

MACKENZIE, (J. N.)

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II. — Nose; neurosis of the —
III. — Nose; affections of the nasal pharynx
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N.B. only the five, above, articles, indexed.
The others not indexed. Mich. 22/88. B.



Jno. N. Mackenzie, Baltimore.

Vol. IV., 1887., New York. Wm Wood & Co.

Articles on Nasal hemorrhage, Neuroses of the Nose, Haemoria, hyperaemia, haemorrhage, catarrhal inflammation & Symples of the Pharynx & Throat Pharyngex.

ilages in different places, sufficiently to destroy their elasticity; then a silver tube of the proper size and shape is inserted into the nostril, and the saddle is adapted to the outside of the nose, so that the organ is thus embraced between an inside and an outside splint, which compel it to assume the exact shape required.

In performing these operations it is necessary to remember that the nasal passages must be kept free and unobstructed.

Hæmorrhage during and after any of the operations mentioned is generally severe. It may be lessened, however, through the depletory effect of cocaine, and still more satisfactorily by the direct application of hot water. In the course of the operation it is well, on the whole, not to attempt to plug the posterior nares, but, by allowing the blood to gravitate into the pharynx, to thus keep the nasal passages free and unobstructed for the entrance of light and the manipulation of the operator. The bleeding is somewhat apt to recur; and instances in which a patient has had to seek professional aid for epistaxis, several hours after the operation, are by no means uncommon.

In conclusion, it will appear that deformities of the nose in general, and of the nasal septum in particular, have of late received unusual attention. This attention, moreover, has been rewarded by large accessions of knowledge as to their anatomy, causation, and general results; and their presence has been met by a constantly increasing series of ideas and methods directed to their relief. Already many of them are amenable to the means now known, and it is not impossible that the near future may bring other and more improved operations for the cases still difficult to reach. It may safely be urged that the day of severe surgical procedures, involving incision and disfigurement of the external surface of the face, has gone by. Even Rouge's operation (see article Nose, Tumors of) can only be justifiable in cases where there is extreme difficulty in reaching the nasal fosse through the natural passages, while with accurate knowledge of the part to be operated upon, and trained skill and experience in operating, few cases will present themselves, in which, by comparatively simple means, the best work cannot be done and the best results secured. These acquirements, however, are absolutely essential to safe and successful operation, since there is no part of the body where greater injury can be done by the rash, the unscientific, or the ignorant. Above all, a thorough acquaintance with the anatomy and pathology of the bony structures of the nose is of the utmost importance.

D. Bryson Delavan.

NOSE: HÆMORRHAGE FROM THE NASAL PASSAGES. The term epistaxis (*ἐπι* and *στραξις*) was used by the ancients in an extended sense to denote bleeding from the nose in general, whether it proceeded from lesions of its external or internal surface, but its use has been restricted by modern authors to those hæmorrhages which take place from the nasal and accessory cavities.

The great vascularity of the mucous membrane of the nasal passages, its spongy or cavernous structure, the intimate connection of its blood-vessels with those of adjacent organs, and their correlation with other vascular tracts in remote portions of the body; its constant exposure to the exciting causes of hyperæmia, together with a certain amount of vulnerability begotten of its natural delicacy of structure, combine to make epistaxis the most common of the hæmorrhages of man.*

Hæmorrhage from the nostrils may be active or passive; may be the result of traumatic causes, symptomatic of various intrinsic pathological conditions, or occur as a critical or vicarious phenomenon.

