetic (page 82) still further complicates the situation.

Fixing the stomach by freezing and by the use of formalin reproduce the picture of an atonic and dilated organ immediately after death.

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Roentgen-ray pictures are equally untrustworthy (586).

The situs of the abdominal viscera (influenced by the position of the diaphragm) as recorded by anatomists is unreliable for the reason that after death there is an elevation of the diaphragm and a compensatory retraction of the anterior abdominal wall.

THE STOMACH AND ANESTHETICS.—Gwathmey⁸, has shown that *oil of orange* added to ether produces anesthesia with less discomfort, quicker results, no preliminary excitement, rapid recovery from effects with neither nausea nor vomiting, with half the quantity of ether. Dr. Geo. Jarvis, of Philadelphia, attributes these results which I have confirmed to the oil of orange which when mixed with ether suppresses the lung reflex of dilatation and the stomach reflex of dilatation which are evoked when ether is used alone (319). The previous inhalation of oil of orange is quite as effective as its synchronous use with ether.

I have observed under the microscope that, with ether alone, the motion of ciliary epithelial cells was inhibited, whereas the addition of orange-oil to the ether seemed to augment the motion in question. Post-operative nausea and other symptoms incident to the employment of an anesthetic may be inhibited by previous nasal cocainization (207). The addition of 2 per cent. of antipyrin to the cocain solution will *prolong* its action.

THE PYLORUS.—Concussion or pressure at the 5th dorsal spine will dilate the pylorus (588). This fact has been utilized for the following purposes:

1. To relieve *pylorospasm*;
2. To facilitate rapid absorption and hasten the elimination of nauseous drugs from the stomach;
3. To eliminate the action of the gastric juice on drugs

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destined for action on the intestinal tract (intestinal antiseptics and lactic acid bacilli-preparations);

4. In the treatment of gastric affections;
5. To aid duodenal-intubation.*

As an illustration of the fourth indication, a lady may be cited whom I saw in consultation with Dr. W. B. Ryder, of Clinton, Iowa.

She almost invariably rejected her meals, 2 or 3 hours after ingestion. She was very much emaciated and all methods of treatment were without avail.

On examination nothing definite was elicited.

Concussion of the 5th dorsal spine was executed two hours after each meal to facilitate vomiting of the food into the intestines. The results were very satisfactory.

It is quite natural that some should doubt on scientific grounds the results as cited. Throughout my work, I have repeatedly emphasized the fact that no credence is placed on therapeutic effects without scientific proof.

Let any one employ Klemperer's oil-test for determining the motor power of the stomach. It is based on the fact that oil is not absorbed in the stomach. After washing the organ, 100 c. c. of pure olive oil are poured into the empty stomach. Two hours later, the stomach is thoroughly aspirated. The difference between the original quantity of oil and that withdrawn indicates the condition of the motor function.

In the norm at this time only 20-40 c. c. of oil should be aspirated. If, after the ingestion of oil pressure is made (at intervals of 3 minutes) at the 5th dorsal spine, within 10 minutes, only 5 c. c. of oil can be recovered by aspiration if the motor power of the organ is comparatively good.

*Jutte (J. A. M. A., Feb. 22, 1913), practices transduodenal lavage in enterotoxism.

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It may also be observed that the dullness at the lower border of the stomach caused by the oil which persists for about 2 hours will disappear in about 5 minutes by the maneuver suggested.

Duodenal ulcer, is characterized by pains occurring one and a half to four hours after a meal due probably to passage of chyme at this period of digestion. The pains in question may be precipitated by opening the pylorus after the manner suggested.

Dr. H. Jaworski, of Paris, has reported to me an observation made by him, *viz.*, that by raising the hyoid bone, the *vomiting of pregnancy* can be inhibited. On investigating this interesting phenomenon, I found that lifting the hyoid bone or the cricoid cartilage opens the pylorus and dilates it to a greater degree than stimulation of the 5th dorsal spine.

When one stimulates the 5th dorsal spine, the stomach assumes a vertical position and dilatation of the pylorus ensues. Another phenomenon is, that the stomach is so *increased in tone* that it is possible to percuss it without simultaneous stimulation of the vagus (321). Repeated analyses of the gastric-contents convince me that stimulation of the vagus (by concussion at the 7th cervical spine) will *augment the hydrochloric acid in the stomach*.

The action of gases on the pyloric reflex has been investigated by Rotky. The pylorus relaxes immediately when oxygen is introduced into the stomach but when carbon-dioxid enters, there is a spasm of the pylorus which relaxes intermittently to permit its escape.

In *gastric tympanites*, due to an excess of carbon dioxid, *magnesium-perhydrol* which liberates oxygen in *statu nascendi* should be efficient. It also neutralizes an excess of gastric acid.

DORSAL GASTRIC NUCLEUS OF RESONANCE.—Ewart,

describes a percussion-note of increased resonance and tympanitic quality immediately below the inferior angle of the left scapula (2-2½ inches in diameter) which he refers to the deep-seated resonance of the stomach. The severe and dangerous forms of heart distress of mechanical gastric origin is attributed by Ewart, to a dilatation of the stomach at this point.

This interesting phenomenon described by Ewart in 1910, was also described by the writer in 1900 (84).

The area of dorsal tympanitic resonance may be increased or diminished by elicitation of the stomach reflexes (316, 318).

One may easily determine the effects on the stomach of stimulation of the vagus (concussion of 7th cervical spine) by using the apparatus shown in Fig. 21.

DUODENAL-INTUBATION.—Several methods have been suggested notably, that of Einhorn', for obtaining the contents of the duodenum.

My method is as follows: An ordinary stomach-tube rounded at the end and perforated is introduced into the organ after the conventional manner, and some of the contents aspirated to compare it with the fluid subsequently aspirated from the duodenum. Any large glass syringe which fits into the end of the stomach-tube may be used. Next, an assistant maintains pressure at the fifth dorsal spine, during which time the tube is passed into the duodenum.

If the tube is in the duodenum, the aspirated fluid is wholly different from the fluid secured in the primary aspiration from the stomach. It is alkaline in reaction as a rule, and by aid of the usual tests, the presence of amylopsin, trypsin and steapsin may be demonstrated.

Prior to the introduction of the tube into the duodenum,

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the tube (while in the stomach) should be cleansed by aid of the syringe filled with some colored fluid. The object of the latter is to make certain the fact that the tube is in the duodenum. If the latter has been entered, aspiration shows the absence of the colored fluid. Reference to fig. 22 shows the tube in the stomach and duodenum as determined by previous percussion.



Fig. 22.—Illustrating the gastric and duodenal areas of percussional dullness. The continuous lines represent the stomach and duodenum. The broken line represents the vertical position of the stomach during the time pressure is maintained at the fifth dorsal spine. Pressure at the latter site not only opens the pylorus in the norm, but also augments the tone of the stomach in the vertical position. D, duodenum; S. T., stomach tube, determined by percussion.

It will be noted that, when pressure is made at the 5th dorsal spine the tone of the stomach is so increased that it may be delimited by percussion just the same as though pressure were made at the seventh cervical spine.

There is this difference, however. Pressure at the seventh cervical spine does not alter the situs of the organ, whereas pressure at the fifth dorsal spine causes a transition of the organ from a horizontal to a vertical position. Within one-



Fig. 23.—Skiagram of the stomach-tube in the duodenum.
The intubation of the latter thus attained was effected by the elicitation of the pyloric reflex of dilatation.

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half minute after pressure ceases at the fifth dorsal spine the stomach resumes its horizontal position.

It will be noted in Fig. 22 that the stomach-tube (S. T.) may be traced a considerable distance by percussion.

We have been swayed by the dogmatic dictum that a percussion blow is only propagated to a depth of $2\frac{1}{2}$ inches, hence any airless structure beyond this point will elude detection by percussion. This fallacy may be easily disproved if one will place a stomach-tube in contact with the posterior surface of the chest and then by percussion of the anterior surface of the latter, attempt to locate its position.

As a rule, the clinician reasonably skilled in percussion may locate the site of the tube no matter in what position the assistant may have placed it.

After introduction of a stomach-tube, one may determine by percussion its position in the *esophagus* from the 6th dorsal spine downwards.

Duodenal-intubation as cited is a rapid method and is no more difficult than the introduction of the tube into the stomach. This method suggests many possibilities in diagnosis and treatment.

Moulin, noted that one could pass three fingers through the pylorus and Knapp, observes that the duodenum may be entered with the ordinary stomach-tube in cases of *complete insufficiency of the pylorus*.

A few words with reference to the duodenum are apposite. The latter is described by anatomists as the most fixed and widest part of the small intestine, having a diameter of 3.81 to 5.08 cm. and is curved like a horseshoe. From a clinical standpoint abetted by the employment of the visceral reflexes, unlike the stomach it does not change its situs during respiration. Whereas the duodenum shows no respiratory dislocation, it is luxated downward with the

S i g m o i d F l e x u r e

stomach when pressure is made at the fifth dorsal spine. This may be ascertained if synchronous pressure is made in the latter situation and at the tenth dorsal spine (which augments duodenal tone and permits of its delimitation by percussion).

The clinical diameter of the duodenum varies from 3 to 5 cm., and averages a diameter of 4.5 cm. If *synchronous pressure* is made at the tenth dorsal spine (which increases duodenal tone) and at the eleventh dorsal spine (which dilates the duodenum), it will be shown that it can be made to dilate from 2 to 3 cm.

In many instances, if the stomach-tube is not pushed sufficiently far into the duodenum only a watery liquid is aspirated, whereas if it is pushed further, the fluid assumes a more intense yellow.

One must recall the fact that the common bile-duct and pancreatic-duct enter the duodenum at the ampulla of Vater, about 4 inches from the pylorus.

The difficulty of passing along the horseshoe duodenum is essentially theoretic.

In some instances, a smaller rubber-tube is fixed in the stomach-tube and aspiration of the duodenal-contents is made through the former.

SIGMOID-FLEXURE.—The large intestine extends from the termination of the ileum to the anus. It is divided into the cecum (*caput coli*), colon and rectum. Its caliber is largest at the cecum and gradually decreases in size until it reaches the ampulla of the rectum when it again increases in size.

When the cecum is filled, it is in close proximity to the abdominal wall.

The appendix is usually given off from the posterior and inner portion of the caput coli about 11-16 of an

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inch below the ileocecal valve. The average length of the colon is as follows:

Ascending colon.....	8 inches
Transverse colon.....	20 "
Descending colon.....	8½ "

The descending colon begins at the splenic flexure and terminates at the *sigmoid-flexure*. The latter (*S. romanum*), is an S-shaped curve about 13 inches in length beginning at the iliac crest and ending at the brim of the true pelvis opposite the left sacro-iliac articulation. The sigmoid is very movable and is the narrowest portion of the large intestine. It has an upper, or colic and a lower, or rectal limb.

According to the measurements of anatomists the length of the large intestine from the caput coli to the termination of the rectum averages 5 to 6 feet.

These figures are evidently too high for the living subject. My experience with colonic-intubation always controlled by X-ray pictures shows that an ordinary stomach-tube is more than long enough to traverse the entire large intestine.

Respecting the *functions* of the latter, much evidence has accumulated to show that is a useless and dangerous structure.

This latter statement was emphasized by Metchnikoff's book on "*The Nature of Man*" and by Lane, who referred to the cecum and ascending colon as a cesspool and carried his conception into practice by "short-circuiting" or by excision of the large intestine.

INTUBATION OF THE COLON.—All authorities are practically agreed that the passage of a tube beyond the sigmoid-flexure is impossible.

Kemp, observes that in his experience, in every attempt to pass the sigmoid it caught and coiled back. Owing to the

S i g m o i d F l e x u r e

great mobility of this structure it is pushed upward which fact suggests the passage of the tube. A flexible wire in a tube was used but the X-rays demonstrated that the passage of the tube beyond the sigmoid was impossible.

Soper, after a wide experience controlled by skiagrams avers that it is impossible to pass the tube into the sigmoid except in Hirschsprung's disease (congenital idiopathic dilatation and hypertrophy of the colon).

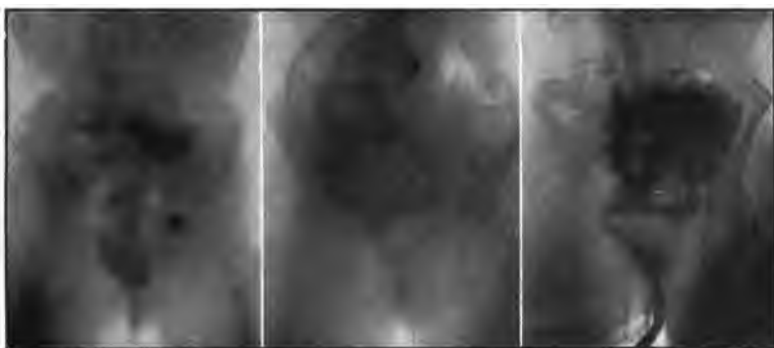


Fig. 24.—Illustrating colonic-intubation; A and B, tube coiled in the rectum; C, successful attempt to pass the tube beyond the sigmoid with cable shown in Fig 25.

Prof. A. Schmidt, observes that owing to the angle formed by the colic and rectal limbs of the sigmoid, it is impossible to pass any instrument.

My investigations on the subject embraced primarily the fact that the sigmoid could be dilated by pressure at the 11th dorsal spine (326) and this dilatation could be demonstrated by percussion, if synchronous pressure (employing two radicularpressors) were executed at the 1st dorsal (592) and 11th dorsal spines. For the passage of the tube, pressure by an assistant at the latter point sufficed. The pressure

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made by an assistant should not at any time exceed 30 seconds so as to avoid exhausting the reflex and during the pressure the tube is pushed (very gently) forward.

Some resistance is of course encountered but it is slight.

The sigmoid is best straightened when the *patient stands* and this position is to be favored whenever possible.

My primary attempts to pass the tube failed completely as shown in fig. 24.

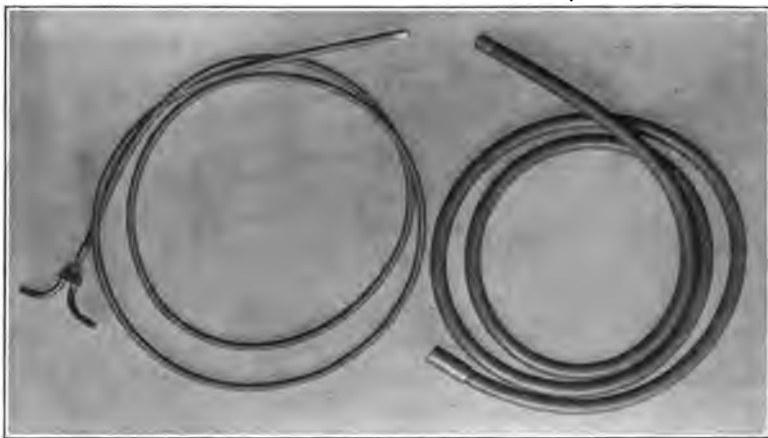


Fig. 25.—An ordinary stomach-tube with flexible cable used for passing the sigmoid flexure in colonic-intubation. To the end of the cable is an attachment with two openings—One for injecting oil and the other for inflation with air to facilitate the passage of the instrument when necessary.

Later, I was almost invariably successful when a strong flexible cable was introduced into the tube (Fig. 25).

Theoretically, one would regard the foregoing maneuver as harmless but two deaths from perforation have ensued with recto-sigmoidoscopy. A gut with a rigid mesentery may be dangerous. Of course serious results have attended even the passage of a stomach-tube or urethral-sound. Pain is a safeguard in colonic-intubation and due consideration must be given to it.

C o l o n i c - I n t u b a t i o n

Colonic-intubation is indicated for a variety of conditions:

1. To correct intestinal stasis;
2. To prevent appendicitis.
3. To introduce nutrient enemata.
4. To introduce medicaments.
5. To facilitate X-ray examinations.

Intestinal stasis is perhaps the greatest contributory factor in the genesis of intestinal autointoxication (338). Constipation is one evidence of defective intestinal drainage. Many of the patients are treated in vain for every conceivable neuropathy or psychopathy. Mental apathy, acute attacks of abdominal pain (often relieved by the horizontal posture), headaches, nausea, vomiting and loss in weight are some of the symptoms of stasis.

C. von Noorden, has recently directed attention to wandering pains (*dolores vagi*) due to fecal-stasis in the sigmoid-flexure which is very sensitive to pressure. The condition is essentially an elective neuritis inasmuch as the sensory fibers alone are affected. Associated symptoms are: indicanuria, arthralgias and slight elevations of temperature (99.5 to 99.86° F.).

A bismuth meal shows delay in some part of the colon.

Colonic-stasis may be caused by splanchnoptosis, kinks, bands, adhesions, etc. A definite blood-picture has been found by Hoxie; hemoglobin high with normal red-blood count. Whites, about normal. With Wright's stain, the polynuclears show an increase of cells with large ambophilic granules (dark, large and purplish). The latter decrease as the excretion of the toxins increases. The degree of intoxication is in the proportion of these dark cells to the total number of polynuclears.

A multitude of affections notably, *asthma*, have been

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attributed to intestinal stasis and Eustis, has cured many cases based on this assumption. Toxic amins have been extracted from the putrefactive intestinal-contents which, when injected into animals cause bronchial-spasm.

The general appearance of these patients is characteristic:—Cold and clammy hand, pigmentation (sallow skin), abdomen is distended and tenderness in colonic-regions where the x-rays show a delay of the bismuth meal. Nodulation of the upper and outer quadrant of the breast is not uncommon and is often erroneously called mastitis (chronic).

Perhaps one of the greatest contributions to surgery is that of Arbuthnot Lane, who by his method of anastomosis rescues many individuals suffering from chronic intestinal stasis.

How much good colonic-intubation will do for these patients as well as those suffering from *chronic appendicitis* can only be decided by time. It is evident however that as we are now able to pass the sigmoid, more thorough cleansing of the colon can be effected.

Duodenal-ulcer according to Moynihan, is secondary to microbic infection from the lower tracts of the alimentary canal but the chief *rôle* as a source of septic infection is played by the appendix. The latter structure is responsible for some forms of intestinal stasis owing to the formation of adhesions. It has been shown that in the colon where bacterial action is at its maximum, it is a predisposing factor in *carcinoma of the colon*. Thus the parts most frequently attacked in order of frequency, are; sigmoid, cecum, splenic and hepatic flexures and transverse colon. The ascending and descending portions are the least often affected.

Nor must we disregard colonic-flushing as a preventive of appendicitis.

No doubt infection is the invariable prelude to the latter.

A n t i s e p t i c s

The appendix is practically a culture test-tube in which feces and microorganisms lodge and are with difficulty discharged. Inflation of the colon with air may reproduce the pains of appendicitis in subjects with recurrent attacks and without symptoms.

In the conventional method of examining the large intestine with the x-rays a bismuth meal is given but it takes 12 to 15 hours to reach the ileocecal valve, 24 hours to reach the transverse colon and 36 hours to attain the sigmoid.

Now, one can make the examination immediately by injecting the bismuth (30 ounces) and then having the patient lie on his right side for several minutes to enable the solution to pass into the cecum. Careful investigations show that, *intestinal antiseptics* taken by the mouth are without any apparent action on the bacterial inhabitants of the intestines and that the most effective means of diminishing the bacterial-content of the large intestine is by regulation of the diet with evacuation of the bowels. The effects of disintoxicating the intestine by the recently discovered "*Glyco-bacter*" awaits development.

CONSTIPATION.—The author's method of treatment (329) in atonic constipation may be due in part to the expression from the spleen of an hormone. Zuelzer, has shown that intestinal peristalsis is produced by an internal secretion of the gastric mucosa elaborated at the acme of digestion and stored in the spleen.

CECUM.—In the percussion of this structure (592) during the time pressure is maintained, it will show respiratory mobility. Absence of the latter suggests cecal-adhesions.

RECTUM.—Atony of this structure may be responsible for constipation. The best site for stimulation is the 5th lumbar spine and the best stimulant is the rapid sinusoidal current.

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The latter was determined by using an inflated balloon (Fig. 21) in the rectum and noting at which point of the spine the needle of the of the manometer was best deflected.

For spinal sinusoidalization, I use the spondylelectrode shown in fig. 26.



Fig. 26.—Spondylelectrode.—The distance between the two electrode discs is just sufficient to span the spinous processes, making contact with the nerves on each side.

When the little lever marked "A" connects the two metal plates together, and the connecting cord is attached to socket marked "B," the electrode is monopolar; while an indifferent pad must be applied elsewhere.

When the lever marked "A" is open, with one cord at "B" and one in socket "C," the electrode is bipolar.

The current can be interrupted by means of the interrupter on handle; or can be made continuous by sliding the ring "D" down over the interrupter to hold it stationary.

Two small discs are provided for diagnostic effects over motor points and two larger discs for therapeutic application to muscles.