Traumatic epistaxis follows contusions, fractures, and other surgical injuries of the nose, or occurs as the result of mechanical irritation of its interior from scratching, rubbing, or picking with the finger; from instrumental interference within, or the application of caustic medicaments to, the nasal fosse or nasal pharynx; from rupture

of varicose veins in the latter situation; from overfilling of the capillaries due to overaction of the heart, as, for example, in diseased conditions of that organ, or due to severe exercise, as in the general vascular agitation of the body which accompanies violent expiratory efforts, such as coughing, sneezing, vomiting, and the like, or dancing (Alibert), and coitus;† from the corrosion of the membrane produced by the inhalation of irritating vapors and powders (bichromate of potash, iodine, chlorine, ipecac, veratrum, chloroform, etc.), or from poisonous doses of those drugs that are eliminated through the mucous surface of the upper respiratory tract; from the solution of continuity of structure, occasioned by ulceration of various kinds, the separation of crusts, the presence of tumors (notably carcinoma and sarcoma); from foreign bodies, insects, and parasites in the nasal and accessory cavities. Under this head, too, may be included the hæmorrhage from the nostrils which occurs in certain surgical injuries of the skull, and particularly fracture of the base, and those affections of the nasal passages accompanied by caries or necrosis. It may also result from concussion. In the famous naval combat between the Merrimac and Monitor, during the civil war, blood spouted from the nostrils of the crew of the former when the round top was struck by the hostile iron-clad.

When slight traumatic causes give rise to nasal hæmorrhage, the explanation is almost always to be found in some local or constitutional predisposing condition, such as a pre-existing catarrhal affection, the previous tendency to epistaxis, the sanguine temperament, or disturbances in the vascular system induced by a host of debilitating influences, such as luxurious living, and excesses of all kinds (over-indulgence in alcohol, tobacco, venery, etc.), the presence of a diathesis, as the hæmorrhagic, scorbutic, etc., and possibly from some imperfectly understood inherited or acquired proclivity, or vaso-motor neurosis. In such persons, over-exertion of the mental faculties, anxiety, violent emotions, and even forcing the voice in declamation and singing, are sufficient to induce copious hæmorrhage from the nose.

Anything that tends to produce an increased flow of blood to the nose, or to delay or obstruct its return to the heart, that increases vascular tension or lessens the resistance of the vessel-walls, predisposes to, and may be the exciting cause of, nasal hæmorrhage. Thus, epistaxis is common in the plethoric, in those addicted to the use of stimulants, and in the so-called apoplectic, and is the crowning symptom of the group of phenomena referable to general excitation of the vascular system, known under the technical name of the nixus hæmorrhagicus. It is also often met with as the result of passive venous hyperæmia from organic disease of the heart, lungs, pleura, kidneys, etc.; from pressure on the venous trunks of the neck, thorax, and abdomen (tumors, dropsy, tight clothing, etc.); in various congestive conditions of the brain, meninges, and cerebral sinuses. It is not infrequently the forerunner of extravasation of blood into the brain-substance, and of retinal apoplexy in connection with renal affections.† It is also predisposed to by habitual interference with the bodily excretions, notably the intestinal. It is a familiar accident in the rapid passage from a dense to a rarefied atmosphere in balloon and mountain ascensions, where it is due to the diminution in the atmospheric pressure and the consequent determination of blood to the mucous membrane of the air-passages.

Epistaxis occurs as a symptom of a number of acute febrile diseases, in some of which, as, for example, typhoid fever, it is considered as a diagnostic sign. It is also a frequent accompaniment of the hæmorrhagic diathesis, scurvy, purpura, and allied affections; in impoverishment of the blood from other causes, as in chlorosis, leucocythæmia, syphilis, tuberculosis, malarial fevers, etc.; in congestion and other diseases of the liver and spleen.†

* On the other hand, absolute continence is said to produce it occasionally (Cloquet, *Ophthalmologie*, p. 554, Paris, 1821).

† The hæmorrhage which takes place in hepatic disease was said to proceed from the right nostril (Galen, *de crisisibus*, lib. iii., cap 3); that from splenic affections, from the left.

* It was the opinion of Pliny (*Nat. Hist.*, lib. xi., cap. 91) that "man is the only creature from whom blood flows at the nostrils."