SACRO-ILIAC PERCUSSION.—Dr. William Ewart¹⁰, who has displayed so much genius in devising new methods of examination has recently suggested a dorsal field of percussion which includes the resonant sacral and iliac surfaces (Fig. 27).

In the norm, there are as shown in fig. 27, two posterior

C i r r h o s i s o f t h e L i v e r

iliac patches of subresonant dullness due to the common iliac blood-vessels.

In *appendicitis*, there is a dullness extending from the right normal patch of dullness over the normal resonant sacral and iliac surfaces. The latter is often more positive than the usual abdominal examination owing to the predominance of retrocecal appendicitis.

In investigating this new method, I found that a fecal impaction of feces in the cecum will yield an increased area of dullness on the right side and fecal impaction in the rectum will increase the area on the left side.



Fig. 27.—Illustrating sacro-iliac percussion: N, normal areas of dullness; CC, dullness of *caput coli* and R, dullness of the rectum.

Even in the norm, pressure with the radicularpressor at the 12th dorsal spine will yield a dull area corresponding to the cecum and pressure at the 4th lumbar spine, a dullness corresponding to the rectum which extends from about the 3rd sacral spine to the coccyx (Fig. 27). Percussion of the cecum in front has already been studied (592).

CIRRHOSSIS OF THE LIVER.—No inconvenience is usually suffered in this affection provided the compensatory circulation is maintained.

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In cirrhosis, the various anastomoses between the systemic and portal circulations are insufficient to overcome the effects of an occluded portal circulation.

Surgery has been utilized by the operation of Talma, which consists of establishing a communication between the systemic and portal circulations thus causing adhesions to form between the great omentum, liver, spleen and parietal peritoneum. This operation is effective in about 50 per cent. of the cases.

In the Route operation, the saphenous vein is anastomosed to the peritoneum.

Whether the liver is enlarged or contracted, the clinical symptoms are practically the same.

I have treated several cases of cirrhosis with contraction with relief of toxic and obstructive symptoms by evoking the liver reflex of dilatation (338).

GALL-BLADDER.—I have requested several of my surgical friends to confirm my method of locating the gall-bladder (598). Dr. Geo. Jarvis, of Philadelphia, and Dr. D. C. Ragland, of Los Angeles, have corroborated my findings. The gall-bladder was percussed and outlined by a stick of nitrate of silver and, at the operation, it was found in the situation located by percussion. I wish to suggest the possibilities of a new "*physiologic surgery*" by methods for eliciting the vertebral reflexes. Thus, the location of the segment for dilating the ureter. Such data are only possible at the time of an operation.

Dr. George Jarvis, an indefatigable investigator on these lines found that manipulation of the pancreas increases vagus-tone as determined by slowing of the heart and contraction of the stomach.

PANCREAS.—Since using my method of duodenal-intuba-

tion (page 85), I have found that stimulation of the 10th dorsal spine will augment the pancreatic secretion.

I do not know whether its internal secretion would be similarly influenced. This internal secretion influences carbohydrate metabolism. Lesions of the islands of Langerhans, are found in a large percentage of cases of diabetes. The author suggests that stimulation of the 10th dorsal spine be tried in cases rebellious to the method already advocated (283, 479).

Pawlow, believed that stimulation of the vagus directly influenced pancreatic secretion.

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CHAPTER V.

MISCELLANEOUS REFLEXES AND DATA.

VERTEBRAL REFLEXES IN GYNECOLOGY—PELVIC SPLANCHNOPTOSIS—
MAMMARY TUMORS—PERTUSSIS—COUGHS—MEDULLA OBLONGATA
—LOCOMOTOR ATAXIA—SPLEEN—EDEMA—EYE—SPONDYMOBILE
GAUGE.

VERTEBRAL REFLEXES IN GYNECOLOGY.—The following are some extracts from a very interesting contribution by Charles L. Ireland, M. D., of Columbus, Ohio, read before "*The American Association for the Study of Spondylotherapy*" (Nov. 12, 1912).

The following clinical picture is the average one of the patient who presents herself to the physician for treatment. She is very sad, has bearing down pains in the pelvis, back-ache, headache, irregular menstruation, leucorrhea, and pains practically everywhere. Areas of vertebral tenderness suggest valuable diagnostic information. Thus, tenderness at the 4th lumbar spine suggests a disease of the uterus; 3d lumbar vertebra, ovaries; 2nd lumbar on the right side, appendix; 10th, 11th or 12th dorsal vertebrae, renal disease, etc.

Many of these so-called cases of uterine disease were treated by every available method without success until it was found that the underlying condition was essentially splanchnic neurasthenia (337, 432). Treating the latter by the sinusoidal current, it was soon found, that in the absence of adhesions, dislocated uteri (weighted by the large accumulation of blood in the splanchnic vessels) were restored to the norm.

Subinvolution of the uterus failing to respond to the

conventional treatment yields to methods for eliciting the uterus reflex (358).

"I will say here that up to one year ago I had always contended that when an ovary was prolapsed, surgery was the only recourse and I had good reasons for so thinking. By the use of the sinusoidal current to provoke the uterus reflex, absolute cure resulted in 9 cases, *i. e.*, reposition of the ovaries ensued".

The author suggests the neologism, "*pelvic splachnoptosis*" to describe ptoses of the pelvic viscera caused by relaxation of the ligaments (420).

In prolapsus uteri, with its complications (rectocele and cystocele), operations usually fail if the perineum (and not the ligaments) is regarded as the only support of the pelvic organs. All the viscera are held in place by suspension from above and the pelvic viscera are not exceptions. Relatively speaking, the uterus has more ligaments than any other viscus and the round ligaments can sustain a weight of about 10 pounds. Even in complete laceration of the perineum the uterus may remain in place thus showing the importance of the ligaments as supports.

Splanchnoptosis is further discussed on page 185.

Reference has already been made to *abdominal supporters* (145) and the methods for testing their efficiency (146).

Dr. Nathan Rosewater, of Cleveland, describes the following three distinct types of devices for supporting the abdomen:

1. The corset type is a rigid, usually more or less metallic corset, shaped to hold and support the protruding belly. These have the advantage of following the fashion for women, supporting the spinal muscles, also they do not allow of much motion of individual

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muscles. Some are too expensive for the masses. Those corsets lacing in front, of moderate price, answer very well provided patients are taught to put them on while lying on their back, to secure the organs in proper place before protrusion of the abdomen and downward drag of the viscera can occur.

2. The zinc oxide adhesive plaster (531).

3. Elastic or supporting belts. These are a more or less elastic supporter or belt of varied materials and forms, fixed with straps and buckles for lifting, holding and supporting the protruding abdomen and preventing its downward drag. Most of these are too complicated for description and impractical. A simple, practical form, which Rosewater uses, is illustrated in Fig. 28. Unlike most of the others, it has no perineal support to irritate and chafe between the legs in hot weather, but the main anterior body, A, of the supporter is held anchored to its place by a strong rubber belt, buckled to it at its lower outer angle on the right, which passes outward and downward over the hip, under the gluteal folds (which prevents it from slipping up). It is buckled into the upper right margin of the supporter A, and passes upward, backward, and crossing over the back to the corresponding upper left buckle.

These belts are instantly adjusted to any tight or loose condition required, and can be let out for women during their entire pregnancy; growing stout or thin only requires adjustment by letting in or out of the rubber-belt, which is made long enough if desired. For long periods of wear, and after laparotomy and other operations, this type of belt is inexpensive, simple, durable and practical. As will be seen in the cuts, the support secured is upward and backward, corresponding to the natural support given by the abdominal muscles. It is best to lie on the back in adjusting this belt, as also with any form of abdominal support or corset. The author after testing various abdominal belts uses the Rosewater belt (Fig. 28) to the exclusion of others whenever possible.

M a m m a r y T u m o r s

Mammary Tumors.—Pseudo-neoplasms (198) can be made to temporarily disappear by pressure corresponding to the sensitive vertebral point by aid of the algesispondyloscope. Insomuch as the object is to inhibit impulses in the spinal nerve, the pressure must exceed two minutes in duration. I have observed that true neoplasms of the gland appear to be larger than they are found at the time of the operation. This is probably caused by the coincident muscular spasm provoked by the presence of the growth for, if the conductivity of the nerve or nerves innervating the

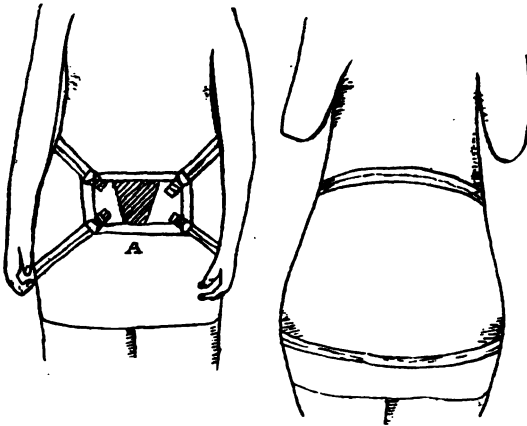


Fig. 28.—The Rosewater abdominal belt.

breast is inhibited (171) the intumescence caused by the spasm disappears temporarily and only the true growth remains.

Pertussis.—Dr. W. T. Baird, of El Paso, has made a most important contribution to the therapeutics of this disease.

His treatment is based on the fact that the supposititious organisms of this affection have their habitat in the mouths of the sublingual glands. The duct-openings in this disease are red and swollen. The lesions are first dried and then

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touched in succession with a probe around which cotton is wound and carrying one drop of carbolic acid. By this treatment the disease may be aborted in 24 hours in the early stages. It may be necessary to repeat the application on several successive days. Neither pain nor soreness follows. In later stages, cure is effected in about one week. In advanced cases concussion of the 7th cervical spine is advocated (624).

COUGHS.—Dr. D. V. Ireland, has succeeded in inhibiting many forms of persistent cough (which had resisted conventional methods) notably in bronchitis by freezing sensitive areas corresponding to the upper dorsal vertebrae. Here, there are probably irritable foci which survive the disease (439).

In *tuberculosis*, writers have directed attention to the *low position of the diaphragm* and have accounted for it in a variety of ways. In a personal communication, Pottenger, suggested an ingenious reason. He believes it to be caused by irritation of the phrenic nerve innervating the pleura (549). To test the correctness of his observation, I have often found in phthisis sensitive points corresponding to the exit of the nerve (2nd and 3rd cervical spines) and when the latter were frozen the diaphragm assumed a higher position.

MEDULLA OBLONGATA.—It occurred to the author that, if one could influence the cerebral cortex by sinusoidalization (383), a like influence could be elicited by stimulation of the medulla. It was found that, when a large electrode was placed at the sacrum and a small interrupting electrode over the medulla and a rapid *very strong* sinusoidal current was used, the facial and other muscles supplied by the cranial nerves could be made to contract. This method suggests itself in *diseases of the bulbar nuclei*.

LOCOMOTOR ATAXIA.—In a report to the "*French Acad-*

P e r i p h e r a l P a i n s

emy of Medicine" (Aug. 21, 1912), Marie and Jaworski, reported their results with vertebral reflexotherapy (616) in advanced tabes. They observed that 10 minutes treatment by the latter method was equivalent to 6 months treatment by the methods of Fraenkel (165) and that this progress after several *séances* was permanent. It is impossible to delimit our conception of tabes and Schwab, has truly said that all progress in neurology is commensurate with the progress made in tabes. Even our present conception of the

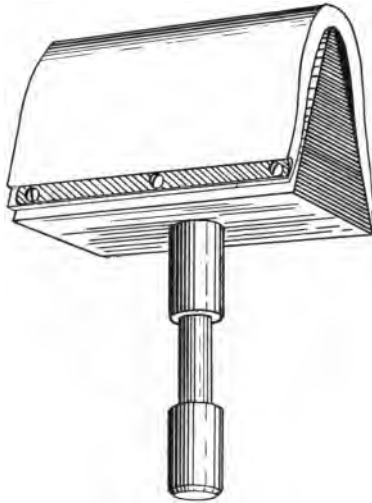


Fig. 29.—Concussor for executing unilateral concussion-analgesia.

disease as a radiculitis (implying involvement of the posterior roots), is handicapped by the fact that radicular lesions are present in other conditions, notably in syphilis.

PERIPHERAL PAINS.—These may be inhibited by concussion-analgesia (367). It is not necessary to evoke bilateral analgesia if one uses a special concussor (Fig. 29) on one side of the spinous processes. Localizing the point for

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concussion has been discussed (369). In paravertebral blocking of nerves (382), the vertebral point for the injection may be similarly located. It is not necessary to introduce the needle very far.

By injecting the Schleich formula at different depths and manipulating the peripheral sensitive point, the insensitiveness of the latter indicates that the needle has penetrated sufficiently far. Next, the syringe is detached from the needle and filled with alcohol (423) which is then injected when permanent effects are desired.

SPLEEN.—Reference has already been made to the reflexes of the spleen (352) and it has been shown that, by contracting this organ, one is able to precipitate a paroxysm of malaria (355).

At a recent meeting of "*The American Electro-Therapeutic Association*" (Sept. 3, 1912), Dr. Louis von Cotzhausen, referred to a physician who suffered from latent malaria for a number of years and in whom a typic paroxysm of malaria was evoked within an hour after concussion of the upper three lumbar vertebrae to contract the spleen.

It is known that the *agglutination test* of Widal, in typhoid fever may not appear until late in the course of the disease or during a relapse.

In several instances, the author has precipitated an early and more decided reaction by previous concussion of the lumbar spines to elicit the spleen reflex of contraction.

Of course, no great value can be attached to these limited observations and Prof. Widal, has promised to give the method in question a more extended trial.

FUNCTIONS OF THE SPLEEN.—The functions of this organ are undetermined despite all the experiments which have been made. Taking advantage of the physiologic fact that,

Functions of the Spleen

the spleen undergoes rhythmic variations in volume, I sought to duplicate the same by dilating the organ by concussion of the 11th dorsal spine and contracting it by concussion of the 2nd lumbar spine.

Examinations of the blood were made by Dr. Alfred Roncovieri, and the following conclusions were formulated;

Concussion of the 11th dorsal spine (which enlarges spleen) produces an increase in the number of red-cells and hemoglobin. No effect was noted on the white-cells.

No morphologic changes were noted in the red-cells after concussion.

Concussion of the 2nd lumbar spine (which contracts spleen), increases the number of white-cells chiefly those of the lymphocytic type. No effect on red-cells or hemoglobin.

Alternate concussion of the 2nd lumbar and 11th dorsal spines increases the red and white-cells and hemoglobin.

Unless the 2nd lumbar spine is concussed last, the results as cited do not ensue but if it is concussed last, the increase in the number of red and white-cells is greater than when either the 11th dorsal spine or 2nd lumbar spine is individually concussed.

1. Average increase of erythrocytes after concussion of the 11th dorsal spine only.....300,000.

2. Average percentage-increase of hemoglobin after concussion of 11th dorsal spine only.....5 per cent.

3. Average increase of leucocytes after concussion of 2nd lumbar spine only.....2800.

4. Average increase of red-cells after alternate concussion.....650,000.

Average increase of hemoglobin after alternate concussion.....10 per cent.

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Average increase of leucocytes after alternate concussion.....3200.

EDEMA.—The author's conception of edema has already been cited (617).

A more recent theory is that of Fisher, and which has been exploited in his book, "*Nephritis; An Experimental and Critical Study of its Nature, Cause and the principles of its relief*, 1912."

He assumes that edema is caused by an excessive production or accumulation of acid in the cells of the kidney. His theory however, only explains the imbibition of fluid by the cells whereas in edema, the water is chiefly in the tissues outside the cells.

Moore¹¹, in an ingenious analysis of this theory concludes that it is based "on a minimum of experimental evidence and has no place in the practice of medicine." In my opinion, the most serious drawback of Fisher's theory is the sweeping generalization of attributing all forms of nephritis to the same cause.

Fisher used successfully solutions of sodium carbonate and sodium chlorid by rectal injections in nephritics in coma with anuria.

BLADDER.—Supplementing the observations concerning the bladder-reflex (358), recent cystoscopic examinations made with Dr. V. G. Vecki and Dr. Henry Meyer, show that the spondylectrode (Fig. 26) is excellent for the elicitation of the reflex in question. The endoscope shows that the *verumontanum* is best contracted when the spondylectrode is applied at the 1st lumbar spine. I would suggest further experiments along these lines by connecting a catheter with a manometer after filling the bladder with an antiseptic solution and then noting the effects of vertebral stimulation.

EYE.—Amblyopia and asthenopia are often dependent on reduced vagus-tone (496).

They may be artificially reproduced by depressing the vagus and by augmenting the tone of the latter the conditions in question may be improved or cured.

In the norm, the degree of depression of the vagus necessary to produce either condition may be accurately gauged by the spondylopressor (Fig. 1).

While the patient is reading test types, the vagus is gradually depressed by pressure between the 3rd and 4th dorsal spines and the degree of pressure necessary to produce symptoms is noted. By this method ocular fatigue can be measured. Howe, has recently devoted himself to a like study by means of an ophthalmic ergograph.

A physician in commenting on my reflex signs of ocular disturbances (443) refers to an oculist of prominence who never felt satisfied that glasses were correct until an examination of the cervical and dorsal regions showed absolute muscular relaxation.

GLAUCOMA.—The exact cause of this condition is unknown and its pathology is explained by the increase in intraocular pressure and the coincident venous congestion.

Many theories have been suggested to explain the increased tension but all that is really known is, that a disturbed relationship exists between intraocular secretion and excretion.

To determine the effects of concussion in several cases, it was found that the best results for reducing tension (as determined by a tonometer) and improving vision was at the 7th cervical spine. Here the effect was to increase vagus-tone. Vagus-tone was very much diminished in the foregoing cases.

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The method of treatment indicated is merely a suggestion.

SPONDYMOBILE GAUGE.—This ingenious contrivance (Fig. 30), of Langworthy, is used for measuring the mobility of the vertebrae.

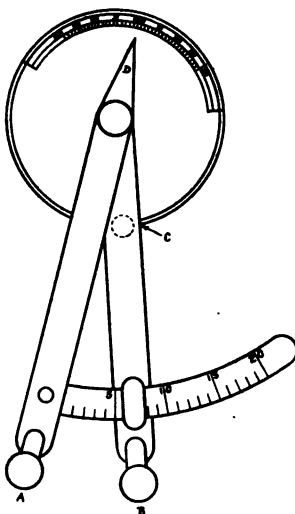


Fig. 30.—Spondymobile gauge.

The thumb screw "C" is first loosened and the rubber feet "A" and "B" are firmly planted on two vertebrae with patient in an upright position. The circular dial is then turned so that the pointer "D" rests at "O" and the patient is instructed to stoop forward as far as possible; the pointer advancing to the mark indicating in centimeters the mobility between the vertebrae thus measured. The reading is then recorded, the upright position once more assumed and with pointer at "O" and instrument applied as before, the patient is requested to bend backwards as far as possible, while the reading, noted to be on the opposite side of the zero mark, is again recorded.

S p o n d y l o b i l e G a u g e

If desired to obtain in one reading the sum of the entire forward and backward movement, the patient may be instructed to bend forward, the rubber feet applied to the vertebrae under consideration, the dial adjusted so that pointer rests at "O" and the patient requested to straighten the back and to continue bending backward as far as possible.

The scale on the dial indicates the range of movement of the vertebral column, while the figures on the curved bar show in centimeters the entire span between the vertebrae measured.

APPENDIX



PHYSIOLOGICAL PHYSICS OF THE VARIOUS FORMS OF FORCE

PHYSIOLOGICAL PHYSICS OF THE VARIOUS FORMS OF FORCE

CHAPTER VI.

ELECTRONOTHERAPY.

EXORDIUM — ELECTRONIC THEORY — PHYSIOTHERAPEUTICS — PHYSIO-
LOGIC PROOF — REFLEXES — SPINAL CONCUSSION — PERCUSSION
OF THE STOMACH — BIOPLASM.

EXORDIUM.—To thoroughly understand this and subsequent chapters, it is assumed that the reader is conversant with the preceding pages and the author's work on "SPONDYLOTHERAPY" (*Physio-therapy of the spine based on a study of clinical physiology*). Despite this assumption however, an endeavor will nevertheless be made to simplify the presentation of the subject-matter. If technicalities are employed they will be *italicized* and defined in an appended glossary.

ELECTRONIC THEORY.—The physical world may be comprehended within the limits of *Force** and *Matter*. Force is that which acts upon matter and the latter is that by which we understand force.

The whole domain of physics is tending toward a unification of the various forms of force under one great principle. This tendency is suggested by the transmutation of various forms of force such as the conversion of sound into electricity

*We shall employ the term force as a matter of convenience. Technically, the word force is wrong if used in any way that implies its objectivity, inasmuch as energy, is the objective thing concerned and force indicates its rate of change.