It sometimes occurs from the suppression of a cutaneous eruption, from the sudden cessation of a normal flow, as the menses, perspiration, urine, etc., or of a pathological discharge, as in the disappearance of a hæmorrhoidal flux. Fabricius of Hilden,³ relates a case where it followed the stoppage of hæmorrhage from varicose veins in the leg.

It occurs in boys at or near the age of puberty in whom a predisposition to hæmorrhage in general exists, and in women as the vicarious representative of menstruation. In the latter case, it may establish the menstrual function, the nasal hæmorrhage being replaced subsequently by the uterine flow, or it may continue throughout the menstrual life of the individual, in which case some derangement or malformation of the sexual organs seems to be responsible for the nasal flow.* Vicarious nasal menstruation was considered a favorable sign by Hippocrates,³ and by Celsus,⁴ who followed closely in his footsteps. In sudden suppression of the menses, the nasal hæmorrhage may terminate in death, as happened in a case reported by Alibert.⁵

Hæmorrhage from the nose is met with also during pregnancy, and may be due to vicarious action, or to the pressure of the enlarged uterus upon the abdominal veins. It occasionally occurs toward the close of menstrual life, and has been observed as a recurring phenomena after removal of the uterus and its appendages by the Porro operation.⁶ It may, furthermore, be symptomatic of reflected irritation from the gastro-intestinal (piles, worms in the intestines) and genito-urinary tracts, and in children, from diseases of the gums or eruption of the teeth.

The sudden impressions made upon the cutaneous surface in its entirety, or upon its individual parts, such as the feet, neck, hands, scrotum, etc., of extremes of heat and cold, as in sudden exposures to temperature variations, hot and cold baths, etc., are sometimes sufficient to induce copious hæmorrhage from the nose.†

In some instances the bleeding seems to arise from psychical impressions, conveyed through the sense of smell, from various articles of food,⁷ such as cheese, apples, the odor of the rose, etc., from the pollen of certain plants, or from the presence of minute forms of animal life in the atmosphere, and this perverted sense seems to be peculiar to certain families. It is highly probable that this so-called "idiosyncrasy" is explicable on the hypothesis of coincident local nasal disease, or of some functional vasomotor neurosis. Blancard⁸ relates a case where the ringing of bells always produced epistaxis. In this connection may be mentioned the case recorded by Salmuth,⁹ where a young man was habitually so affected by the sight of a hæmorrhage from his mistress' nose, that blood began to flow immediately from his own, and a similar observation is related by Rhodius.¹⁰

Now and then, epistaxis is encountered as an intermittent or periodical condition occurring at regular intervals (Taunton¹¹), and depending in some instances on a malarial cause, as evidenced by its disappearance on the exhibition of quinine (Millet¹²).

The so-called epidemic occurrence of epistaxis is probably explicable by the prevalence of some malignant systemic disease with prominent local complications, or by the existence of meteorological conditions favorable to congestive states of the nasal mucous membrane.

Hæmorrhage from the nose is a not uncommon symptom of nasal catarrh. It may be small in amount, or be sufficiently copious to produce considerable depression, and even collapse. It is generally excited by picking, scratching, rubbing, or blowing the nose, by sneezing and coughing, by the separation of crusts, and a multitude of other exciting causes that determine an increased flow of blood to the nasal membrane. Sometimes such hæmorrhages occur at night, from unconscious irritation of the nose with the finger during sleep. Quite extensive loss of blood occurs, however, without the intervention of

traumatic influences in chronic inflammatory conditions of the nasal tissues, perhaps from congestion of the cavernous structure and loss of resistance in the erectile cellular walls, or from stoppage of the nostrils,¹³ for when the nose is freed of mucus and crusts, or when the redundant tissue is removed and the normal aerial pathway is restored, the recurring hæmorrhages cease. The bleeding in many such cases comes from the cavernous tissue. Indeed, nasal obstruction from any cause (deflection of the septum, hypertrophic enlargements of the nasal structures, etc.), predisposes to epistaxis, in all probability from the creation of a more or less complete vacuum behind the seat of obstruction. The writer has seen very alarming hæmorrhage occur from such a condition, the blood flowing into the stomach and air-passages and leading to the suspicion of pulmonary disease. This is probably also the explanation of many cases of so-called "spontaneous" epistaxis. The same is also true in regard to obstruction in the retro-nasal space, closure of the posterior nares plus the consequent congestion of the nasal passages, and the altered relations in regard to atmospheric pressure conditioning the predisposition to hæmorrhage. In cases, moreover, wherein no bleeding-point is discoverable in the nasal passages, it must be remembered that the flow may come from one of the accessory sinuses, or even from the middle ear.

Epistaxis is, perhaps, most commonly met with in infancy, is less common in youth and manhood, while in later life, the tendency to hæmorrhage reappears, a fact to be explained by the degenerative changes in the vascular system which accompany the processes of old age.

The symptoms of rhinorrhagia do not differ from those of hæmorrhage in general. Usually the amount lost is small and insufficient to give rise to constitutional disturbance. It escapes drop by drop from the nose, or it may flow in a continuous stream. The literature of the last two centuries contains accounts of cases where large quantities of blood were lost in a short while, and if we can believe the reporter,¹⁴ as much as seventy-five pounds has been known to escape in the space of ten days. Those who suffer from habitual epistaxis are subject to derangements of vision.

The bleeding generally comes from one nostril, but may occur from both. When the bleeding-point is seated anteriorly, the blood flows from the anterior naris, while, if it is located in the posterior portion of the nostril, the blood escapes into the throat, aided in its passage to that region by the natural obliquity of the nasal floor. Gaining the throat, it is either expectorated or enters the air-passages, and is removed by coughing; or it may gravitate into the œsophagus and be swallowed. Its presence in the stomach may excite vomiting, or it may pass through the alimentary canal and be voided at stool. Finally, the blood may be discharged through the lachrymal ducts and puncta.

PATHOLOGICAL ANATOMY.—The hæmorrhage may take place from the surface of the mucous membrane, or into the submucous tissues. The latter generally occurs in connection with blood-poisoning or traumatism. Bloody tumors (hæmatomata) of the nasal fossæ, especially of the septum, are occasionally encountered as the result of mechanical injury.¹⁵

The writer has observed, on microscopic examination, quite extensive hæmorrhages into the cavernous tissue in long-standing cases of hypertrophic catarrh. The extravasation may take place into the meshes of the cavernous body, or between it and the mucous membrane. When the bleeding has been slight, the only macroscopical evidence of its existence will consist in minute extravasations (ecchymoses) or capillary apoplexies. Usually the nasal mucous membrane is intensely hyperæmic. The hæmorrhage generally arises from solution of continuity of the membrane at isolated spots or over circumscribed areas, rarely, if ever, from the whole surface of the nasal fossa. The point of origin of traumatic epistaxis will obviously depend upon the nature and mode of operation of the mechanical or chemical irritant, or upon the situation of the lesion which produces it.

In view of the intimate vascular communication be-

* A case of this kind has come under the observation of the writer.
† According to Cloquet (op. cit., p. 554) there are certain springs in Auvergne the temperature of whose waters is so low that copious hæmorrhage from the nostrils occurs from immersion of the hands during the heated term.

tween the erectile tissue and the cerebral circulation, it is highly probable that the so-called "critical" hæmorrhages and those by which congestive conditions of the brain are relieved, and perhaps also those of vicarious origin, take place from the cavernous bodies, which latter may be looked upon, therefore, among other physiological properties which they possess, as serving, in that respect, a certain teleological purpose. Whether this be true or not, the writer is convinced that many nasal hæmorrhages originate primarily from the vascular spaces of these bodies, and that the latter play an important rôle in the pathology of epistaxis.