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and of electricity into heat, light, motion or chemical energy. Heat, light, electricity and magnetism are under the influence of one or two mechanic conceptions:—that of *ether* and that of ultimate particles which embody matter and electricity.

Matter is an accumulation of positive and negative electric charges and the chemic elements are merely varying numbers and arrangements of these charges.

Atoms are supposed to be infinitesimal oppositely charged particles known as *electrons*, the electric units of nature. The latter move in orbits and are thrown off from all highly heated or electrified bodies. In accordance with this theory, matter and force are identical. The electrons bombard space and its contents at the rate of from 50,000 to 100,000 miles per second.

If one observes a particle of radium through a little instrument with a magnifying glass known as the Spintariscope, one may see a display of scintillating bodies flying around like shooting stars and bombarding a little screen covered with sulphite of zinc. The light effects are caused by explosion of the rays each time they strike the crystals of zinc-sulphite.

Despite the vulgar prejudice of the absolute distinction of mind and matter, they are but two aspects of the same thing.

It is difficult to conceive the mind as a simple thinking organ; on the contrary, it is psychodynamic and must be regarded as a force, like heat, light and electricity. This dynamogenic or force-producing power of mind can be demonstrated (page 188).

The discovery of *radium* has exploded old theories. It was formerly supposed that a substance was composed of atoms held together by a kind of cement like

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the bricks of a brick-wall. Every phenomenon in nature is dependent upon matter in motion.

A moving electron radiates ethereal waves and a flying column of electrons produces a magnetic field in circles around the moving electrons as a center.

Electricity is an invariable property of matter. In this sense, electricity is not a form but a vehicle of energy which can be moved from place to place in the form of motion or of strain. In motion, it is current and magnetism; under strain, it is charge and in vibration, it is light.

PHYSIO-THERAPEUTICS.—The term physiatrics is used to designate the natural forces employed by the physician in the treatment of disease. The action of heat, light and other forces is so little understood and used so indiscriminately with neither rhyme nor reason that any good results attained by their use is attributed to *suggestion*.

Suggestion is often employed as a term of reproach and is a most serious menace to progress in the acceptance of medical observations. Lotze affirms that, our apprehension of the word is one prolonged deception and Taine, in his book on "*Intelligence*," asserts that, all perception is hallucination, although in some instances it may be shown to be true. The credulous in medicine believe too much and the skeptics believe too little.

One must confess that drugs may likewise act as excellent vehicles for suggestion.

Take a force like electricity which has been used by the physician for many years and yet its action has been questioned.

Moebius, a nerve specialist of great reputation, asserted that four-fifths of all electrical cures are dependent on mental influences. Beard, in his time, a leader in electro-therapeutics, observed, "If you expect to get definite results

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from electrical applications, you must be sure that your patient has faith, otherwise the application will do him no good."

Electricity is one of the most valuable assets that the physician possesses in the treatment of disease when it is used and not abused.

The patient clamors for cure and is in no wise concerned how it is effected.

The scientific physician clamors for proof concerning cures and rightly so, for all knowledge must be arranged under general truths and principles. The physician is handicapped in determining results by his lack of instruments of precision.

Our senses are gross and unreliable. With the telescope and a photographic plate the presence of millions of stars may be revealed yet the light of these stars does not in the least affect the unaided eye.

The ear is deaf to most things yet with a microphone the tread of a fly is like the march of cavalry.

For our heat-sense, we need a variation of one-fifth of a degree on a thermometer to enable us to appreciate any difference in temperature yet, with the bolometer of Langley, a difference of a millionth of a degree may be detected.

My endeavor in this chapter is to show that the various forms of force used in the treatment of disease are governed in their action by one underlying principle and that the latter is essentially mechanic. We can conceive the electrons as bombarding space with terrific speed thus giving rise to all kinds of perturbations of the *ether*.

When these ethereal-waves impinge on a medium of perception, they are practically a series of infinitesimal blows which act like drops of water piercing the rock not by the force of the blows but by their frequency.

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This conception of the action of the forces has suggested to the author the neologism, *electronotherapy*.

PHYSIOLOGIC PROOF.—It is not necessary to go far afield to cite examples where the reaction of an organism is employed as a test for the action of certain agents.

The physiologic action of currents was an accidental discovery by Galvani, and since his time many experiments have been made. Protoplasm (also known as bioplasm), the fundamental basis of all living bodies contracts when an electric current passes through it.

Protoplasm is made up principally of water, oxygen and nitrogen of the air we breathe and from the carbon of the food we eat. To the latter may be added sulphur, phosphorus, iron and a trace of mineral salts.

Protoplasm is vitally characterized by its ability to grow, reproduce and to respond to stimuli.

Nerves and muscles show a definite response to the action of currents.

Taste-perception is produced when the Galvanic current is applied to the back of the neck; and if the same current is passed through the cheek, the percipient can recognize the specific quality of each pole. Passed through the head, the same current provokes a sensation of light with color-perception, and stimulation of the auditory nerve with the identical current, induces sound-effects.

It is quite natural that nerve-force should be identified with electricity. The nervous system (and its mechanisms), has its radii of lines with batteries, switches, relays, transformers, condensers, resistances, shunts and automatic circuits. Electricity is known only by its effects; beyond this our knowledge does not extend.

We know that electricity will decompose water, deflect the needle of a compass and heat a wire through which it

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flows. Chemism, heat and light, the three great forces of Nature, are directly interchangeable in rapidity and direction of the molecular vibrations. Chemic decomposition produced by electricity is known as electrolysis and the products of such decomposition are known as ions.

It is likely that the atoms composing the living animal tissues are merely ions which are the material carriers of electricity.

Artificial electric stimulation of nerves corresponds most nearly to their natural excitation. Animal bodies probably create electric currents and the effects depend upon the nature of the discharge.

The feeblest electric stimulation of a nerve induces in it a chemical change. Thus nerve-force is a physicochemic process. With every contraction of muscle an electric change occurs.

The discharge of an electric eel is sufficient to kill a horse but the means of producing this electric charge is unknown.

The power of reacting to stimuli, called irritability, is the most conspicuous characteristic of the living organism.

The action of etheric-concussion on the living organism has heretofore baffled interpretation for the reason that, no account has been taken of the reflexes of the organs.

Practically every organ of the body has governing centers in the spinal cord and when these centers are stimulated by the physiologist in his laboratory, organs can be made to contract or dilate.

Though these results have been partially attained by vivisection, it has been shown by the author that, in the living human, like effects may be achieved by the use of stimuli applied to definite regions of the spinal column.

The latter have been located with reference to definite spines of the vertebrae.

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If, for example, one strikes a series of blows corresponding to the spine of the 7th cervical vertebra, there is a contraction of the heart, stomach, liver, spleen and other organs.

The phenomena thus elicited are known as reflexes. Thus one speaks of a heart, stomach, liver and a spleen reflex. These reflexes are of some duration but may be dissipated at once by colored sheets of gelatine (blue, violet or red) held in front of the organ. When the latter maneuver is executed, it is impossible to elicit the reflexes of the internal organs for reasons cited on page 204.

What is known as the knee-jerk, is a forward projection of the leg when one taps the tendon below the kneecap with a hammer during the time the leg is crossed on the knee of the other extremity.

When the tendon is struck, the blow which is in the nature of a stimulus is conducted by a sensory nerve to the spinal cord. It is then transmitted to motor-cells in the anterior part of the cord where it is converted into an impulse which is then conducted to the muscle resulting in contraction of the latter. It is the muscular contraction which causes the knee-jerk.

If the toe of an adult is pricked with a pin, the foot is pulled away in about one-tenth of a second. This is also a reflex and is very slow when compared with the speed of electricity or a light-wave. The latter would travel seven times the equator in a second but the nerve-wave travels at the rate of only 100 feet a second.

A reflex is made up of a stimulus causing a discharge of force, transmission of the latter to a center whereby another force is discharged and finally, the transmission of force to the stimulated area.

All actions are essentially reflexes and if this viewpoint is carried further, it means that we have no will of our own and that our actions are simply the result of external circum-

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stances. We are instinctively active like ants or bees and we are creatures of physical forces.

All reflexes are purposeful in character. Thus, closing of the eyelid and contraction of the pupil protect the eye from foreign bodies and the retina from intense light.

Loeb* contends that, irritability and conductivity are the only qualities essential to reflexes and both are common qualities of all protoplasm (page 126).

Plants possess no nerves, yet the flight of a moth into a flame differs in no wise as a reflex or instinctive process from plant *heliotropism*.

What happens to a nerve when it is stimulated or when it is struck by a series of blows?

After Loeb demonstrated that, muscles could be made to contract or relax under the influence of certain *ions*. Mathews found that, a like effect could be observed in nerves. It was Graham, who divided all substances into those which crystalize when they solidify and those which do not.

The latter were designated colloids or gluelike substances. The colloids in the body bear a positive electrical charge and are precipitated by negative *ions*.

Now the nerves consist of colloid particles in suspension and the thicker this jelly-like substance, the better will the nerve conduct. When chloroform or ether is inhaled unconsciousness ensues when the nerves no longer conduct sensation. Here, the action of the anesthetic is to dissolve the colloid substance and the thinner the latter the less easily will the nerves conduct.

The colloid particles as intimated, are positively charged and a nerve is stimulated by a current proceeding from the negative pole. The positive and negative *ions* in a nerve are balanced. Now suppose the

*The Mechanistic Conception of Life, 1912.

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nerve is stimulated by blows, then the colloid particles coming together would have their surfaces reduced. The latter would reduce their electrical charge and releasing a number of negatives charges, a nerve impulse would be started.

SPINAL CONCUSSION.—If the 7th cervical vertebra corresponding to 3 in Fig. 19, is struck a series of blows with a rubber-hammer, the nerve-roots are stimulated and the blows are propagated to the vagus or pneumogastric nerve.

When the latter nerve is thus stimulated indirectly, there is a contraction of the organs (heart, liver, spleen and stomach). Such contraction may be readily observed when the patient is before the X-rays and it can be demonstrated by percussion.

If the blows are feeble, there is no contraction of the organs, but instead a stimulation of the vagus. Stimulation of the latter is characterized by an increase of tone. What is known as “TONE” will be described presently. Visceral-tone has also been discussed on page 7.

The vagus is the longest and most extensively distributed cranial nerve. How do we know that it is through the vagus that blows delivered at the 7th cervical vertebra contract the organs?

If atropin is injected into the body before an attempt is made to elicit the reflex contraction of the organs, the latter cannot be evoked. This is because atropin paralyzes the motor endings of the vagus. After several hours, the paralyzing effects of atropin evanesce when it is again possible to contract the organs by blows delivered at the identical vertebra.

PERCUSSION OF THE STOMACH.—The stomach receives its motor supply from the vagus, *i. e.*, if the latter nerve is

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stimulated, the muscular fibers of the organ contract, in other words, the tone of the organ is increased.

Now, tone is an essential attribute of all living organisms. For all practical purposes, the term relaxation, may be used as the antithesis of tone.

The centers in the brain and spinal cord are in a state of tonic excitation and from these centers impulses are constantly passing through nerves to muscles and organs maintaining the latter in a condition of tonic stimulation.

If a decapitated frog is suspended vertically with the hind legs downward and the sciatic nerve of one leg is severed, this leg will hang down more limply than the other leg. Such an experiment shows that the tonic-impulses are no longer conveyed from the spinal cord to the muscles supplied by the severed nerve.

If *percussion* of the stomach is attempted on an individual (standing), one elicits a *tympanitic sound* but if the vagus is stimulated (by striking the 7th cervical vertebra), a *dull sound* is provoked. In our investigations we have determined the potentiality of the forces in three ways:

1. By the intensity of the dullness.
2. By the duration of the dullness.
3. By the distance at which the force is operative.

A moderately thin subject should be selected for experimentation and percussion must be executed with the subject in the erect posture. If the blows are forcible, in association with the dullness, there is a contraction of the organ, otherwise only dullness without any retraction of the organ.

Why does stimulation of the vagus convert a *tympanitic* into a dull sound? Such stimulation causes the walls of the stomach to become tense (owing to increased tone of the

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muscle-fibers in the organ), thus putting the air or gas in the stomach under increased tension. For the latter reason, we have the physical elements necessary for the transition of a tympanitic to a dull sound.

Naturally, the amplitude and length of the waves set up in the ether when light, electrical energy or magnetic disturbances are distributed will influence the results.

To test the action of the forces, I employed a strip of metal. In the latter, a small opening was made which was applied over the 7th cervical vertebra. It is necessary to protect the other regions of the spine to eliminate the action on other centers.

When light (used at a distance to eliminate the heat factor), heat, electricity (sinusoidal), radium, or electromagnetic waves were applied over the spinous process in question, the effect was always the same, *viz., dullness of the stomach on percussion*. The moment some of these forces were removed, the tympanitic tone of the stomach was restored. In other words, the action of some of the forces was purely transitory.

The electromagnetic waves from a parabolic reflector were effective at a distance of several feet.

Radium (10 milligrams used), was only effective when it was held in juxtaposition to the vertebra but the moment it was removed, the stomach-dullness disappeared. In fact, radium was the most transitory in its effects.

The X-rays were effective for a brief period after their action. I always attributed shrinking of the heart during exposure to the Roentgen rays as psychic in origin. In other words, the contraction of the organ was attributed to emotional causes. This view demands revision in accordance with these later observations.

The most powerful of all the forces in its duration was

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the *magnetic force* and the latter, will be the subject of consideration in future chapters.

LIVING BIOPASM.—All living *bioplasm* is distinguished and characterized by the following properties:

1. Irritability, or the power to react in a definite manner to some form of external excitation irrespective of the fact whether the stimulus is electric, mechanic or chemic. If the bioplasm is represented by muscle, the reaction is a contraction of the muscle.

2. Conductivity, or the ability to transmit molecular disturbances at one point to all parts of the irritable material.

3. Motility, or the power of exhibiting spontaneous movements.

Physiologists aver that, all protoplasmic movement is the resultant of natural causes the nature of which is not understood.

We shall attempt to prove that the foregoing properties of *bioplasm*, which, in their summation is nought else but tone, may be reproduced by magnetic force without stimuli transmitted from the nerve-centers.

Furthermore, that in such reproduction the tone exceeds that created in the organism.

Summarizing the subject-matter of this chapter, the following conclusions may be formulated:

1. The therapeutic action of the various forms of force is dependent upon matter in motion.

2. The etheric-waves thus created by bombarding electrons are equivalent in their action to a species of concussion.

3. Inasmuch as the action of all the forces is governed by one underlying principle which is essentially mechanic, the neologism *electronotherapy* is suggested.

4. In *electronotherapy*, reflexes are elicited independent

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of the fact whether the forces are employed at the periphery or at a spinal center. Applied in the latter situation, the reflexes are of greater amplitude and of longer duration. It is therefore evident that, in the treatment of disease by aid of reflexes (Reflexotherapy), the elicitation of central reflexes is preferable.

5. The forces like light and the X-rays, directed toward the stomach-region and at *a distance*, will increase the tone of the stomach, as evidenced by the conversion of the normal tympanitic sound into a dull one.

The moments the forces cited are brought in immediate contact with the stomach-region their irritant effect becomes manifest and no dullness ensues.

Light from a thermotherapeutic lamp which consists of a large incandescent bulb (50 C. P.), in connection with a parabolic metallic reflector, yields a stomach-dullness at a distance of 24 feet after passing through two plaster-walls of my office.

With a patient within a few feet from the source of illumination, *the rays pass through lead, sheet-iron and other metal*. In other words, if a sheet of metal is held over the stomach and the light is directed on the metal, a dullness of the stomach can be elicited. This dullness however evanesces the moment the light is withdrawn.

This experiment demonstrates that there are components in light which in their penetrative power bear a resemblance to Roentgen's rays but differing from the latter, in their ability to pass through glass, lead and bone.

The great mathematician, James Clerk-Maxwell, contended that light and electricity were fundamentally one. It was on this theory that Hertz, was led to discover his waves which Marconi, utilized for conveying messages. Sir Oliver Lodge, refers to light as an electro-

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magnetic disturbance of the ether. In other words, light is an electric vibration, the result of electric oscillations in the molecules of bodies which are hot or in bodies without heat (phenomenon of phosphorescence).

Further experiments were conducted with an ordinary 16 C. P. incandescent bulb; the subject standing at a distance of 5 feet from the source of illumination. The transposition of the stomach from tympanicity to dullness being utilized as a criterion of action.

The following conclusions were formulated with reference to several investigations:

1. An uncolored bulb produced dullness only during the time the light was directed on the stomach-region.

2. Filtered through *blue* or *red* glass, the results were absolutely negative, *i. e.*, no dullness ensued. The results were equally negative with *green* and *violet*.

3. Filtered through yellow glass, a dullness (after removal of the light) ensued lasting 2 minutes. In this, as well as in the foregoing experiments, the exposure was about 20 seconds in duration.

4. The solar rays* were negative until concentrated by aid of a large lens at some distance. Too small a focus annihilated the results. When the solar rays were focused on a sheet of lead held in front of the stomach-region, dullness of the stomach ensued just the same as when light from an incandescent bulb was passed through a sheet of lead.

*Kime (*Iowa Med. Jour.*, April, 1900), speaking of his own work on the use of the solar rays (heliotherapy), refers to Finsen, himself and myself, who working along the same lines independently, each has pursued his own methods. "In order of their publication," he continues, "the papers were, Abrams, March, 1899; Kime, June, 1899; Finsen, September, 1899."

The treatment of laryngeal tuberculosis by the solar rays is accredited to Sorgo, and called the "Sorgo Treatment." The identical method was suggested by the author many years in advance. The only reasonable object of this citation, is to establish the matter of priority in discovery.

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5. When the magnetic flux from a small or a powerful electromagnet passed through any colored glass excepting yellow glass, no stomach dullness ensued.

6. When the magnetic flux passes through a *yellow medium*, the stomach tonicity (as revealed by dullness), lasts *nine times* as long as simple exposure. Gamboge painted over the stomach-region prolongs the tonicity three times the length of time.

Crude experiments conducted by the author show that, color modifies the attractive attributes of an ordinary magnet; yellow and blue increasing and red, decreasing such attraction.

7. Heat is negative through colored glass excepting yellow.

8. When a concussion-apparatus is allowed to concuss the air at some distance from the subject, stomach-dullness may be elicited. If colored media are interposed between the apparatus and the subject, no dullness ensues unless yellow glass or a yellow gelatine sheet is used.

9. A yellow medium prolongs the duration of the stomach-tonicity with heat, light and magnetism to a greater extent than when the latter are used alone.

10. When two forces are employed synchronously no stomach-dullness ensues; one force negating the action of the other force.

Here, we are probably dealing with similarly charged forces as is the case with colors (page 204). If heat and light are used simultaneously with the magnetic force so that, the heat or light is directed toward the negative pole of the magnet (while the positive pole of the latter is directed toward the body), stomach-dullness ensues.

11. When yellow glass is placed in front of an X-ray tube *some rays pass which produce a stomach-dullness.*

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12. If yellow glass is held in front of the stomach, in ordinary light, a dullness at once ensues. This color will intensify the tone of all the organs and permits of a better definition of their boundaries by percussion. In other words, this color *augments the tonicity of the organs*. Other colors thus used *diminish the tonicity* and decrease the boundaries of the organs (page 151). To relax the organs and thus secure a visceral rest-cure, green, violet or blue may be used and yellow when a tonic effect is desired.

13. Any variation in the proportion and character of the electrolytes in a tissue is capable of imparting to that tissue certain properties. The chief electrolyte in our blood is sodium chlorid. If a muscle is put into a solution of the latter (*i. e.*, isotonic with the muscle), it twitches rhythmically, while the addition of a soluble calcium salt prevents the twitching. My investigations show that the stomach-musculature exhibits like phenomena. Let a subject ingest 50Cc. of normal salt solution—a persistent stomach-dullness ensues until inhibited by the ingestion of the same quantity of fluid containing 5 grains of chlorid of calcium. When the latter is ingested, it is impossible to impart tone to the stomach by the most powerful magnetic flux. Chlorid of calcium may be indicated in all spasmodic conditions of the stomach-muscle.

CHAPTER VII.

MAGNETIC FORCE.

HISTORICAL.

MAGNETISM AND CHARLATANRY — GILBERT — PARACELSUS — MESMER
— DE PUYSEGUR — PERKINS — MODERN HISTORY.

We are devoting special consideration to the magnetic force for the reason that, it is convenient to use, it has no pernicious effects, it is more potential in action and it has antedated the various forms of force in the treatment of disease.

The force of magnetism can lay claim to great antiquity. It is not strange that, "The Father of Philosophy," Thales, should have endowed the magnet with a soul or as an expression of life. If this mysterious force were unknown to us, even in this day of great achievements, its discovery would awaken the same extraordinary interest and awe which Plato, Aristotle and even Homer could not evade.