The bleeding-point is very frequently found upon some portion of the cartilaginous septum. As Valsalva pointed out long ago,¹⁶ it frequently occurs at the junction of the "alæ nasi with the bone, about a finger's-breadth, more or less, from the bottom of the nostrils."

The respiratory region, being more exposed to the exciting causes, is consequently more often the seat of hæmorrhage than the olfactory portion of the nose.

On microscopic examination, various changes are found in the vascular walls, such as degenerative appearances from atheroma, syphilis, softening, sloughing, and rupture of the vessels, etc. Extreme tenuity of the fibrous trabeculae of the cavernous tissue is also occasionally met with.

DIAGNOSIS.—Hæmorrhage from the posterior nares may be confounded with hæmoptysis, hæmatemesis, or bleeding from the bowels (*vid. supra*), an error which may generally be avoided by examination of the nostrils, when some evidences of its occurrence will be found. In fevers, care should be taken to discriminate between a critical hæmorrhage and that which results from a serious nasal complication, the former being a favorable sign, the latter one of grave moment, and calling for prompt attention. Finally, the possibility of its origin from the accessory sinuses, the middle ear, and even from the cerebral vessels,¹⁷ should not be overlooked, and, on the other hand, the possibility of simulation for purposes of malingering should be borne in mind.

The **PROGNOSIS** depends upon the cause of the hæmorrhage. In the majority of instances it is good. Critical and vicarious hæmorrhages which serve to relieve congestive conditions of neighboring or remote organs, or to complicate local disease of a curable nature, afford also a favorable prognosis. When, however, the bleeding is dependent upon a diathesis, or occurs as the complication of serious structural disease from acute blood-infection, especially in the course of certain epidemic influences, or of organic visceral changes, the result is less favorable. Collapse may occur from the loss of large quantities of blood, or the constant losses of small quantities may beget an impoverished condition of the system, with derangement of nutrition, and an enfeebled state of the special senses, and may even awaken the predisposition to more serious organic disease.

TREATMENT.—When one is called to a case of epistaxis, the first thing to determine is its nature. Vicarious and critical hæmorrhages should be left to nature unless the flow be so excessive as to jeopardize the life of the patient. Slight bleeding from the nose, of whatever nature, may also be disregarded, as the tendency is to spontaneous arrest.

The measures usually employed for the stoppage of more profuse nasal hæmorrhage may be conveniently considered under the following heads: (1) rest; (2) position; (3) revulsives, and measures designed to produce reflex contraction of the nasal blood-vessels; (4) opiates and narcotics; (5) astringents; (6) remedies to slow the action of the heart; (7) caustic applications to the bleeding-points; (8) pressure, external and internal; (9) transfusion.

In moderately severe cases of epistaxis, the patient should remain perfectly quiet in the sitting position, with the head inclined very slightly downward and forward, to throw the floor of the nostrils into a perfectly horizontal plane. All tight clothing about the neck and thorax should be loosened, and the sufferer should be directed to avoid, if possible, all tendency to sneeze or cough, and all down-

ward or backward movements of the head. Respiration may be carried on through the mouth. The fears of the patient should be quieted; in nervous people, the very sight of the blood often serves to increase the hæmorrhage. Great weakness or tendency to vertigo may require that the patient be placed in the recumbent position, or he may be propped up in bed with pillows in the semi-horizontal decubitus. Holding both arms above the head, throwing, suddenly, the arm corresponding to the affected nostril vertically upward, and compressing the bleeding naris with the fingers of the opposite hand (Négrier¹⁸), pressure at the root of the nose, above the upper lip, or on the corresponding facial or carotid artery, and similar devices, have been from time to time recommended and employed.

Measures applied to excite reflex contraction of the blood-vessels in the nasal mucous membrane are often of service; such are the application of cold to the nape of the neck (cilio-spinal centre), to the hands, feet, breast, scrotum, rectum (ice clyster of Sydenham), or forehead, dashing cold water in the face, or on the back, etc., or various revulsives applied to these regions. A method in use among the ancient Greek and Arabian physicians consisted in opening a vein in the foot. The Greeks used cupping-glasses to the hypochondrium, and local depletion for the nostril from which the blood flowed. In the Middle Ages, a favorite method was to apply the actual cautery to the soles of the feet, and several centuries ago it was recommended to bend the little finger on the bleeding side backward, which procedure, it was thought, acted as a revulsive by the great pain which it produced, and the consequent determination of blood to the part. Cupping the blood in the extremities is also an old practice, which led to the famous Jounod's hæmostatic boot. It is highly probable that the old-fashioned method of venesection from the arm did more good by the subsequent compression of the bandage and the retention of blood in the forearm than by the way in which it was alleged to act.

In some cases the flow of blood may be arrested by opiates and narcotics. Of these, the most serviceable is morphine given hypodermatically.

The principal astringents employed for the relief of nasal hæmorrhage are hot and cold water, alcohol, perchloride of iron in solution or crystalline form, alum, chloride of zinc, ammonio-ferric alum, tannic and gallic acids in powder or suspension, kino, and catechu; the internal administration of turpentine, the mineral acids, etc., and the hypodermatic use of ergot and morphine are recommended. Hot water and alcohol are especially efficacious. Great caution should be exercised in the use of the perchloride of iron, for it not only often fails to arrest the hæmorrhage, but also gives rise to a dirty mass in the nostril, which may even, through decomposition, excite septicæmia. A case is on record in which the injection of perchloride of iron led to pharyngo-bronchitis, and death from gangrene of the lungs. The introduction of cobwebs into the nostril will often suffice, by acting as a styptic, and at the same time allowing coagulation of blood in its meshes, to arrest the hæmorrhage.

Astringents can also be employed on tents, as originally recommended by Valsalva and Morgagni, or by means of soluble bougies.

In severe cases it is sometimes of service to slow the action of the heart with digitalis and similar drugs.

The ancient custom of introducing wicks, and strips of various substances, for the purpose of promoting coagulation, is, as a rule, successful, or a feather or similar object may be used for the same purpose.

If a bleeding point can be discovered, it is usually sufficient to apply some caustic, such as chromic acid, to prevent recurrence of the hæmorrhage; or the same end may be attained by the electric, or even the actual, cautery.

By means of the above measures, the necessity for tamponing the nares may generally be obviated.

If the hæmorrhage be at all alarming, plugging the nostril should be at once resorted to, as it is useless to temporize with less radical measures. Of all methods of

arresting hæmorrhage, the best is pressure. This may be accomplished by simply pressing the ala against the septum and the opening of the nasal fossa, or by the introduction of the finger within the nostril and making direct pressure on the bleeding point, or by tamponing the vestibule and anterior portion of the fossa with absorbent cotton, sponge, charpie, strips of lint, oakum, etc. If the hæmorrhage arise from the posterior portion of

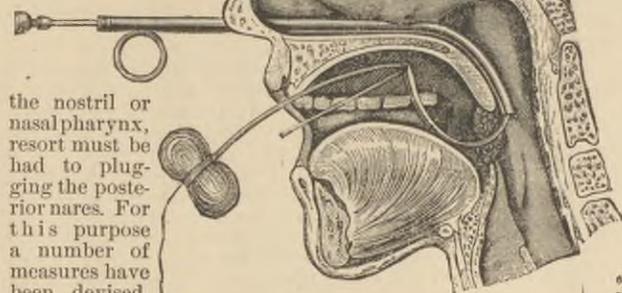


FIG. 2512.—Plugging the Posterior Nares by Means of Bellocq's Sound.