If Lucretius, were inspired to sing the magnet's power in his "*De Rerum Natura*," he could have apostrophized no greater marvel.

The fact that, we are already acquainted with some of its attributes, should prove an incentive to know more about a force the nature of which is only known to us by its effects.* The medical history of magnetism is a riotous recital of misguided judgment, defective imagination and charlatanry.

*"It is sometimes of great use in natural philosophy," said Sir William Herschel, to doubt of things that are commonly taken for granted, especially as the means of resolving any doubt, when once it is entertained, are often within our reach."

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Contributory to exaggeration of statement was the fact that, no attribute however mysterious could be superimposed on the magnetic force which could add to its mysteriousness.

So securely is magnetism interwoven with charlatanry that, he who attempts to sever the bonds must be prepared to suffer the darts of calumny but the undaunted one, will find ample reward for his undertaking despite the fact that, in medicine, it is easier to establish a fact than to have it accepted.

Perhaps the greatest work ever published on magnetism was that of an Englishman, William Gilbert, who, in the year 1600, was President of the "Royal College of Physicians." He mentions that, Discorides, believed that if a piece of *lodestone* were finely ground and mixed with water it would when swallowed, benefit many disorders of the blood.

Magnetic medicine however, was regarded as dangerous, inasmuch as it contributed to melancholia and even death. The ancients who entertained curious ideas respecting the curative virtues of magnets conceived different kinds, some of which were beneficial and others dangerous.

Some asserted that small quantities of ground lodestone were the true "elixir of life." It was also claimed that, lodestone taken internally, possessed the power of drawing iron arrow-heads from the body and that, this power was also effective in absorbing the arrow-head.

The famous salve of Paracelsus, for the treatment of wounds caused by iron-daggers was an elaboration of this idea. The salve was essentially a compound of powdered lodestone and ordinary ointment.

It was this same Paracelsus, really a great physician, in the first half of the 16th century, who regarded personal

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magnetism as a force not unlike that of a magnet which attracted iron.

To him the attraction of sex was essentially magnetic.

What we now call gravitation, was regarded by Kepler, perhaps the most profound thinker of his time, as magnetic attraction. To him, the magnet was the soul of the physical world and it was by magnetic attraction that the planets were held in bondage with the sun.

Descartes, was likewise engaged with a theoretical study of magnetism.

At this epoch, the magneto-motive force was employed as a convenient vehicle for explaining all psychologic phenomena and it was extensively used in the treatment of disease.

In 1766, Mesmer, published "*De Planetarum Influxu*," designed to show planetary influence on the nervous system and his "*Ueber die Magnetkur*" was the product of his studies of magnetism as a curative agent.

Mesmer, supposed that a force existed which he called "animal magnetism," by means of which, one person could influence another. This "animal influence," he regarded as the essential nature of mesmerism. Subsequent investigators demonstrated conclusively that, the phenomena observed by Mesmer, were wholly subjective and quite independent of any known force.

Swedenborg, in 1763, claimed that, by magnetic sleep one could be raised to the celestial light even in this world, if the bodily senses could be entombed in lethargic slumber.

Binet and Feré, describe the performances of Mesmer, who, with a long iron-wand would walk among his throng of patients touching the latter particularly the affected parts of the body. To energize his results, he would sometimes substitute for his manipulations strong elec-

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tric currents. In his manipulations, he would pass his fingers over the body of the patient time and time again, until he was assured that the magnetized person was thoroughly saturated with the healing fluid.

De Puysegur, in his instructions to hypnotizers, whom he designates as magnetizers, enjoins them to regard themselves as magnets and the arms, particularly the hands, as poles and to imagine the magnetic fluid as passing from one hand to the other through the body of the patient.

An American, Dr. Elisha Perkins, by name, may be regarded as the prince of charlatans. He exploited the discoveries of Galvani and Volta, by employing two pieces of metal known as "Metallic Tractors." The latter drawn over affected parts could cure practically everything by virtue of their magnetic influence. His patented discovery gained him wealth and fame. The "tractor cure," as it was called, led Dr. Haygarth, to fabricate a pair of false tractors by which marvelous magnetic cures were likewise effected. These tractors were made of every conceivable material but results were equally good, provided the operator during their application, discussed magnetism and described squares, circles and triangles with the sham-tractors.

In New York, at one time, yellow fever was prevalent and Perkins, with faith in his tractors went there to cure the disease but succumbed to the fever which he contracted.

Belief in the curative powers of the magnet was promulgated by Baron von Reichenbach. He claimed to have discovered a new force from magnets which he called odic or odylic force. The latter, like the *magnetic flux*, was invisible and its properties could only be determined by its effects. Despite the popularity of the odic force in the treatment of disease, it was shown that the effects were caused by the influence of the mind over the body. Though the

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patients claimed they could see faint luminous emanations issuing from the magnet, a piece of wood so prepared to resemble a magnet yielded like results.

MODERN HISTORY.—The concensus of opinion of modern investigators favors the view that, magnets are endowed with absolutely no power on the human organism and that, so-called magneto-therapy is merely a delusion.

Some years ago, Thomas Edison, confined a boy's head inside a colossal electro-magnet thus permitting the magnetic flux to pass through his brain. Absolutely no effects were observed. Later, experiments were made with the flux passing through the body of a man. The flux was sufficiently powerful to hold rigidly heavy iron-spikes against the breast and forehead, yet no effects either for weal or woe were noted.

As a result of elaborate experiments made by Peterson¹² and Kennelly, they concluded that, the human organism was in no wise appreciably affected by the most powerful magnets and that, neither direct nor reversed magnetism exerts any apparent influence upon the iron contained in the blood, upon the circulation, upon the brain, nerves or upon ciliary or protoplasmic movements.

Modern literature is quite prolific with the reports of cases cured by "magnetic wave-currents," and one physician, who reports many such cases, concludes, "results are so much more satisfying and convincing than a library of theories."

To account for these results many ingenious theories are invoked. One supposes that the magnetic waves have a vibratory action upon cellular life. Another, compares the action of the waves to the exchange between the poles of a Galvanic current.

Another, is convinced that, by permitting the waves to

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act promiscuously along the spine, there is a notable effect on *metabolism*. Wm. Harvey King, conducting a series of experiments with the waves on blood-pressure, noted an average increase of the latter of 16 mm. He found that, the treatment increased the out-put of urea and uric acid with a perceptible increase of indican. Investigations with these waves on the blood demonstrated an increase of hemoglobin, leucocytes and red blood-corpuscles. Unfortunately, the foregoing observations cannot be accepted as evidence of the action of magnetic waves insomuch as the sinusoidal current taken from the magnetic poles was also employed.

A very pertinent fact however, illuminates these observations of King¹³. Referring to the treatment of constipation, he says, "I have been obliged at first to use the sinusoidal current as taken from this machine until there is established a more or less regular movement of the bowels. When this is accomplished, the patient is again placed in the regular magnetic field, with a result of continued improvement so far as regularity of movement is concerned and in general improvement." The insignificance of the foregoing will become apparent by reading the subsequent chapter.

Magnets are now used for removing foreign bodies (iron and steel) from the eye in a simple and efficient manner. The electro-magnet is equally efficient in diagnosis. Definite sensations of pain in the eye when the circuit of the electro-magnet is made or broken, suggests the presence of magnetic metal.

The sideroscope, a magnetic needle suspended upon a silk thread, will also assist in the detection of foreign bodies in the eye. Sellheim¹⁴, after introducing a soft-iron catheter inside the uterus studied the movements of the latter under the influence of a powerful magnet applied outside. The force was sufficient to straighten a retroflexed uterus. The

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alternate lifting and dropping of the uterus was utilized as a species of massage and by mobilizing the organ, adhesions from inflammations were prevented.

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CHAPTER VIII.

MAGNETIC FORCE.

PHYSICS.

MAGNETIC POLES — MAGNETIC FORCE — MAGNETIC MATERIALS — DIAMAGNETISM — DEMAGNETIZATION — THEORIES — MAGNETIC FIELD — MECHANICAL EFFECTS — TERRESTRIAL MAGNETISM.

Only relevant data concerning this subject will be briefly discussed.

MAGNETIC POLES.—The north pole of the magnet, is also called the positive or plus (+) pole and the south pole, is also known as the negative or minus (—) pole.

One of the fundamental laws is that: Like magnetic poles repel one another and unlike poles attract one another. This is similar to the law of attractions and repulsions of electric charges. The two poles are inseparable, *i. e.*, a magnet with only one pole is impossible.

MAGNETIC FORCE.—Force is that which moves or tends to move matter. The force which a magnet attracts or repels another magnet or a magnetic material is known as magnetic force.

The force exerted between two magnetic poles is proportional to the product of their strengths and is inversely proportional to the square of the distance between them.

MAGNETIC AND NON-MAGNETIC MATERIALS.—Any substance in which magnetism may be induced and which is therefore attracted by a magnet is known as magnetic material. The following are recognized as magnetic: iron (the strongest known magnetic material), steel, nickel and cobalt. Salts of iron and other metals, porcelain, paper and oxygen

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are feebly attracted by a powerful magnet. Materials which are neutral as regards magnetism are referred to as non-magnetic.

DIAMAGNETISM.—Diamagnetic bodies refer to substances (bismuth, antimony, phosphorus, copper) which are apparently repelled from the poles of a magnet.

INDUCED MAGNETISM.—If magnetism is communicated to a magnetic material without actual contact, the substance is said to be magnetized by induction. Induction takes place along certain directions known as lines of magnetic induction or lines of magnetic force. The latter act through a vacuum and air and through all materials excepting those in which magnetism may be induced. Magnetism set up by an electric current is known as electromagnetism.

DEMAGNETIZATION.—If a magnet is struck by a series of blows or heated to a temperature about red heat, for unknown reasons, the greater part of its magnetism disappears.

According to Bidwell, light falling upon recently demagnetized iron produces an immediate revival of magnetism.

COERCIVE FORCE.—Some materials are more easily magnetized and demagnetized than others. In such instances it is assumed that, there is some force known as coercive force or retentivity, opposing magnetization and demagnetization.

SATURATION.—A magnet when fully magnetized is said to be saturated. When the latter has been attained, it grows weaker for a definite time and if left alone, the magnetism finally becomes permanent in strength.

THEORY OF MAGNETISM.—Magnetism is not a fluid. When a magnet magnetizes steel it loses none of its own magnetism. A fluid is incapable of propagating itself indefinitely without loss. The theory now accepted is that, molecules of magnetic material are magnets by nature and when

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unmagnetized, the molecules are arranged in a haphazard manner so that they neutralize each other's external magnetic effects. If this material is now subjected to the influence of magnetic force, the molecules become so arranged that their poles point in the same direction (Fig. 31).

MAGNETIC FIELD.—The space surrounding a magnet pervaded by the magnetic forces is known as the magnetic field and is most intense near the poles of the magnet.

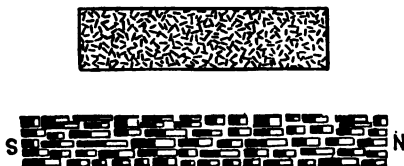


Fig. 31.—Illustrating the theory of magnetism. In the upper figure the molecules owing to their disorderly arrangement have lost their magnetism but when the molecules are arranged end to end, so that the N-seeking poles all point in one direction and the S-seeking poles in the other as in the lower figure, the molecules are magnetized.

MECHANICAL EFFECTS OF MAGNETIZATION.—When an iron bar is strongly magnetized it increases by $\frac{720000}{1000000}$ of its length, and when the magnetizing force is stronger, it again contracts. The increment in length is due to the molecules setting themselves with their longest directions parallel to the length of the bar (Fig. 31). Nickel contracts slightly when magnetized. When a bar is magnetized or demagnetized, a faint metallic clink in the bar is heard.

These observations prove that in magnetization there is a disturbance in the arrangement of the molecules. In what is known as the magnetization of light, it has been found that a ray of polarized light passing through certain substances in a magnetic field has the direction of its vibrations changed.

TERRESTRIAL MAGNETISM.—The earth is a powerful

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magnet and has its magnetic poles. From the earth's north magnetic pole in the Southern Hemisphere, a huge stream of magnetic flux is constantly flowing through the atmosphere until it reaches the earth's south magnetic pole in the Northern Hemisphere. These magnetic streamings pass along paths of least resistance. The presence of magnetic oxides of iron and masses of iron or steel facilitates their passage. Thus, the flux-streams are concentrated around structural steel buildings and railroad tracks.

A compass needle so suspended as to be able to move either in a vertical or horizontal plane inclines or dips toward the earth. There is no dip on the earth's magnetic equator but it increases toward the poles. Directly over the latter, the angle of inclination is exactly 90° .

Iron bars set upright for a long time acquire magnetism from the earth. The earth's magnetism varies from place to place on the surface of the earth and there are daily, annual, secular and irregular variations, which are associated with modifying solar activity. Magnetic storms have been attributed to a number of unusual spots on the sun, volcanic eruptions and electric currents in the atmosphere. Many attempts have been made to explain the cause of the earth's magnetism. It has been attributed to the presence of large quantities of magnetized iron below the earth's surface, to induction from the sun (which Biot claimed is itself a powerful magnet), and to currents of electricity flowing around the earth. The latter, the theory of Ampère, is the most suggestive.

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CHAPTER IX.

MAGNETIC FORCE.

PHYSIOLOGICAL PHYSICS.

ANIMAL TISSUES—MAGNETISM AND VISCERAL TONE—ACTION ON VOLUNTARY MUSCLES—VISCERAL ATTRACTION AND REPULSION—VISCERAL DEMAGNETIZATION—LOCAL DEMAGNETIZATION—TRANSMISSION OF FORCE—MISCELLANEOUS EFFECTS.

It is the object of the author in this chapter to submit a few observations in a direction believed to be substantially new, and to present succinctly in the subsequent chapter some conclusions based on these premises. The writer acknowledges the incompleteness of his observations which have only extended over a period of three months and he also admits that his limited knowledge of physics deters him from interpreting more fully the observed phenomena.

Hypotheses have been eliminated and only facts are presented.

When Kirchoff, thrust between the image of the sun from the heliostat and the tinted band of his spectroscope, a flame of sodium vapor, and instead of the expected brightening, saw the band darkened, he left his laboratory hastily with the words, "That seems to me a fundamental fact."

If certain fundamental facts have been established by the author he anticipates their elaboration by physicists, psychologists and others more competent than himself.

Some of the author's observations would have been impossible of attainment, if it were not for the fact that the *reflexes of the organs* (page 120) can now be recognized objectively.

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Considering the discredit cast on the therapeutic employment of the magnetic force, all consideration of this subject will be evaded, so that the reader is constrained to formulate his own conclusions.

My investigations were made with feeble and powerful magnets (Fig. 32).

Animal tissues.—Any material in which magnetism may be induced and which is therefore attracted by a magnet is magnetic material.

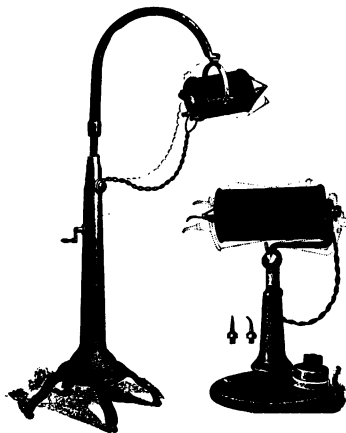


Fig. 32.—Giant and smaller electromagnet. The giant magnet has a lifting power of approximately 400 pounds to the square inch. The smaller electromagnet has a little over one-fourth the strength of the giant magnet.

If any of the human tissues are suspended on a light silk thread near a magnet, the latter will attract one pole of the tissue and repel the other. The north pole of the magnet repels the north pole of the tissue and attracts its south pole.

The foregoing effect varies with the tissues employed and is best exhibited by nerves, whereas the least effect is noted with the spinal cord.

The same magnetic attraction is exhibited by the mem-

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braneous coverings of the nervous system, organs and muscles. It has always been contended that these membranes act as electric insulators to retain the normal quantity of electricity in the foregoing structures. One knows that, magnetism induced in a bar of iron may induce magnetism in another piece so that a magnet may be made to support a number of nails end to end, each of which has become a magnet by induction.

The foregoing effect may also be observed with the tissues.

An ordinary bar or horse-shoe magnet will also attract the tissue although the force thus exhibited is very feeble in comparison with an electromagnet. The iron-content of the tissues has without doubt some effect on the results yet, the liver and spleen which in the norm show a high content of iron exhibit a feebler power of attraction than the nerves. Even after the tissue has been immersed in a solution to dissolve any iron which may be present, the tissue is attracted to the magnet although less readily than before. Here, one must assume some change in the molecular arrangement of the tissue.

Fresh tissues do not show the foregoing properties of attraction or repulsion. The tissue must first be allowed to dessicate naturally. If the tissues are artificially dessicated the results are compromised. The tissue must be deprived of blood. The latter although containing iron is diamagnetic.

Experimenting largely with nerves, the results were never uniform. This may have been caused by varying degrees of dessication or for other reasons which I do not know. Thus, as this manuscript is about to go to press, I repeated my earlier experiments with negative results. Unfortunately, time will not permit me to determine the cause for this discrepancy.

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Severed nerves in chloroformed animals proximally connected with the spinal cord, exhibited less magnetic attraction than nerves removed from the body and suspended by a thread. The reason for this is noted on page 159.

About the year 1819, Oersted, in investigating the relation existing between magnetism and electricity found that, when an electric current flows through a conductor, a magnetic flux is created which makes the conductor a magnet. The conductor loses its magnetic properties as soon as the current ceases to flow. The nature of the material through which the current flows is of no importance. In my investigations using various organs and tissues as conductors, a decided difference was noted in the deflection of the needle.

The close resemblance between electricity and magnetism was further emphasized by the discovery of Faraday, in 1831. The latter found that, whenever lines of magnetic flux are caused to cut or pass through conductors so connected as to form closed circuits, currents of electricity are generated.

ACTION OF MAGNETISM ON VISCERAL TONE.—On pages 62 and 124 reference was made respecting what is understood by tone of the organs. Perhaps the most conspicuous physiologic manifestation exhibited by the forces is that of increasing vital tone.

In this respect, the magnetic force is insuperable.

On page 121, the reflexes of the organs were likewise discussed. It was noted that different stimuli applied to definite regions of the spinal cord would cause either a contraction or dilatation of various organs.

The stomach was employed as a vehicle for the exhibition of such effects. *When the stomach-tone is employed as a test for the action of the forces, a moderately thin subject must be selected and the entire abdomen must yield a tympanitic tone on percussion. A normal subject must likewise be selected*

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otherwise the results will be modified. Percussion must be executed during the time the patient stands. No results can be expected in any other posture.

Now, in the application of the stimulus to the region of the 7th cervical vertebra, two effects could be elicited: increased tone of the stomach or the latter plus contraction of the organ.



Fig. 33.—Illustrating the area of the stomach by percussion before (continuous line) and after concussion of the 7th cervical spine (broken line). The reduction in area is known as the stomach reflex of contraction.

The former effect was ascertained by dullness on percussion (page 123) and the latter, by dullness plus recession of the lower border of the stomach. Heat, light, radium, X-rays and magnetism, when permitted to act in the region

of the 7th cervical spine produced a dullness corresponding to the stomach approximating the anterior abdominal wall. With all the forces excepting magnetism, this dullness was of brief duration and was soon succeeded by the normal tympanitic tone on percussion. If the stimulus employed was concussion by aid of an electric hammer striking a series of rapid blows varying in strength from 6 to 12 pounds, in association with dullness of the stomach the organ became contracted (Fig. 33).

The latter, known as the stomach reflex of contraction, remains contracted for about 15 minutes after which time it gradually resumes its former position. The longest duration of the latter reflex noted by concussion was 20 minutes.

It is evident that the duration and the amplitude of the reflex are determined by the vigor of the muscular fibers of the stomach. When the magnetic flux is permitted to act on the region of the 7th cervical vertebra, unlike the other forces which are transitory in action, it will produce a dullness of the stomach lasting for many *hours* without causing the stomach to recede.

All forces show this action (of temporary duration), on the tone of the stomach applied at the spinal region mentioned or at a distance from the subject but the magnetic force will exhibit such action lasting for hours and at a greater distance. Thus, with the small electro-magnet (Fig. 32), this dullness of the stomach can be elicited at a distance of 30 feet and with the large magnet (Fig. 32), at a distance greater than 60 feet. In both instances the dullness persisted for a variable period of time after the magnetic flux has ceased to flow.

If a patient enters a room in which the magnetic flux has been allowed to flow for several minutes, a stomach previously showing a tympanitic tone on percussion, will

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yield a dull sound within 20 seconds. The latter dullness is of considerable duration. One of the most important observations concerns the conveyance of the magnetic force by an individual. If an individual exposes himself for about one minute to the flux of a giant magnet and then enters another room (time should not exceed 30 seconds), and stands alongside an individual with exposed abdomen, percussion will demonstrate in the latter a *dullness of the stomach*. This dullness will last for several minutes.