the nostril or nasal pharynx, resort must be had to plugging the posterior nares. For this purpose a number of measures have been devised, the most familiar of which is the cannula of Bellocq, an instrument perhaps more often figured and less frequently used than any other in the armamentarium of the surgeon (see Fig. 2512). As a substitute for Bellocq's instrument, an ordinary soft-rubber female catheter or hollow oesophageal bougie, or a large-sized Eustachian catheter, may be employed. A rubber, catgut, or silk string is passed through the lumen of the instrument, which latter is then introduced through the nasal passage into the pharynx. The distal end of the string is then caught with a pair of forceps or other convenient apparatus, and drawn out of the mouth. The sponge, or whatever material be used, is then tied securely to the string, and traction is made on its proximal end until it is securely impacted in the posterior nares. Instead of using cotton, etc., in plugging both anteriorly and posteriorly, resort may be had to various substances, such as different kinds of rubber bags, a piece of the intestine of an animal, closed at one end, introduced on a probe into the nostril and then inflated with air or water. Even a condom may be used for this purpose. Various kinds of apparatus, modelled on this principle, are to be had in the market, and go under the euphonious names of "rhineurynters" and "rhinobyons."

While plugging the nostrils is the most efficacious method of stopping hæmorrhage from the nose, it is not altogether devoid of danger. If the plugs be left in too long, septicæmia, erysipelas, suppurative otitis (Gellé¹⁹), and even gangrene of the face (Créquy²⁰) may possibly complicate the case. I have also seen unilateral convulsions of the muscles of the face, neck, and extremities follow the retention of a plug in the nostril, and immediately subside on its removal. Care should always be taken to affix a string securely to the plug, in order to insure removal and prevent gravitation into the throat. In a case under the care of Dr. Oscar Coskery, of Baltimore, in which the patient himself had tamponed his own nares, the plug was loosened during sleep, and, becoming impacted in the larynx, caused death by suffocation.

Posterior plugging is, furthermore, occasionally open to an additional danger from tetanus. Such a case has come under my notice, occurring in the practice of a well-known physician of this city, and another in the experience of Dr. Colles, of Dublin, is frequently referred to by writers on epistaxis.

After the plugs have been taken out (which should be done, if possible, within twenty-four hours), careful search

should be made for the source of the hæmorrhage. Apart from well-defined lesions in the nose, it will be not infrequently discovered that the hæmorrhages come from little spots or areas, which will generally be found either on the septum, just within the vestibule, or on the middle and lower turbinated bodies. These turgid or bleeding areas should be touched with the galvano-cautery or with chromic or acetic acid. When great turgidity (chronic puffiness) of the turbinated bodies is present, producing obstruction of the nostril, a stellate cut may be made into them with the cautery knife. In the contraction of the tissues which ensues, the nostril becomes free, and the hæmorrhages usually cease.

The internal treatment of epistaxis does not differ from that of hæmorrhages in general. Syncope demands stimulation, general prostration tonics, and even transfusion may be resorted to with success in extreme cases. In examples of the "hæmorrhagic diathesis" the bleeding may continue in spite of plugging, until it stops through heart failure.

John Noland Mackenzie.

¹ Hughlings Jackson: London Hosp. Clin. Lect. and Reports, vol. iii., p. 251 (S. Watson, Dis. of the Nose, etc., Lond., 1875, p. 51).

² Cited by Friedreich: Virchow's Handb. d. Path. u. Ther., 1855, Bd. V., 1 Abth., s. 389.

³ Op. omnia. Ed. Kühn, Lips., 1827, tom. ii., p. 174. De morbis, lib. i., and Aph., Sect. 5, Art. 33.

⁴ De medicina, lib. ii., Cap. 8.

⁵ Nosologie naturelle, etc., Paris and Lond., 1833, p. 353.

⁶ Arch. de Toxicologie, April, 1884. Am. J. Med. Sc., July, 1884, p. 292.

⁷ Brucyris: De re cibaria, lib. i., Cap. 74.

⁸ Collect. Med. Phys., Cent. VI., Obs. 74.

⁹ Obs. Med., Brunswick, 1648, Cent. 4.

¹⁰ Cent. I., Obs. 89 (cited by Good, Study of Medicine, Phila., 1824, vol. ii., p. 460).