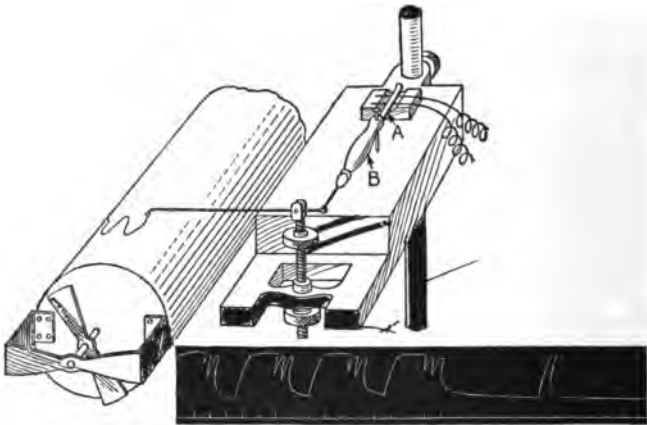


Fig. 34.—Apparatus for recording wireless messages with the leg of a frog; A, nerve; B, muscle. The attached tracing represents a record.

No dullness ensues until the individual exposed to the flux is alongside of the person examined. It is evident therefore that the action is one of propinquity and not due to the influence of the flux at a distance.

The augmented tone of the musculature of the stomach may be accepted as a delicate physiologic test for the presence of the magnetic force. In other words it can be used as a magnetometer.

A frog is used as a delicate physiologic test for strychnin and the same animal is used for detecting adrenalin which dilates the frog's pupil. Another delicate test for adrenalin is the increased tone produced in the stomach-musculature of the frog whereas in mammals, the effect is to relax the muscle.

Fig. 34, shows a frog's-leg receiver recently employed by a French physiologist for recording wireless messages. The sciatic nerve of the leg is connected into the microphone-circuit of the receiver. One end of the leg is fixed to a base and the other end connected with a pivoted lever which records on a drum revolved by clock-work, the contractions of the muscles caused by the electrical impulses.

If the region of the 7th cervical vertebra is first concussed and then the body (in proximity to the magnet) is exposed to the magnetic flux, the stomach will remain contracted for *hours*. In other words, the magnetic force will *fix* the organ in the position in which it has been placed by concussion.

One may employ the same maneuver in fixing the heart, aorta, liver and other organs either in a state of contraction or dilatation. These effects may be prolonged by color (page 130). The best results however, are attained by allowing the magnetic flux to act for several minutes at the regions of the spine where the reflexes are elicited by concussion.

The researches of the author show that the organs may be made to contract or dilate by irritating the skin over the organ. The reflexes thus evoked explain our empirical methods of treatment by liniments, poultices, water and a host of physical remedies. The skin reflexes are infinitesimal in amplitude and duration when compared with the reflexes evoked from the spinal region which last for *hours*.

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The skin reflexes may, however, be fixed for a greater duration of time if the magnetic flux is allowed to flow during their elicitation.

Thus, the heart reflex of contraction by scratching the skin over the heart (allowing the magnetic flux to act only during the scratching process) will last 5 minutes compared with a duration of 20 seconds before the flux is allowed to flow.

All the skin reflexes after the patient has been exposed to the flux are greater in amplitude and duration.

One may formulate the following constant: *The duration and amplitude of a visceral reflex is in direct proportion to the intensity of the magnetic flux and its proximity to the spinal region governing a given reflex.*



Fig. 35.—Tracings of the pulse; A, before the tip of the electromagnet is placed at the 7th cervical spine; B, during the time the flux is first allowed to flow and C, about 30 seconds thereafter.

The effect of the flux on the heart is easily ascertained by palpation of the pulse before and during the action of the flux. With the patient in juxtaposition to a large electro-magnet, the pulse becomes feeble and is inhibited or nearly so. These effects are accentuated when the magnetic force is allowed to act directly on the region of the 7th cervical vertebra (Fig. 35).

It is indeed strange how little of the magnetic flux is necessary to increase the tone of the organs. An ordinary bar or horse-shoe magnet impinging on the stomach, heart or any of the organs will at once (by increasing the tone of the organs), bring out an area of increased dullness.

The organs are ordinarily in a varying state of tonicity. The tone of the organ may be normal (orthotonic),

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increased (hypertonic), diminished (hypotonic) or absent (atonic).

A relaxed organ will yield a smaller area of dullness than an organ which is in a state of tone. To accurately reproduce the area occupied by an organ, it must be put in a condition of augmented tone, otherwise percussion will yield untrustworthy results.



Fig. 36.—Illustrating the employment of an ordinary horseshoe magnet for outlining the boundaries of the heart and liver. The broken lines show the boundaries before, and the continuous lines, after the use of the magnet held by the patient in the center of the organ. The stomach in the norm cannot be defined by percussion owing to the tympanitic quality of its sound. In this illustration, the magnet placed in the stomach region caused a dullness of the organ thus permitting its delimitation.

In Fig. 36, the organs are percussed before and after an ordinary magnet is held by the patient in the region of the organs.

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In Fig. 37, the aorta, heart, liver and spleen, are percussed before and after the flux of an electromagnet is allowed to flow. In the latter instance, the patient stands in juxtaposition but not in contact with the magnet.



Fig. 37.—Percussion of the heart and liver before (broken lines) and after (continuous lines) the subject is in proximity to a giant magnet. The outline of the stomach was determined during the flow of the magnetic flux.

In a subject with a responsive stomach-muscle, one may increase the tone of the stomach (as shown by dullness on percussion) at a distance of over 80 feet.

The foregoing stomach-reaction represents the basis of most of my investigations.

The stomach cannot be defined by our usual methods of percussion. The tympanitic tone of the organ cannot

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be accurately differentiated from the tympanitic tone of the intestines. It must be observed that the tympanitic tone of the intestines is partially changed to dullness by the magnetic flux (owing to the tone imparted to them), but the dullness is not as pronounced as that of the stomach hence the possibility of differentiation by percussion.

It has been shown (page 123) that, by artificial stimulation of the *vagus*, one may, by increasing the tone of the stomach, cause the latter to yield a dullness on percussion. If, however, one injects $\frac{1}{6}$ grain of atropin (which paralyzes the motor endings of the *vagus*), artificial stimulation of the *vagus* after the manner cited is incapable of increasing the tone of the stomach. In other words, one cannot elicit the stomach reflex. If, after atropin is injected and the patient's body is in proximity to a powerful electromagnet, the tone of the stomach is nevertheless restored as evidenced by the dullness on percussion.

The foregoing is noted with reference to all the organs supplied by the *vagus* and is surprising considering the fact that the magnetic force can restore tone quite independent of nerve-force. This statement demands modification as shown on page 164.

If an individual is in an electromagnetic field between *like poles* of two electromagnets no dullness of the stomach can be elicited and the same effect is manifest if the poles are unlike (Fig. 38).

If the dullness of the stomach is evoked by exposure to the streamings of either the north or south pole of a magnet, it can be made to disappear at once by exposure to the pole opposite to that which first caused the dullness.

The foregoing is in accordance with one of the laws of

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magnetic force,—the poles of opposite name neutralize one another.

Exposure of the subject to two like poles of a magnet multiplies the intensity of the dullness; the streamings being concentrated anteriorly on the stomach-region.

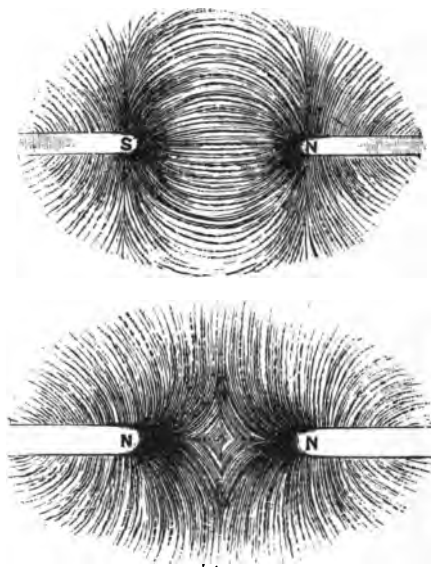


Fig. 38.—Illustrating the forces producing attraction between unlike poles and repulsion between like poles. The interposition of the body in both instances yields negative results owing to neutralization of unlike poles and the repulsion of like poles.

It has been observed that whereas the magnetic force increases the tone of the organs it neither contracts nor dilates them.

In my earlier investigations errors of interpretation ensued with reference to the foregoing.

Thus, when the magnetic force was allowed to act for several minutes in the region of the 7th cervical spine, prolapsed stomachs were hauled up a considerable distance. In all such instances, I was dealing with relaxed (hypotonic

or atonic viscera) organs. In the norm, however, such effects are not observed; the tone of the organ is augmented but there is no change in its position.

An important fact in the use of the magnetic force is that there is no danger of exhausting the tone of the organs nor in fixing a reflex from excessive stimulation and furthermore, in increasing the tone and in fixing a reflex, a *séance* need not exceed five minutes.

Physicists have demonstrated the fact that, under constant magnetizing force the magnetism will go on slowly and slightly increasing for a long time, a phenomenon called magnetic creeping.

ACTION ON VOLUNTARY MUSCLES.—In considering the action of the magnetic flux on the organs, we were dealing with visceral muscle (pages 7 and 147). It is not easy to gauge the action of magnetic force on voluntary muscles inasmuch as it is difficult to exclude expectant attention and the personal equation. However certain phenomena are quite evident.

The magnetic force is in no sense an excitant but a tone-producing force. Making and breaking the current of an electromagnet is without any effect and imparts no tone to the organs. With the patient approximating a giant magnet, fully 10 seconds elapse before the tympanitic sound of the stomach is converted into dullness.

The magnetic force permitted to act on voluntary muscles gives absolutely no evidence of its action despite the fact that augmented tone is imparted to them just as it is to visceral muscle.

If, one percusses any voluntary muscle during the time the percussed part is adjacent to the source of the magnetic flux, the muscle bulges and in susceptible subjects a spas-

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modic contraction ensues which may persist even after the flux ceases to flow.

The biceps (arm) is a suitable muscle for such experimentation. The same phenomena may be observed in the exposed muscles of a vivisected animal.

If a relaxed scrotum is exposed to the flux there is no retraction of the testes but, if during the time of the exposure, the *cremasteric reflex* is elicited several times, the scrotum shrinks quite perceptibly. The use of electricity is more exact.

One may note that, the reaction of the muscles is accentuated when the electricity is applied during the time the part is in proximity to an electromagnet.

The augmented reaction is quite evident and persists after the magnetic force is discontinued. The foregoing results are only noted after the parts have been exposed to the magnetism for about one minute. The augmented reaction depends on which pole of the magnet is directed toward the part acted upon by the electricity and which pole of the latter is used.

If the muscle is first demagnetized (page 161), the intensity of the muscle-reaction becomes less evident.

VISCERAL ATTRACTION AND REPULSION.—If one first determines the lower border of the liver by percussion, and fixes at a definite point below the site of dullness, the tip of a giant electromagnet and again determines the lower liver-border, the latter will be found to descend one or more centimeters during the time of the flow of the magnetic flux. The moment the flow of the latter ceases, the liver-border regains its former position.

The following facts were determined:

1. The tip of the magnet placed below the stomach,

spleen and kidneys will elicit the same phenomenon during the flow of the flux.

2. Placing the tip above the anatomic site of the abdominal organs cited, the organs rise only during the flow of the flux.

3. If the liver (and the same applies to the other abdominal organs), is first charged (for about one minute) with the north pole of the electromagnet and the tip of the latter pole is placed below the liver-border, instead of a descent of the latter, it rises. In other words, it is repelled.

4. If the liver is first charged from the south pole, the degree of its descent with the north pole is greater than when it is not charged at all.

5. If any of the spinous processes are concussed (excepting the 7th cervical spine), for one or more minutes, it is impossible to cause any descent of the liver, stomach or spleen. It is known that jarring or a few sharp strokes of a hammer may cause the greater part of the magnetism to disappear in a magnet.

If one however, concusses the 7th cervical spine which stimulates the vagus and causes the liver, spleen and stomach to contract (reflexes of contraction), the mechanic agitation is counterbalanced by the stimulating impulses conveyed to the organs in question.

If the region between the 3rd and 4th dorsal spines is concussed and the tip of the magnet is placed at a fixed point below the liver, the latter is repelled. Concussion of this region stimulates the sympathetic nerves (at the expense of the pneumogastric nerves), and has a conspicuous action in reducing the nerve-tone of the organs (page 162).

The heart has an important influence on the position

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of the abdominal organs as one can readily determine (selecting the liver for demonstration) by percussion. This influence is modified according to whether the heart-region is positively (N-pole) or negatively charged (S-pole).

6. If the tip of the magnet is placed at a fixed point below the spleen, the descent of the latter is greater at its anterior extremity than in the center of the organ.

Regarding the spleen (like other organs) as a magnetic structure, its greatest attractive force would be at its anterior and posterior ends.

In attempting to control by the X-rays the results obtained on the organs by percussion, I found it was often impossible. It was found that the X-rays in a powerful magnetic field were deflected from the target of the tube first in one and then in the other direction according to whether the north or south pole of the electro-magnet was presented toward the tube (Fig. 39). These effects were only observed after the tube had reached a certain degree of hardness.

The original theory of Stokes, that the Roentgen rays consisted of sets of ether-ripples was generally accepted despite the fact that there was no evidence of refraction, reflection or diffraction. Failure of the most powerful magnetic fields to create deviation favored an etheric rather than a corpuscular theory. More recent investigations of Bragg¹⁶, seem to prove that the X-rays are of two kinds; reflecting and non-reflecting rays.

Electro-optical phenomena are many. Faraday, discovered that a wave of light *polarized* in a certain plane can be twisted round by the action of a magnet so that the vibrations are executed in a different plane.

In 1877, Kerr, showed that a ray of polarized light is likewise rotated when reflected at the surface of a magnet.

Kundt, demonstrated that the plane of polarization of light-waves is also rotated if the light traverses an

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almost transparent film of iron placed transversely in a magnet field.

Attempts to prove visceral attraction and repulsion in animal-experiments were negative. Further investigations demonstrated the reason for the latter. In the human, a few whiffs of chloroform or ether even when mixed with oil of orange (page 82), destroys at once any downward pull of the viscera by the magnetic force. If a solution of cocain is used in the nose, the organ (*e. g.*, liver) instead of being pulled downward is actually repelled.

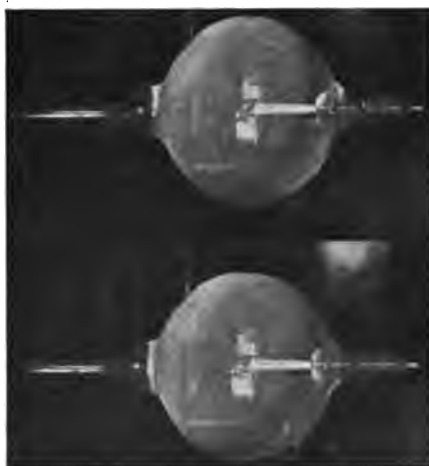


Fig. 39.—Illustrating deflection of X-rays in a powerful magnetic field. The upper tube shows the rays before the flux is permitted to flow. This illustration inadequately exhibits the pronounced deflection associated with a tube of a definite degree of hardness.

Fright or fear likewise destroys the downward pull on the organ. The emotions increase the adrenalin in the blood which annihilates the tone of the organs (page 8).

Experiments with the exsected stomach were equally negative in accordance with the well-known physiologic

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observation that, smooth muscle cut out of the body passes at once into a state of tonic contraction lasting for hours.

The physiologist who discredits observations made without the domain of his laboratory seems to forget that disease is practically an experiment of nature under abnormal conditions. All physiologic experiments made in the laboratory are equally conducted under adverse conditions.



Fig. 40.—Helix and coil of wire (indicated by arrow) for demagnetization.

VISCERAL DEMAGNETIZATION.—Demagnetization is effected by magnetizing in opposite directions and, by decreasing the intensity of the current, the magnetism is gradually reduced to zero. In other word, to demagnetize an object, one subjects it to a series of cycles of diminishing intensity.

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With the alternating current, a rheostat is the only adjunct necessary for demagnetization.

If only the constant current is at command, one may use a transformer or a cheaper substitute consisting of a double-throw pole-switch arrangement and gradually reduce the current by means of a water-rheostat.

To demagnetize the body, the author employs a universal and a local method. In the universal method, a demagnetizing coil is used consisting of a helix 6 feet in length and of sufficient diameter to enclose an individual. It consists of 188 turns of bare copper wire wound on a wooden frame (Fig. 41).

In the local method, a coil of wire is wound around a piece of soft iron (Fig. 40).

If an individual enters the helix and demagnetization is executed for several minutes, it is impossible to percuss the stomach even though the vagus is stimulated artificially. This action may persist for hours. The abdominal organs (liver, spleen, stomach), lie lower and it is impossible to elicit visceral attraction and repulsion (page 156).

LOCAL DEMAGNETIZATION.—It has been shown that the organs are dominated by two sets of nerve-fibers which are opposite in action and which for convenience may be grouped as vagus and sympathetic-fibers.

The vagus-fibers maintain the organs in a state of contraction whereas the sympathetic-fibers strive to keep them in a state of dilatation. When both sets of fibers are in a state of physiologic tone the organs are neither contracted nor dilated but in a condition of equipoise.

If we stimulate the vagus-fibers at the 7th cervical spine, we contract the heart, aorta, stomach, liver and spleen.

If one stimulates the sympathetic-fibers at a point

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between the 3rd and 4th dorsal spines, there is a dilatation of the foregoing structures.

By the foregoing maneuver, we have imparted tone to the vagus or sympathetic fibers.

The magnetic force is the equivalent of tone (page 124) insomuch as by its use a like effect is attained.

Demagnetization corresponds to the removal of tone. If one applies the extremity of the iron rod (Fig. 40) to the 7th cervical spine and executes demagnetization for several minutes, the tone of the organs supplied by the vagus-fibers is annihilated and the action of the sympathetic-fibers on the organs becomes dominant.

In consequence of the foregoing, percussion will show:

1. Dilatation of the heart and aorta;
2. Enlargment of the stomach, liver and spleen;
3. Dilatation of the intra-abdominal veins.

If one removes the tone of the stomach by demagnetization, how can one demonstrate enlargement of the organ by percussion? The magnetic force neither contracts nor enlarges an organ but merely fixes it in a definite position. After demagnetization of the vagus, the flux is directed toward the region of the stomach until it acquires sufficient tone to yield a dullness on percussion. After this manner, dilatation and descent of the organ may be demonstrated.

The abstraction of tone from the vagus is easily demonstrated.

First of all, one must know that, if pressure is made in the region of the 7th cervical spine the pulse can no longer be felt if a certain degree of pressure is executed. The greater the tone of the vagus, the more pressure is necessary to stop the pulse.

If, in a given case, 10 kilograms of pressure are neces-

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sary to arrest the pulse at the wrist by means of my spondylopressor (Fig. 1), after demagnetizing the vagus at the 7th cervical spine, the pulse will be inhibited with a pressure of 3 or 4 kilograms.



Fig. 41.—Illustrating the area of stomach-dullness incident to the ingestion of water. With the ingestion of 9 ounces of water, this dullness continues for about one minute but it persists if the tone of the organ is removed by demagnetization of the vagus.

Another simple method is to ingest 9 ounces of water. In the norm, this produces a dullness (Fig. 41) not exceeding one minute. If, during the time the water is ingested and demagnetization is executed at the 7th cervical vertebra, the dullness will persist during demagnetization and for some time thereafter until the vagus which controls the output of water from the stomach has again acquired tone. The latter may be acquired at once by exposing the subject to the magnetic force.

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If one desires to remove the tone of the sympathetic fibers, the rod of the instrument (Fig. 40) is fixed between the 3rd and 4th dorsal spines and the effects noted are:

1. Contraction of the heart and aorta;
2. Contraction of the liver, stomach and spleen;
3. Contraction of the intra-abdominal vessels.

In the latter maneuver, the vagus-fibers become predominant.

After the tone has been abstracted from the vagus or sympathetic fibers it may be restored at once by charging the former with the magnetic flux at the 7th cervical spine and the latter, between the 3rd and 4th dorsal spines.

It has already been shown (page 156) that, there is such a condition which I have referred to as visceral attraction and repulsion.

If one demagnetizes the spleen or liver by applying the rod of the apparatus (Fig. 40) over either organ, neither visceral attraction nor repulsion is possible. In demagnetizing the liver after the foregoing manner, the organ drops lower but does not enlarge.

When demagnetization is attempted over the heart-region, there is a drop of all the abdominal organs including the kidneys.

TRANSMISSION OF FORCE.*—When one strikes a series of blows corresponding to the 7th cervical spine, the vagus is stimulated (page 123).

Physiologists have always contented themselves with the generic statement that, if a nerve or muscle is irritated a stimulation ensues.

My observations show that, *stimulation is equivalent to the discharge of force*. The latter statement can be readily demonstrated.

*Energy, *vide* preface and page 115.

If, during the time the 7th cervical spine of one subject is struck a series of blows with a rubber-hammer, and the stomach-region in another subject standing in juxtaposition to the first subject is percussed, a dullness can be demonstrated. This dullness is of limited duration (about 30 seconds), but can be made to reappear by repetition of the blows. It will also be found that, the increased tone produced by the transmitted force increases the tone in all the organs supplied by the vagus hence, delimitation of the latter by percussion will be facilitated (page 184).

Such increase in the tone is of limited duration (30 seconds) hence the execution of percussion must not be delayed.

Concussion of other vertebrae is negative inasmuch as the effect is tantamount to demagnetization (page 160). Force may be shown to be transmitted in the following ways:

1. By contracting the muscles of one arm in juxtaposition to the stomach-region. When the two arms are forcibly flexed, no dullness of the stomach ensues. It is necessary to determine the reason for the latter, as it will explain a host of phenomena.

Physiologists have established the following facts:

- a. Electrical currents appear in the body when a muscle or nerve is active and such currents are intimately associated with the functional condition of the tissue.
- b. These action-currents correspond to the general law that, every active portion of nerve or muscle maintains a negative relation toward the resting part. In other words, the active muscle and nerve show a negative electrical reaction toward the resting muscle and nerve.
- c. The action-currents of muscle and nerve are sufficiently strong to have a stimulating action of their own.

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It is assumed by the author that, the force generated say in the one arm is negative and in the resting stomach-muscle it is positive the result being contraction of the stomach-musculature. When the muscles of both arms are synchronously contracted a number of times, there is a discharge of two negative forces which neutralize one another with negative effects on the stomach-muscle.

If two north or two south poles of two magnets are directed in the region of the stomach, no dullness of the stomach is elicited.

The foregoing will explain subsequent phenomena.

2. If the muscles of one arm of the subject (in proximity to his stomach-region) are brought to contraction by an electric current, a dullness of the stomach ensues but if the muscles of both arms are simultaneously contracted, there is no dullness.

Using one person as a subject and contracting the muscles of another subject (while the arms are in proximity to the stomach-region of the first subject), like effects may be noted.

Striking the arm-muscles is negative in its results.

3. If any part of one subject is brought in proximity to the stomach-region of another subject no dullness ensues *except when the heart-region is brought into such relation*. The contact must be immediate. If, however, the activity of the heart is augmented by inhalation of amyl nitrite, the effect is noted at a distance of several inches.

4. Stimulation of the muscles of a *dead frog* (the muscles still responding to electricity), will produce the effects noted when stimulating living muscles.

5. If the beating heart of a frog is removed from the latter, and placed on glass or a board and brought in immediate contact with the stomach-region of a subject,

dullness of the stomach is at once elicited. Thus, with an exposure of one-half minute of the beating heart to the stomach-region, the dullness of the stomach will persist for one-half minute.



Fig. 42.—Apparatus for recording stomach-contractions incident to the action of transmitted energy. It consists of a stomach-tube to one end of which a rubber-balloon is fixed and to the other end a pump for inflating the balloon in the stomach. The pump and stomach-tube are connected with a piece of V-glass tubing. The stomach-contractions are transmitted to a tambour, the lever of which makes the record on a revolving cylinder.

6. If, say a leg-muscle of a frog is removed and then divided by bringing the cut surface into contact with the longitudinal surface of the muscle a number of times in proximity to the stomach-region of a subject, dullness of the stomach is at once elicited. The force thus propagated is analogous to the electric currents from muscles.

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7. The same phenomenon is exhibited by metal (page 179) and plants.

Thus, if the stomach-region is brought in almost immediate contact with a growing palm, dullness of the stomach ensues. If, a leaf from a living palm is severed or, if the transverse cut surface is brought in contact with the longitudinal surface of the leaf a number of times (in proximity to the stomach), the same phenomenon of dullness is exhibited as when a muscle removed from an animal is similarly manipulated.

The effect cited by the maneuver with the leaf of the palm may be elicited at a distance of 5 feet from the patient and the force passes through a sheet of metal held in front of the stomach.

The transmission of psychic force is discussed on page 188.

With the apparatus shown in Fig. 42, an attempt was made to make a record of the stomach-contractions with the results shown in Fig. 43.

The effects of emotions on the stomach-musculature are shown in Fig. 44.

The use of the apparatus for making these records is no more difficult of execution than making records of the pulse.

MISCELLANEOUS EFFECTS.—It is difficult in the absence of a *reflexometer* to accurately gauge the action of magnetization and demagnetization on the reflexes.

The following effects are however apparent:

1. If the motor area of the brain on the right side is demagnetized, there is an apparent increase of the reflexes on the opposite side.
2. If the same area is magnetized, the reflexes on the opposite side become less evident.

Temperature.—If the temperature of the body is

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below normal, exposure of the individual to the magnetic flux raises the temperature one degree or to the normal.

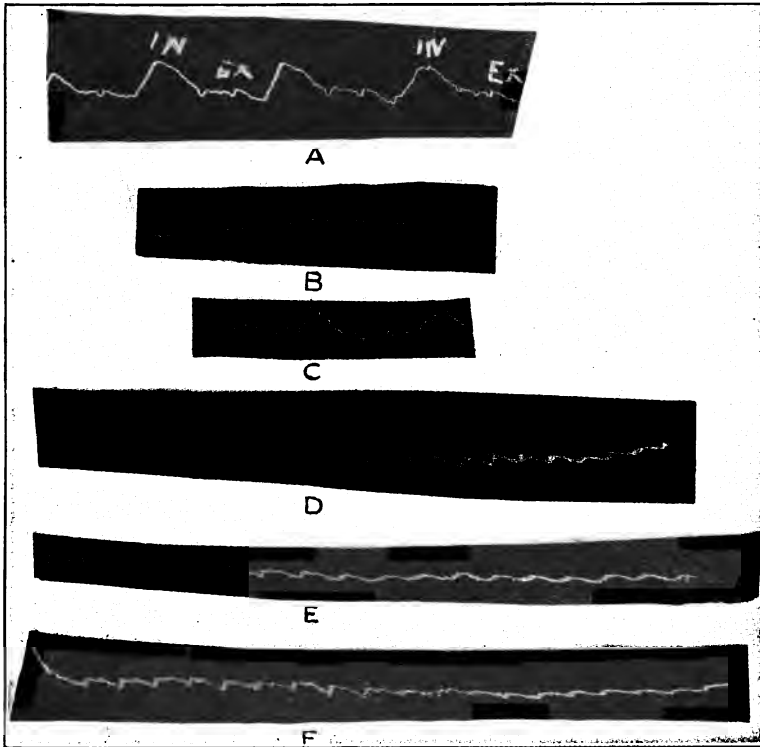


Fig. 43.—Tracings of the stomach with the apparatus shown in fig. 42. A, normal curves dependent on respiratory excursions; B, normal curves due to transmitted pulsations of the aorta; C, curves caused by concussion of the 7th cervical spine; D, curves caused by contraction of the stomach due to making and breaking of the current leading to an electromagnet in proximity to the subject; E, curves caused by *transmitted energy* from one subject (by concussing the 7th cervical spine) to another subject; F, curves due to transmitted psychic energy from one subject to another subject. During the making of records C, D, E, and F, breathing of the subject from whom the records were taken was temporarily suspended. The records of transmitted energy were made during the time one subject was in proximity but not in contact with the other subject.

To express this matter in terms of greater precision one instance may be cited. An individual with a tuberculous kidney shows a temperature of 96.2° F. He is

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then placed within 3 inches (without contact) of a powerful electromagnet (Fig. 32) for a period of 3 minutes. At the end of the latter time, the thermometer registers 98.6° F.

No influence is noted on temperature if the latter is normal.

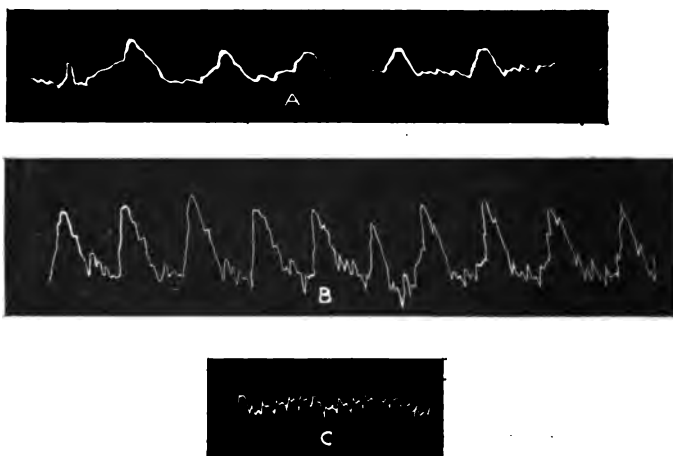


Fig. 44.—Physiological manifestations of the emotions as exhibited by contractions of the stomach; A, joy; B, fear; C, great agitation. These tracings were taken from different subjects in whom these emotions were expressed by aid of the apparatus shown in fig. 42. Practically identical records were made in other subjects under like emotional conditions.

In my investigations it has been noted that, *electrolysis* is accentuated by the magnetic flux. This may easily be demonstrated by aid of a solution of potassium iodid. The brown coloration (due to the liberation of the iodine) is more intense with than without the magnetic flux.

Microbiology.—Notwithstanding a number of investigations, no microbicidal action of the magnetic force could be demonstrated. The results on photographic plates were likewise negative.

Attempts were made to determine whether *digestion* was facilitated by the magnetic force and retarded by

demagnetization but I dare not venture to cite my results for the reason that they were not conducted over a sufficient period of time to justify any formulated conclusions.

Demonstration of stomach-border.—If what is known as a triple O capsule is filled with *ferrum reductum* (reduced iron), and well covered with wax (to prevent its solution by the gastric juice), is swallowed, its location may be determined by a powerful electromagnet. With the patient standing, the tip of the magnet is placed in immediate contact with the skin of the abdomen approximating the supposed position of the lower border of the organ.

In the average subject (without an excess of abdominal fat), when the current of the magnet is on, the capsule may be seen (and felt) to approach the tip of the magnet but disappears with every break of the current. The best effects are noted with make and break of the current.

The capsule is best located outside of the rectus muscle.

The impact of the capsule can be localized by the patient. Making and breaking the current during the time the tip of the magnet is moved about the region of the stomach is another method of localization.

Another method is to have the patient swallow a soft perforated iron-capsule about the size of the end of an average stomach-tube and connect it with rubber-tubing of small caliber. The capsule is better attracted if it has been previously magnetized by the pole opposite to that which is used for attraction.

To facilitate to localization of the capsule, a special method of percussion is employed. The finger is placed not on but just above the skin and then struck with the other finger. A peculiar flopping sound is heard in the region of the capsule.

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By placing the tip of the magnet in the region of the duodenum during the time pressure is made at the 5th dorsal spine (page 85), the capsule can be drawn into the duodenum. To show that it is in the latter situation, have the patient drink some colored water. If the capsule is in the duodenum, a glass syringe attached to the rubber-tube will aspirate a fluid differing in color from the ingested water.

CHAPTER X

DEDUCTIONS

HYPOTHESES—THE REFLEX NATURE OF MAN—TONICITY—ANIMAL FORCE — LIFE — PROLONGATION AND REINFORCEMENT OF REFLEXES — TOPOGRAPHIC PERCUSSION — VISCERAL ATTRACTION AND REPULSION — NEUROSES — SPLANCHNOPTOSIS — PSYCHIC FORCE — COLOR — POPULAR QUESTIONS — SUMMARY.

Hypotheses are essential in formulating conclusions based on all knowledge concerning scientific investigations.

Prior to the promulgation of the Newtonian hypothesis of gravitation and the laws of Kepler, astronomy was in a hopeless state of chaos.

The atomic theory in chemistry is incapable of demonstration yet, as a working hypothesis, it has created a revolution in this science. The fact that an hypothesis is only demonstrable by its results in no wise compromises its value.

Hudson, observes, "The most that can be said of any scientific hypothesis is that, whether true in the abstract or not, everything happens just as though it were true. When this test of universality is applied, when no known fact remains that is unexplained by it, the world is justified in assuming it to be true, and in deducing from it even the most momentous conclusions." The author is fully alive to the apothegm that, a single antagonistic fact militates against the value of the most ingenious theory ever evolved.

A careful study of the subject-matter of the preceding chapter directs attention to the pertinent fact that, the phenomena cited suggest the close identity of so-called animal-force with the various forms of force.

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Everything tends to show the identity of the various forms of force, notably, the conservation of energy, the advances in the study of radioactivity, the kinetic theory of gases and the transmutation of electricity into heat, light, motion or chemical energy.

Selenium changes the electrical resistance under the influence of light. In its crystalline condition, its sensitivity to light is increased especially to *greenish-yellow rays*. This property of selenium has led to the construction of the photophone.

The proof adduced by the author concerns chiefly the phenomena incident to the elicitation of the visceral reflexes and the tonicity of the organs, notably the stomach.

In accepting the reflexes as demonstrative evidence one interrogation seems apposite: Are the visceral reflexes acknowledged phenomena?

For many years, physiologists have been able to contract and dilate organs in vivisectioned animals by stimulating definite nerves of the spinal cord. What the physiologist has done in the laboratory has been successfully attained by the author in the living human.

In 1898¹⁶, the writer first demonstrated by aid of the X-rays what are now known in the literature as the "heart reflexes of Abrams." The latter signify contraction or dilatation of the heart incident to stimulation of definite regions of the spinal cord.

After this, a large number of his eponymic reflexes were discovered and his observations have been confirmed by some of the leading clinicians of the world.

Man is essentially a reflex animal (page 5). The phenomena of vegetative life, respiration, circulation, nutrition, etc., are produced in the subconscious state, and without voluntary effort. Consciousness is not co-

extensive with mind and the work of mentality can be accomplished without consciousness, just as the machinery of a clock might work without a dial.

Man portrays his automicity in his reflexes and the latter are controlled by a force over which he can exercise no conscious control.

The dead birds found about light-houses are drawn by the glare to strike against the heavy panes. The moth flies straight for a flame and if the pushing effect of the heat balances the attractive force of the light, it will circle the flame. A flower in a room will direct its petals towards the light.

The reflex acts of the birds and moths differ in no respect from the reflex acts of the flower. The same force is dominant.

Even though the author vaticinates the skeptic reception which will at first be accorded to his observations, he could not possibly have relinquished the many toilsome though delightful hours which he has devoted to a study of this subject. The force which inspired his instinctivity differed in no respect from that which activates the work of the ant or the bee.

TONICITY.—The contractility of the stomach-musculature and the transition of tympanitic resonance to dullness on percussion was also adduced as proof of the identity of the various forms of force.

Tonicity has already been discussed (pages 6 and 124). Muscle in a state of tension which is practically its tonus is a conspicuous example of living matter. In consequence of this tension, the efficiency of the stomach as a motor organ is increased. Muscle-tonus is a reflex and is caused by stimuli acting on the skin (and elsewhere) conveyed by nerves to the cord and from the latter, impulses are carried to the muscles. This tonus disappears if either the pos-

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terior roots of the spinal-nerves or the afferent nerves from the muscle are cut.

Important functions of tonicity are the production of heat and the maintenance of *metabolism*.

ANIMAL-FORCE.—The actual connection between magnetism and currents of electricity was not definitely determined until 1820, when Oersted, published the fact that a magnetic needle is disturbed by the presence of an electric current in its neighborhood.

Magnetism set up by an electric current is known as electromagnetism.

There is no difference in the magnetic force produced by a permanent magnet and that produced by an electric current. The magnetic field surrounding the flowing current consists of a kind of magnetic whirl and is strongest nearest the current.

Investigations concerning animal electricity began with the famous experiment of Galvani, in 1786, who observed contraction of the frog's thigh when touched in two places with the ends of a metallic arc. This discovery led physiologists at that time to believe that the vital force was at last discovered.

Notwithstanding Volta's observation that, the contractions were caused by the dissimilarity of the two ends of the metal touching the moist conductor and upon the production thereby of a Galvanic arc, later investigation demonstrated that electrical differences of potential do occur in the animal body.

In every active nerve or muscle electrical currents are produced, and the latter are intimately associated with the functional condition of the tissue. Every active part maintains a negative electrical relation toward the part at rest.

Electrical phenomena are encountered in other tissues and in plants.

If a shaded and exposed part of a green leaf be connected with a Galvanometer, an electric current is developed when the light falls on the exposed part.

The electrical organs of electrical fishes are essentially metamorphosed muscles and the force of the electric current in the cramp fish amounts to 31 volts.

For many years, the subject of animal electricity was in disrepute owing to the charlatantry associated with it, but thanks to its scientific investigation by physiologists, notably, DuBois-Reymond and Hermann, it was partially rescued from evil.

It is questionable whether animal-magnetism is derived wholly from animal electricity or the earth's magnetism or whether both are concerned in its production. The theory of Ampère, supposed that the cause of the earth's magnetism was due to currents of electricity flowing around the earth.

One may conceive the sun as a gigantic cathode negatively charged giving off corpuscles like all incandescent bodies. These corpuscles coming under the influence of the earth's magnetism travel along the line of the earth's magnetic force. It is even probable that the corpuscles whirling about on their own axes create a magnetic field in their vicinity.

It is reasonable to assume that, the molecules of animal tissues are inherently or naturally magnetized; each molecule showing a north and south polarity. This polarity may be caused by closed circuits of animal electricity or from the magnetic flux in the atmosphere.

In the act of magnetization, like poles face in the same direction (Fig. 31). We may further assume that every

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electrified molecule is a magnet with varying degrees of magnetic force and what is known as chemical affinity is nought else but the magnetic properties of molecules.

Energy is essentially the mechanics of the *ether* and force is anything which moves matter.

LIFE.—Scientists are disposed to group the natural sciences into the biological sciences dealing with living things and the abiological or physical sciences dealing with lifeless matter.

It was a great concession when the vital phenomena of animals and plants were studied equally with man in determining the field of life.

Of all vital phenomena, motion furnishes the most suggestive impression of living. Thus, a child would regard a steam engine as a living thing.

The conception of life has always varied with the development of the human species. The primitive conception was associated with the wind, waves, fire, in fact with anything in motion.

Vital-force was primarily employed to signify a mystical power resident in the living and differing from electric, thermic and other forms of energy.

At present, vital-force signifies energies resident in living matter.

The hypothesis of vitalism, supposed that the phenomena of life are inexplicable apart from a special vital-force resident in organisms and different from the chemico-physical energies of the inanimate world.

The neo-vitalists maintained that it was impossible to furnish a complete chemico-physical restatement of any observed function.

Vitality was a complex adaptive synthesis of matter and energy, the secret of which was unknown. Foster con-

tended that what we call structure and composition must be approached under the dominant conceptions of modes of motion. The qualities of living matter are expressions of internal movements.

Our present conception of vital phenomena (in animals and plants) refers the vital energy to a single inorganic force drawn from the sun. The sun is an inexhaustible source of physical energy and maintains the activity of all living things. The forces which exist in nature may be transformed but not created by living things.

The forces of organic and inorganic matter are identical.

The distinguished Calcutta physicist, Bose, believes that in some obscure degree, all matter lives. It is difficult to distinguish a dividing line between the animate and inanimate. Bose, regards as a true test of life in an object, its capacity to respond to an external stimulus—*i. e.*, its irritability or sensitiveness. Iron is as irritable as the human body as shown by a galvanometer. Metals have periods of activity and rest like animal matter; they show curves of fatigue when stimulated excessively, and stimulants and narcotics have an action on metals similar to that observed in living animal matter. The forces emanating from chemical reactions and metal show the same action as the force discharged from the organism.

Dissolving common salt in a vessel of water or striking steel with a hammer in proximity to the stomach-region, will at once evoke a transitory area of stomach-dullness. With the salt undergoing solution a tremendous force is developed (page 181). Striking the steel mechanically agitates it and demagnetizes it. Why a few strokes of a hammer causes the greater part of the magnetism to disappear cannot be accounted for by physicists but in the light of my investigations it would appear to be caused by a discharge of force from the metal. To avoid air-concussion, the metal was struck with a rubber hammer.

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Life is dependent on external conditions of the earth's surface and is in a sense a function of the development of the earth. In the ceaseless and intricate dance of the molecules constituting living matter, the question of personal identity must be considered. Matter is essential to consciousness. Matter changes constantly but consciousness shows no solution of continuity. As one writer observes, "Constancy of form in the grouping of the molecules, and not the constancy of the molecules themselves, is the correlative of this constancy of perception."

There is no reason to question the belief that, if one could gather the molecules and put them in the same relative positions which they occupy in the organism and endow them with identical forces and distribution of forces and motions and distribution of motions, this organized molecular concourse would constitute a sentient thinking being.

Identity is no less an attribute of inorganic than it is of organic matter.

The property of assuming more than one elementary form is known in chemistry as allotropism. The diamond, graphite and amorphous carbon are identical in composition, although showing different properties. Here identity is not only a question of a difference of the number of atoms in a molecule but a difference in the arrangement.

When crystals of urea were first discovered in the body they were regarded as products of vital energy but this theory was exploded when urea was formed outside of the body by synthesis.

Scientists recognize a law of change and a law of continuity. They deal with energy which is neither created nor destroyed. Respecting mentality at death, we do not know

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what part of the cosmos takes it up. The latter is a problem of psychology.

The chemic theory of Pflüger suggests that the real difference between dead and living *proteid* lies in the grouping of the nitrogen in the molecule.

In the physics of life, the origin of energy predicates an understanding of the law of the conservation of energy. Chemic action is demonstrated by different forms of energy; it may be heat, light or electricity. A chemic reaction is not only a rearrangement of matter, but also a transformation of energy.

The epoch-making researches of Loeb, suggested the identity of electricity and vitality.

Common salt dissolved in water makes the latter a conductor of electricity.

Arrhenius, demonstrated that by this solution the molecules are torn asunder with an enormous electrical charge on the atoms (one set being positively and the other set negatively charged).

The electrically charged atoms are known as *ions*. In the contraction of a muscle, the negatively charged atoms start the contraction and the positively charged atoms arrest it.

The chief value of food is to produce electricity; heat and other objects are of secondary importance.

In deducing from the observations of the preceding chapter concerning the force concerned in vital phenomena, we are constrained to conclude that it is an electromagnetic force. Whether the electromagnetic force is derived from animal electricity or the latter is of magnetic origin is a mere question of logomachy.

Before the time of Oersted, the intimate relations of electricity and magnetism were not recognized and until the time of Faraday, it was impossible to conceive of the enormous storage of electricity from spinning magnets.

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In accordance with Ampère's theory of magnetism, which may be paraphrased with specific reference to the organism, one may regard the animal tissues as molecular magnets around which an electric current is continually flowing. In other words, the molecules of tissues are nought else but rotating portions of electrified matter (Fig. 45).

In the study of all vital phenomena, the cell must be regarded as an elementary organism. It is the beginning and source of the entire body. It is the primary anatomic and physiologic unit of the organic world. The essential constituent of the cell is bioplasm, the characteristics of which have already been discussed on page 126.

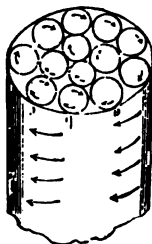


Fig. 45.—Illustrating Ampère's theory of magnetism. Each molecule has a current of electricity circulating round it. This figure represents the N-seeking pole and the currents move in the direction opposite to that of the hands of a watch (after Poyser).

We have noted that the magnetic force will reproduce the phenomena of bioplasm and in this action it is superior to all the other forces employed in our investigations. In assigning to electro-magnetic force the source of vital energy, we dare not deny the transmutation of the various forms of force.

PROLONGATION OF REFLEXES.—It has already been shown (page 125) that the magnetic force will produce reflexes lasting for many hours and in this respect the other known forces in comparison are relatively inert in action. This prolongation of the reflexes is equivalent to the supply of tone (page 124).

REINFORCEMENT OF REFLEXES.—Reading of the subject-matter on page 40, will elucidate the purport of this caption. The magnetic force may be employed in lieu of the mechanic methods cited. When a subject is exposed to the flux in a magnetic field, the organism displays its specific attribute of selection; the sympathetic-fibers and vagus-fibers appropriating an amount sufficient for their individual use. If, however, one charges the vagus-nerve at the 7th cervical spine, this power of selection is defeated and the tone acquired by the vagus-fibers will be in physiologic excess of the inherent force present in the sympathetic nervous system.

Life, said Sir Thomas Browne, "is a pure flame and we live by an invisible sun within us."

The organism may be regarded as an animal machine. Ostwald speaks of a benzine motor, which regulates its benzine-supply by means of a ball-governor in such a way that its velocity remains constant, as having exactly the same property as a living organism. If such a machine could work constantly and could receive an inexhaustible supply of benzine, we would be compelled to regard it as a living organism.

In our mechanistic conception of life, we fail to pay due regard to the regulatory mechanism of the organism by which it regulates its supply of force (as expressed in tissue-tone) and what physiologists call force. The selective attribute of supplying and discharging force to the organs is probably mediated by the autonomic system (page 25). If during the time this system is demagnetized (at the 7th cervical spine), it is impossible with the most powerful electromagnetic flux to elicit any stomach-dullness; *i. e.*, no tone can be imparted to the stomach or for that matter to any of the other organs.

It is not unlikely that, the sympathetic system is purely negative in action like the vasodilator nerves

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(page 64); its activity only becoming manifest when the force resident in the autonomic system becomes diminished. At any rate, force as a factor in the animal machine is an important one.

TOPOGRAPHIC PERCUSSION.—Augmenting the supply of tone to the organs by increasing the rigidity of their muscular components will yield a more pronounced dullness on percussion (page 150). After this manner we may delimit the organs in a manner almost equivalent to their delimitation by the X-rays without any of the errors or inconvenience incident to the use of the latter. To attain these results, all that is necessary is to have the patient stand in proximity to the source of the magnetic force.

In this respect, either pole is sufficient. In the absence of a large electromagnet, one may fix an ordinary horse-shoe magnet in the center of the organ which is to be delimited (Fig. 36). The right border of the heart which is conceded to be difficult to delimit is readily outlined provided percussion is executed at the end of a forced expiration.

VISCERAL ATTRACTION AND REPULSION (page 156).—No conclusions have been formulated respecting these phenomena exhibited by the organs in morbid conditions. Sufficient data however, have been accumulated to show that further investigations will furnish important facts concerning this subject.

Drugs have an important influence on the phenomena in question (page 159). In hysteria, asafetida, valerian and allied drugs, have been found empirically to possess a remarkable sedative action. Such effects have never been explained other than by saying that, all malodorous drugs are grateful to hysterics.

In hysteria, I have found that the organs show little or no magnetic attraction but after administering a drug like valerian the attraction is augmented; that is to say,

the liver will be found to descend lower after than before the administration of this drug.

TRAUMATIC NEUROSES.—After accidents, symptoms of neurasthenia or hysteria or both develop. The condition is often known as “railway brain” or “railway spine.” As a rule there is no anatomic change present to account for the symptoms. It has been shown on page 157, that concussion of the vertebrae is equivalent to demagnetization but whether the latter has any bearing on the condition is a matter for further investigation.

Mere concussion of an organ like the liver will not only prevent its descent by an electromagnet (page 156) but will actually cause its repulsion, *i. e.*, percussion shows a rise of the lower border of the organ.

SPLANCHNOPTOSIS.—Many ingenious theories have been suggested to account for prolapse of the abdominal organs. Among the theories are:

1. Pathologic reversion of the location of the abdominal organs to an embryonic state;
2. The abdominal organs are supported by ligaments and when the firmness and rigidity of the latter are impaired the equilibrium of the organs is disturbed. This theory is defective for the reason that, all the ligaments in the abdomen are insufficient to support even the liver;
3. The abdominal organs are kept in place by intra-abdominal pressure.
4. The organs are kept in position by negative aspiration of the thorax;
5. The position of the organs is maintained by pressure and ligaments;
6. The organs are maintained in position by the normal tone of their muscular tissue (page 8).

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The author finds that the latter theory is probably the correct one as can be demonstrated by the following investigations. If one demagnetizes (which is equivalent to the abstraction of tone) the region corresponding to the 7th cervical spine, tone is removed from the pneumogastric nerve which supplies the abdominal organs. In consequence



Fig. 46.—Illustrating a fall of the organs (aorta, heart, liver, spleen and stomach) after removal of vagus-tone by demagnetization at the 7th cervical spine. The broken lines indicate the position of the lower borders (excepting heart and aorta) before and the continuous lines after demagnetization.

of this loss of tone or energy, there is an immediate drop of the liver, stomach and spleen (Fig. 46). A more decided drop is noted if demagnetization is executed over the region of the heart. The latter is probably the chief source of the energy of the organism (page 164). In consequence of the latter maneuver, the heart likewise drops. If one now

charges the vagus with magnetic force at the 7th cervical spine, the organs at once resume their former position.

It has already been shown (page 154) that magnetic force only fixes but does not raise normal viscera, hence, by this method we have a simple means of determining the presence of prolapsed organs. If, by charging the 7th cervical spine, any organ rises in position, it must have been prolapsed.

Demagnetization attempted over the liver or spleen causes only a descent of the liver or the spleen.

If one demagnetizes between the 3rd and 4th dorsal spines, the tone of the vagus is no longer counteracted by the tone of the sympathetic nerves (page 161) and the organs occupy a higher position than when the magnetic force is conveyed to the vagus at the 7th cervical spine.

The behavior of the kidneys was quite contrary to my expectations. Demagnetization at the 7th cervical spine causes a rise in the position of the kidneys and a contrary effect when demagnetization is executed between the 3rd and 4th dorsal spines. It is possible that although the normal position of the other organs is dominated by the vagus the sympathetic influences the normal position of the kidneys.

Force of the heart.—Electrical variations due to the contractions of the heart (Fig. 47) may be determined by electrocardiograms. Here, the contraction of a ventricle is comparable with a simple muscular contraction (page 165).

The hands of the patient are immersed in jars containing 0.9 per cent. of sodium chlorid solution. The jars are connected in circuit with a very delicate Einthoven thread-galvanometer and the movements of the latter are recorded photographically. This apparatus is chiefly employed in detecting irregularities in the rhythm of the heart.

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An important avenue of study consists in determining the force of the heart by the method indicated on page 166. Here, force may be calculated by the intensity and duration of dullness plus the distance from the subject in whom dullness of the stomach is evoked.

PSYCHIC FORCE AND ITS TRANSMISSION.—On page 165, reference was made to definite facts concerning action-currents.

The following investigations show that the psychic action-currents conform to like laws.

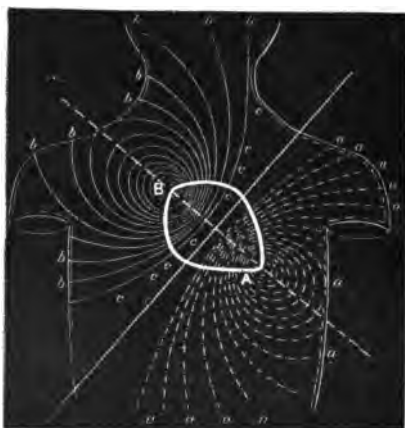


Fig. 47.—Showing variations of electrical potential associated with the beat of the human heart and their distribution in the body (after Waller). These electrical currents generated by the activity of the heart diffuse throughout the entire body according to the usual laws.

The action-current is associated with the process of excitation and is produced by all kinds of stimuli but varies in strength with the strength of stimulation.

1. If one side of the head of a subject is struck a series of blows by means of a rubber-hammer, a stomach-dullness in the subject ensues. Here a force is generated not unlike that evoked by striking the 7th cervical spine (page 164).

2. If, however, blows are struck on both sides of the head of the subject, no stomach-dullness can be elicited. The two negative currents apparently generated neutralize the production of psychic force. Concussion of the head in the median line is likewise negative.

3. If, while sitting in proximity to the exposed stomach-region of the first subject and one side of the head of another subject is concussed, a stomach-dullness can be elicited in

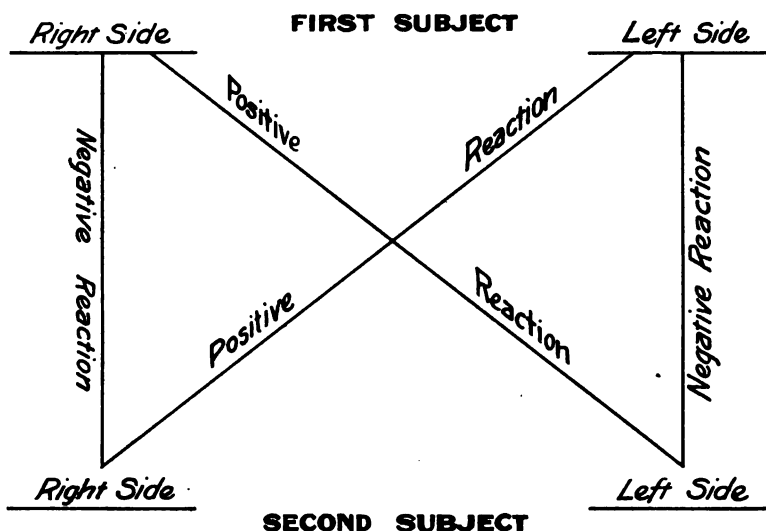


Fig. 48.—Illustrating positive and negative reactions on the stomach musculature by stimulating like and unlike sides of two subjects.

the first subject. Such dullness however, is not evoked if the head of the second subject is concussed in the median line or first on one and then on the other side.

If subject one is faced by subject two and the right or left side of the head of both subjects is simultaneously concussed, no stomach-dullness ensues. If, however, opposite sides of the head of both subjects are concussed, dullness ensues. A similar phenomenon is noted when the arms of both subjects are voluntarily contracted (Fig. 48).

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This experiment suggests that our bodies may be likened to a horseshoe magnet, positively charged on one side and negatively charged on the other side. Further, that the circumambient ether in proximity to our bodies is similarly polarized. In accordance with the law of attraction and repulsion (page 138), the positive and negative reactions in the foregoing experiments may be explained.

Electrotaxis illustrates this attraction and repulsion. If a Galvanic current is allowed to flow through a trough filled with water and containing animals, the latter move in the direction of either the positive or of the negative current.

4. These maneuvers are negative with moderate electric stimulation.

5. If during the time the center of the head is being demagnetized, concussion on either side of head is negative with reference to the elicitation of dullness. If, however, only one side of the head is demagnetized, concussion of the other side elicits the stomach-dullness. If demagnetization is executed over the region of the heart, concussion of the head is negative in revealing stomach-dullness.

The probable source of the force in the organism is from the heart.

6. *Thought yields a force the presence of which can be exhibited by stomach-dullness.* This force however is not revealed if the brain functionates in its entirety unless a special maneuver is tried. It is necessary to demagnetize one side of the brain during the time of thought. In demagnetizing, it is not necessary to reduce the intensity of the current (page 160); the mere change of polarity suffices. The best effects are noted when the rod of the demagnetizing instrument is placed on the side of the frontal region.

With the first subject in one room with closed doors and

the other subject in another room, the force provoked by thought may be transmitted from the latter to the former over a distance of forty or more feet as revealed by stomach-dullness in the first subject. Psychic force passes through metal and all other media thus far tried.

Anger and emotions yield a force which may be transmitted over a distance of eighty feet.

The potentiality of the psychic force is determinable by the intensity and duration of the stomach-dullness and the distance of the subject from the person engaged in thought. The position of the recipient with reference to the person occupied in thought is of no moment but the recipient must be standing to elicit the reaction of stomach-dullness.

In my experiments, the person engaged in thought was instructed to perform examples in mental arithmetic.

The Cartesian conception that, matter cannot act where it is not, was overthrown by Newton, in his law of universal gravitation.

7. COLOR influences the transmission of psychic force as can be noted when the person engaged in thought holds large colored sheets of gelatine in front of the head. Green and violet obstruct the passage of the force whereas blue and notably *yellow* intensify the action of the force as revealed by the intensity and duration of the stomach-dullness. Light acting on the head through a yellow medium minimizes psychic activity (page 200).

Some writers work better in proportion as the heat and light are more intense. Some cannot think well in the dark. Red excites some individuals and most animals. Witness the matador as he excites the infuriated bull to charge by manipulations of his red cloth.

There is reason for the foregoing. Electric light thrown on one side of the head stimulates like a blow

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and excites the stomach to contract. Directed on the center of the head, it is negative. Light passed through a red medium covering the head is negative when directed on one side of the head but produces a powerful contraction when directed on the *center of the head*.

This exciting effect on protoplasm is the same whether resident in muscle or brain.

Psychic force may be transmitted to another (as revealed by stomach-dullness), if during thought, the *head* is covered (covering other parts does not suffice) with some red material or, if the latter is held in front of the stomach of the second subject.

This experiment dispenses with the necessity of demagnetizing one side of the head. Furthermore, the stomach of the patient engaged in thought may be used provided any red material is thrown over the head or held near the stomach-region. If red paper or any other red material is thrown over the head of an intelligent dog, the stomach of a subject in proximity to the animal shows dullness and the latter disappears when the colored material is removed. The force thus transmitted differs in no respect from the psychic force of the human as far as its physiologic effects is concerned.

The foregoing experiments may explain some of the phenomena of telepathy. Thought-transference is a reality despite the fact that the most we know about it is that we know nothing about it and are not sure even of that.

The proceedings of the "Society for Psychical Research," reveal many pertinent paradigms which demonstrate that in man there is a faculty which permits him *at times* to communicate directly with the consciousness of another individual.

I have purposely italicized "at times" for the reason

that my investigations show that, the force is only propagated during the time one side of the brain is temporarily incapacitated (unless color is employed, page 192). It is necessary to show in further experiments if it is possible for an individual to inhibit voluntarily one side of the brain.

If in my experiments I have utilized the stomach-muscle as an index in revealing force and its transmission, conventionalism has not been disregarded.

Frogs' legs are now employed for recording wireless messages (Fig. 34). *Psychists* have accepted the contracting muscles of the frog as the first definite index of thought-transference. Our nerves and muscles are more complex and responsive than those of a frog.

"Cheiro," in his "*Language of the Hand*," describes an instrument for measuring psychic force and maintains that, the indicator-needle of his instrument establishes the reality of thought. Careful investigation by two members of the "*Society for Psychical Research*" demonstrated that the results were due to other causes.

The "sthenometer" of Dr. Paul Joire, is supposed to fulfill the same indications as the former.

A more thorough understanding of psychic force may explain the phenomena of *telekinesis*.

It is reasonable to suppose, considering the data already presented that the force of the organism may be compared to the magnetic force.

Magnets act at a distance although there is no apparent medium connecting them with the object acted upon.

The most tenable theory supposes that, the flux of the magnet passes out at its north pole and reenters it at its south pole.

In other words, the magnet at one pole is like a force-pump and at the other pole, it is like a suction-pump. After this manner attraction and repulsion are explainable.

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COLOR.—The experiments on page 130, direct attention to the influence of color on tonicity of the organs. The therapeutic value of colors (chromotherapy) has been acknowledged on empirical lines.

Percussion demonstrates that in the light, the organs show more tonicity and better delimitation (page 184) than in the dark. Respecting the action of color on the tonicity of the stomach, *vide* page 129,

Fleming, in his book "*Waves and Ripples*," shows that there are many more ether-waves than are currently supposed in the solar spectrum and with the diffraction spectrum of Langley, it has been shown that the greatest heating power is not found in the infra-red, but in the orange or orange-yellow. We found that these colors will augment the action of the forces (pages 129 and 191).

In the spectrum one finds radiations varying in length from several miles long (oscillations of Hertz) to less than .000009 of an inch (violet rays). Light is an electromagnetic disturbance of the ether. It is in this way only that one can account for the penetrating effects of light as shown in my experiments. I am assuming that, *light is positively or negatively charged and colors are probably only different charges* (page 203).

Dullness produced by yellow (page 128) is at once dissipated by violet, blue or green.*

Why red permits the transmission of psychic force with the brain acting in its entirety, I cannot say other than to suppose that it is oppositely charged to the two hemispheres of the brain.

*In my works on "Autointoxication," (page 245), and "Diagnostic-Therapeutics," color in diagnosis (chromodiagnosis), has been discussed.

POPULAR QUESTIONS.

PERSONAL MAGNETISM.—Although this phrase is now employed figuratively, at one time it had a literal significance. It was supposed that a physical force equivalent to that exhibited by a magnet passed from one person to another. This conception of personality was abandoned when science was unable to demonstrate a so-called transmitted vital force. If one reviews the history of medicine one finds that, the great men in the profession owed their success to their personality. “Successful treatment,” said Hufeland, “requires one-third science and two-thirds *savoir-faire*.” Science and heart are so nicely blended in the truly great physician that neither is operative separately. “Cheer is a powerful drug, for a merry heart doeth good like a medicine.”

The so-called personal magnetism has been chiefly exhibited by “healers” who were not physicians. Their presence or manipulations seemed to arouse the latent energy of the patient and endow him with increased vitality.

With the facts presented are we in a position to deny teledynamics or a transmission of energy?

What is known as induction of magnetism is the communication of the latter to a piece of iron without actual contact with a magnet and by this process the piece of iron will have two poles; the pole nearest to the pole of the inducing magnet being of the opposite kind, while the pole at the farther end is of the same kind as the inducing pole.

This inductive action is like that observed when a non-electrified body is brought under the influence of an electrified one. (*Vide*, page. 139).

Can we deny that the animal-force of one individual cannot act on another by induction?

Magnets have their likes and dislikes as exhibited by

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attraction and repulsion. All matter has the same attractive force. Every molecule is a magnet and is electrified. Some are powerful and others feeble.

As a rule, a natural *lodestone* cannot lift its own weight yet Sir Isaac Newton, had a lodestone set in his hand ring which although weighing but three grains could lift 233 times its own weight.

Chemical affinity is probably only the magnetic properties of molecules.

My friend, Carl Snyder, in his remarkable book, "*New Conceptions in Science*," observes: What we used to call loves and hates of the chemical "affinities" was but a name for the action of electrically charged atoms. Thus chemistry like light will be annexed to the wide domain of electricity.

Lord Kelvin, refers to matter as minute whirls or "vortex-rings." These rings are like the smoke-rings from a locomotive or from tobacco. Two smoke-rings attract each other like little worlds and if stopped by an obstacle in a room, they will move on again when the obstacle is removed. Gravitation is a relatively weak force when compared with the enormous molecular forces. In accounting for personal magnetism due regard must be paid to the vibration-rate during transmission of the force and to the fact whether the recipient is properly attuned to these vibrations. Personal likes or dislikes may only be questions of individuals in or out of tune (page 206).

MUSIC AND NOISE.—Every phenomenon in nature depends on matter in motion or vibration. In music we are dealing with vibrations which create pleasant mental images and emotions. The physical reaction of the organism to music is manifested by changes in the pulse-rate and blood-pressure. Quiet and restful numbers reduce the latter.

D e d u c t i o n s

Horace, in his Thirty-second Ode, Book 1., concludes his address to the lyre:

"O laborum, dulce lenimen, mihi cumque salve.

Rite vocanti."

(O, of our troubles the sweet, the healing sedative).

A line of poetry is nought else but simple physical processes; it means the rate of heart-beat and regularity or irregularity of breathing of the author at the time the verse was written.

Bacon, Milton and others, recognized the value of music as a stimulant to intellectual work. By aid of the *ergograph* it can be shown that, when the fingers are fatigued, music will restore their vigor. Sad music will have a contrary effect. Experiments on dogs demonstrated that music increases the elimination of carbonic acid, increases the consumption of oxygen and augments the functional activity of the skin. In consequence of its acknowledged physiologic action, music has been employed (musicotherapy) in the treatment of mental and nervous affections. In the classics, we recall that the singing of birds was the method employed to cure the insomnia of Maecenas.

The author is inclined to regard the pathology of many nervous affections as the physics of abnormal vibrations.

Recalling the observations on page 156, respecting visceral attraction and repulsion, it has been found that music and the vibrations of a tuning-fork will increase the descent of the liver whereas noises will not only destroy this attraction but may cause an actual repulsion of the organ.

Many popular expressions like, "shattered nerves," "nerves in tension," and "upset nerves," are employed to describe the sensations of nerves in disorder. The foregoing expressions may be literally true if we regard the structures of the body as infinitesimal magnets with modified polarity

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(*Vide*, page 182), or bear in mind the molecular vibration of nerve-tissue and the response of such tissue to the vibrations of tuning-forks as shown on page 206. Molecular vibration is a universal law.

• COSMIC INFLUENCES.—It is generally conceded that the cosmic forces exhibit a potent influence upon the organism. The nature of this influence is but little understood. The pains of rheumatic and gouty subjects are modified by conditions of the weather.

Edward Dexter¹⁷, has contributed an important monograph bearing on the mental and physiological effects of metereological conditions.

In a living organism a part of the available energy is necessary for the vital processes of living, while the reserve energy goes into the intellectual processes.

Weather-conditions play on the reserve energy by affecting oxidation, which is the chemical basis of life. Inhabitants of hot climates are apathetic and improvident. An equable, moist temperature weakens body and mind. The most favorable temperature for health, with its aggressive energy, is about 55 degrees F. and this is found in the temperate zones. The dominant peoples are shown between the 25th and 55th parallels.

The effect of weather has been shown upon human conduct by marked fluctuation of immoral acts. We find ourselves out of sorts on hot, humid, cloudy, and perhaps rainy days. We have always known the influence that weather-changes play in the causation of disease, especially in the so-called barometric neuroses. The total atmospheric pressure at sea level on an adult body is about fifteen tons. Variations of this pressure are compensated by resiliency of the blood-vessels, which equalizes the circulatory disturbances. In the old, however, the diminished arterial elasticity accounts for the headache, rheumatic pains, drowsiness, etc., resulting from altered pressure. Relative rarity of the air with

oxygen deficiency induces exhaustion. Electric storms produce headache. Positive atmospheric electricity stimulates and the negative variety present in inclement weather depresses the individual.

Arrhenius, has striven to show that various physiological processes, notably menstruation, are related to electrical variations of the atmosphere and the chemical changes thereby effected. At the suggestion of this celebrated savant, experiments are now being conducted upon 50 school children in Stockholm, to determine the effect of electricity upon the growth of children.

The application of electric currents to the soil has been shown to increase the quantity and quality of its products.

The influence of terrestrial magnetism (page 140) on the physiologic processes must be an important one.

The phenomena of terrestrial magnetism as exhibited in magnetic storms and the auroral light seem to have their analogies in the "brain-storms" and *photisms*.

CLOTHING.—Light-hunger, and may we add light over-feeding, are potent factors in disease. A poverty of light is no less pernicious in its effects than the excessive light of the tropics. Tropical neurasthenia has been attributed to overstimulation by the actinic rays of tropical sunshine. In our experiments we have noted that, relaxation of the organs (diminished tonicity) ensues when the solar rays are focused on individual organs. At a distance the rays augment the tonicity of the organs (page 128). We have found that the rays contracting the stomach act through black clothing and that the action of these peculiar penetrating rays may be inhibited by violet, green or blue. It is therefore suggested that for light-hunger, yellow (page 130) garments should be used and the other colors when the light is too intense.

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We have found that each time the light from an incandescent bulb is allowed to act on the head, the stomach of the subject shows dullness. The latter ensues with all colors excepting *yellow*. It is therefore suggested that this color should be utilized as a lining for hats when it is desired to minimize brain-activity due to the influence of light.

Magnetic rings, belts, etc.—Magnetism is frequently exploited by the unscrupulous advertiser who sells to the unwary rings, belts, pads and garments supposedly endowed with magnetic virtues. These have been repeatedly tested by the author with results which were invariably negative.

What is obvious cannot compete with what is obscure in the treatment of disease, hence the success of the charlatan.

If magnetism is desired, the expenditure of a few cents would purchase a really efficient magnet.

DEXTRAL OR SINISTRAL SYMPTOMS.—For some reason, patients will complain of symptoms predominating either on the right or left side of the body. Such complaints I have heretofore regarded as ridiculous. The cortical sensory areas dominate opposite halves of the body. If the skin on the right side of the body is irritated, stomach-dullness ensues but the latter cannot be elicited if the skin of the left half of the body is irritated. The tonicity of the right lobe of the liver is increased by irritating the skin on the left side and a like action is exhibited by the left lobe of the liver when the skin on the right side is irritated. A few inhalations of some anesthetic prevent the foregoing effects.

SUMMARY.*

1. The trend of scientific opinion is to reduce all force

*The number or numbers in parentheses refer to the page or pages in this work respecting the subject-matter from which conclusions have been formulated.

to a single underlying principle and to unify as it were, the various forms of force (115).

The theory of the *Conservation of Energy*, showing the transmutation of force (116) corroborates the foregoing.

The Aristotelian conception of "*Soul*" as "the vital principle" or the generally accepted distinction of Descartes, between mind and matter (*res cogitans* and the *res extensa*) is no more acceptable than the belief of theologians that, there existed in man an imponderable, incorruptible and incombustible bone which was necessary for the nucleus of the resurrection body.

One may speculate with metaphysics, but science invariably investigates and progresses along the lines of sense-impressions.

Science never transcends human intelligence, nor does it invoke in the interests of its doctrines any suspension of nature's laws; for, after all, "Facts are the words of God."

The religionist denies that science offers consolation to the soul. Applied to the ignorant, this contention may be true but the educated cannot reconcile doctrines in conflict with progressive science. The doctrine of "*Immortality*" is by no means alluring. Annihilation of self is, according to the religion of Buddha, perfect rest, and is not to be feared when old age has come with its inevitable assemblage of infirmities. Haeckel, relates the legend of the unhappy Ahasuerus, who vainly sought death after finding his eternal life intolerable. The orthodox doctrine of the soul supported by spiritualistic philosophers is that, it possesses none of the properties of matter; that it is created simultaneously with the body, and that it is capable of itself, independent of any other cause, of controlling the bodily functions.

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We must regard life as a force active on and through matter.

2. The electronic theory (115) employed in explanation of physiotherapeutic action, supposes the results to be effected by the interplay of moving particles electrically charged. The action in question causes the discharge of reflexes.

3. Stimulation predicates a discharge of animal-force (164), and one of the evidences of the latter, is augmented tonicity of the organs and tissues (123). •

4. The chief source of animal-force is probably derived from the heart (164) and its distribution in the organism is one of the functions of the autonomic nervous system (25). The sympathetic system is probably only negatively active.

5. Animal-force, as far as its physiological action is concerned, cannot be differentiated from the other forms of force. It is a form of energy like light, heat, electricity, magnetism and the X-rays.

Electricity is an invariable property of matter but matter and electricity are so intimately associated that they are practically the same. The organism may be regarded as an aggregation of electrified corpuscles and in this sense, all life-processes (vitality) and electricity are identical. What we regard as animal force or energy may be the electrical charge of the individual atoms whereby one set is positively charged and the other negatively. Here, force must be regarded as a vehicle of energy: in motion, it is current and magnetism, under strain, charge and in vibration, light. Animal-light, peculiar to luminous fish, crustaceans and zoöphytes may thus be explained. Photisms (glossary) are likewise explainable.

6. Assuming the electronic theory to be correct (115),

the atoms of matter constituting the organism are negatively and positively charged and that, if an electron is withdrawn from the atom the latter is left positively electrified.

The organs exhibiting attraction and repulsion (156) conform to the law that, bodies charged with one kind of electricity repel those charged with the same kind, but attract those charged with the opposite kind.

7. The organs are maintained in their normal position by an electromagnetic attractive force. If the latter is partially removed (186), the organs fall, and rise when supplied with any of the various forms of force, the most potential of all being the magnetic force.

Color likewise influences the relative position of the organs as will be subsequently noted.

8. My experiments with light and colors (127 and 194) seem to prove that, the so-called spectral-colors consist objectively of very rapid transverse electromagnetic vibrations of the ether, ranging from approximately 400 millions of millions per second for red to 760 millions of millions for violet. This theory assumes that waves of light are not mere mechanical motions of the ether, but that they are undulations partly magnetic and partly electrical. In addition to this accepted theory, I assume that colors represent different electrical charges.

The visible spectrum of "white light" is only about one-tenth of the actual measurable solar spectrum. The sense of color is probably variations in the amount of energy. Thus, the energy necessary to produce the sensation of red must be 100,000 times as great as the energy necessary to produce the impression of green.

Two spectral-colors producing by their mixture the sensation of white are known as complementary colors. They are as follows:

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Red and green-blue;
Golden yellow and blue;
Blue, green and violet.

It has been shown (153) that the positive or north pole or the south or negative pole of a magnet will, by increasing the tone of the stomach transform a tympanitic into a dull sound (reaction) but if the two poles are employed synchronously, the poles are neutralized and no dullness ensues. Like poles yield a reaction *when presented in the same direction*.

When colors were used with the poles of a magnet, the following was observed:

- a. Yellow with the negative pole, no reaction;
Yellow with the positive pole, a reaction;
- b. Green with negative pole, a reaction;
Green with positive pole, no reaction;
- c. Violet with negative pole, a reaction;
Violet with positive pole, no reaction;
- d. Blue with negative pole, a reaction;
Blue with positive pole, no reaction;
- e. Red gives a positive reaction with both poles.

From the foregoing, one is constrained to conclude: Yellow is positively charged, whereas green, violet and blue are negatively charged and red, is both positively and negatively charged.

We know that an intense white light (from an incandescent lamp) will produce stomach-dullness when directed on the gastric region (128).

All of the complementary colors yield a *positive reaction*.

When the positive pole of a magnet is directed toward the stomach, it yields a positive reaction, but, if the subject swallows 2 grains of medicinal methylene blue, there is no reaction.

This latter experiment may aid us in elucidating the disputed photo-chemical theories of color-perception and may show that the retinal excitation of colors is dependent on positively or negatively charged electromagnetic vibrations.

The gastrologist may utilize this method for determining many obscure problems. Thus, if a blue colored substance is ingested with the food, the duration of digestion (or the time when the food leaves the stomach) may be determined by the reappearance of stomach-dullness when the stomach is exposed to the flux of the positive pole of a magnet.

My investigations suggest that, the position of the organs is influenced by color, and it is not improbable that, the red color of arterial blood and the blue color of venous blood were destined in part for the specific object of hastening the circulation.

The light of a red incandescent lamp over the heart and a blue lamp over the region of the liver causes the latter to ascend. By reversing the position of the lamps, the opposite condition ensues—the liver descends.

8. The X-rays are not different from ordinary light when the physiological test suggested (148) is established as a criterion of action. Indeed, there are media impervious to the X-rays which permit of the penetration of light.

9. The transmission of energy from one organism to another has been established (164).

The energy developed in contracting a muscle demonstrates the same physiologic action as the energy generated by thought. The content of thought like color is probably dependent on the number of waves in a second of time or by the corresponding wave-length. Thus, we may speak of the physics of thought.

It is within the range of probability that some means

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may be discovered for modifying the vibrations of the psychic force and thus establish the content of thought.

10. The recognition of animal-force and the utilization of like forces suggests many possibilities in the realms of science, notably in the direction of elucidating many obscure problems in pathology. We may eventually define pathology as the physics of abnormal vibrations. By aid of appropriate vibrations we may restore the equipoise of the body by a rearrangement of the molecules or by raising their vibration to a normal standard of frequency. This action corresponds to tone-vibrations which set other bodies in motion. Thus, if the A-string of a violin is struck, the A-string of a piano standing near sounds in harmony with it. It is not improbable that investigations along lines here suggested will demonstrate that each organism has its normal standard of vibration and this will be modified by disease. In my limited observations, it was found that, the transition of the tympanitic sound to stomach-dullness in the norm was effected with tuning-forks with a vibration-number of 256. When the vibrations were very much above or below this standard the results were negative. By increasing the tone of the vagus (page 123), the stomach responds to higher or lower vibrations. In making the tests the tuning-fork is held in proximity to the stomach.

Faith cures may be attributed to the creation of energy or the rearrangement of tissue-molecules by powerful emotions. Thus, we may speak of the physio-chemistry of cures.

11. The dominant action attributed to the reflexes (5 and 40) in our mechanistic conception of the life-processes, is in accordance with our belief, that instinct is a mere expression of the various forms of force. The phenomena of the animal-body are vital demonstrations of chemistry and

mechanics, and are as irresistible as the force which causes the magnet to attract iron filings. The bee constructs a perfect cell without a mathematical education and birds migrate without chart or compass.

12. In accepting the reaction of the stomach-musculature as a basis for our varied deductions, we are employing bioplasmic matter (126), the most primitive and sensitive substance for exhibiting the phenomenon of vitality. The reaction manifested by increased tonicity is absolute, definite and easy of interpretation by a recognized method of examination known as percussion.

Other organs (notably, the heart) exhibit increased tonicity but the stomach is preferred for the reaction inasmuch as any change in its sound is easier of interpretation.

Contractions of the stomach may be easily demonstrated by aid of a manometer (Fig. 21) or a recording apparatus (Fig. 42).

By aid of the *gastrodiaphane*, one may note a diminution in the area of the stomach-illumination by approaching the region of the stomach with an ordinary horseshoe magnet. Transillumination in this way however, is too gross for recognizing the transmission of energy.

Any electrical difference of potential (that is, difference in amount of positive or negative electricity) is indicated by the swing of the needle of the Galvanometer.

To further prove the correctness of my observations, a stomach-tube converted into a non-polarisable electrode was introduced into the stomach and the hand of the subject immersed in a salt-solution. Tube and vessel were connected with a very sensitive Galvanometer.

When yellow light or a horseshoe magnet approached the stomach-region, the readings were invariably negative to the original electrical potential.

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Green light yielded no results but psychic energy through a red medium covering the head of another subject (page 192), gave the same effects as the magnet and yellow light. The magnet caused the greatest deflection of the needle.

GLOSSARY

BIOPLASM.—Any living matter. Also known as protoplasm, sarcode, biogen and cytoplasm. It always contains the following 12 essential elements; calcium, carbon, chlorin, hydrogen, iron, magnesium, nitrogen, oxygen, phosphorus, potassium, sodium and sulphur.

CREMASTERIC REFLEX.—Drawing up of the scrotum and testicle when the skin on the inner side of the thigh is irritated.

ELECTROLYSIS.—Decomposition of a salt, a chemical compound or certain tissues of the body by aid of electricity. The substances so decomposed are known as electrolytes.

ELECTROTAXIS.—The reaction of protoplasm (animal or vegetable) to one or the other electric pole. Positive electrotaxis refers to the living body attracted toward the cathode (negative pole) or repelled from the anode (positive pole). The reverse process is called negative electrotaxis.

ERGOGGRAPH.—An instrument used for recording the value of work done by muscular-contractions.

The ergodynamograph records muscular-force in addition to the value of the work effected by muscular-contractions.

ETHER.—A highly tenuous medium filling all space as well as solids and liquids and supposed to be the vehicle for transmission of the various forms of force.

GASTRODIAPHANE.—A small electric-light bulb introduced into the stomach. Examinations show transillumination of the anterior wall of the organ.

HELIOTROPISM.—Also known as heliotaxis and a form of

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phototaxis. Growth or movement toward (positive h.) or away from (negative h.) the sun or the sunlight.

IONS.—Groups of atoms conveying charges of electricity. Ions charged with negative electricity (from the positive pole or anode), are known as anions and those charged with positive electricity (at the negative pole or cathode), are called cations.

LODESTONE.—Iron ore attracting other pieces of iron. Specimens of lodestone are natural magnets.

METABOLISM.—A term employed to signify tissue-change and embraces the sum of the chemical changes subserving the functions of nutrition. It includes constructive (anabolism) and destructive (catabolism) changes.

PERCUSSION.—An important method of diagnosis first employed by Auenbrugger, a Viennese physician in 1761, and appearing in his work, *Inventum Novum*.

The basis of percussion consists of differentiating resonant from dull sounds. By its aid one can determine the density and tone of organs and define the situation of the latter. Resonant notes are produced over organs containing air whereas airless organs yield dull-notes.

PHOTISMS.—Subjective phenomena of luminosity. Individuals feel as though a dark-room became suddenly illuminated. Photisms have been coincident with many conversions. Saint Paul had a blinding heavenly vision.

The observation that rays similar to the N-rays are given out from the body and detected by a fluorescent screen has never been confirmed and the same refers to the colored rays of Hooker.

POLARIZED LIGHT —A change effected in a ray of light passing through certain medium (*e. g.*, tourmaline) called a polariser. The transverse vibrations occur in only one plane in lieu of in all planes as in the ordinary ray of light.

PROTEID.—Also known as protein. A group of substances making up the greater part of animal and vegetable-tissues and formed chiefly by plants.

PSYCHISTS.—Believers in psychic force or those engaged in psychical research. The term psychic is also used to designate an individual who is endowed with the power of communicating with spirits (spiritualistic medium). Psychism as a doctrine refers to a universal soul animating all living beings, the difference in their actions being due to the difference of individual organizations.

REFLEXOMETER.—An instrument for measuring the force necessary to excite a reflex.

SPLANCHNOPTOSIS.—Also known as Glénard's disease and visceroptosis. Refers to an abnormal sinking down of the abdominal organs.

SUGGESTION.—Implanting an idea in the mind of another person by some act or word on the part of the operator. This is tantamount to the artificial production of a certain psychic condition. Experimenters are frequently influenced by the same condition (*auto-suggestion*) and, in their state of expectant attention, they frequently perceive what they expect to perceive.

TELEKINESIS.—An alleged spiritistic manifestation whereby movements of objects are effected without contact with the mover.

TYMPANITIC.—Refers to the sound elicited by percussion over organs containing air (stomach and intestines). The pitch of a percussion note over the stomach depends chiefly upon the tension of its walls enclosing the air. When the tension of the walls is increased, a tympanitic is converted into a non-tympanitic or dull sound and the latter is again converted into a tympanitic note, when the walls of the stomach are relaxed.

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