¹¹ Lond. Med. and Surg. Journal, 1830, vol. iv., p. 489.

¹² Journal de Connais. Med. Chir., Août, 1844 (Friedreich, op. cit., s. 388).

¹³ See paper by author in Trans. Med. Chir. Fac. of Maryland, 1883, on Naso-Antral Catarrh and its Rational Treatment.

¹⁴ Act. erudit. Lips., 1698, p. 205.

¹⁵ Flemming: Dublin Journ. Med. Sci., 1883, vol. iv.; also, Jarjavay (cited by Beausseant, Des tumeurs sanguines et purulentes de la cloison des fosses nasales, Thèse de Paris, 1864).

¹⁶ Morgagni: De sedibus et causis morborum, tom. i., xiv., 34, in. fin.

¹⁷ See case of Köppe, Arch. f. Ohrenheilkunde, Bd. ii., s. 181 (Fraelkel, Ziemssen's Cyc., Am. ed., 1876, vol. iv., p. 159).

¹⁸ Archives générales de médecine, vol. xiv., p. 168, 1842.

¹⁹ Rev. mens. de laryng., vol. vii., No. 12.

²⁰ Gaz. des Hôp., 1870, vol. lvi.

NOSE, NEUROSES OF THE. I. THE PHYSIOLOGICAL NASAL REFLEXES.—

Before passing to the discussion of the essentially neurotic conditions of the nose, it will be necessary to consider two acts or phenomena which are intimately related to the physiology of the nasal apparatus, and which may be regarded as the normal nasal reflexes, viz.: *Sternutation*, or *sneezing*, and *nasal cough*. To these may be added still another, which partakes of the characters of both sneezing and coughing, which seems to be the resultant of an attempt at the simultaneous accomplishment of both acts, and which, for want of a better name, may be denominated *sneeze-cough*.

Sneezing is the natural method by which the nasal apparatus resents direct or indirect injury to its interior—the normal protective reflex. It is only when it is repeated sufficiently often to cause inconvenience, or occurs in well-marked paroxysms, that it may be looked upon as a pathological phenomenon. In this latter aspect it will be considered farther on in this article.

Nasal Cough.—In 1883* I first called attention to cough as a physiological nasal reflex, and to the frequency with which, in an aggravated form, it is met with as a symptom of nasal disease. Like sneezing, it may be looked upon as a normal protective act. As a pathological phenomenon it will be fully discussed in the section which treats of the Neuroses Proper.

My attention was first directed to the study of nose-cough by the repeated observation that, during manipulation with instruments (probe, forceps, snare, Eusta-

* On Nasal Cough and the Existence of a Sensitive Reflex Area in the Nose, American Journal of the Med. Sciences, July, 1883. The results of these experiments were first brought before the Baltimore Medical Association in the early part of 1883, and subsequently before the Medico-Chirurgical Faculty of Maryland (April, 1883, vide Transactions) and the American Laryngological Association (May, 1883, vide Transactions).

chian catheter, etc.) within the nasal fossæ, paroxysms of coughing were induced, which only subsided upon the withdrawal of the instrument, or upon changing its position in the nasal chamber. The cough varied greatly in character, from a succession of short expiratory acts to convulsive paroxysms which interfered seriously with the use of the instruments. These attacks occurred, furthermore, only when the foreign body came in contact with the deeper portions of the nostril; in several cases where the snare was used, they seemed to be excited only at one particular spot in its passage through the nose, and ceased when the loop entered the naso-pharynx. My clinical experience, too, furnished me with cases where distressing cough existed, the etiology of which was rendered obscure by the absence of disease or irritation in pharynx, windpipe, or lungs. In this latter case, one of two conditions was invariably present—viz., either a hyperæmic or slightly swollen state of the mucous membrane, chiefly affecting the turbinated bodies, or pronounced hypertrophic enlargement of these structures.

It was in the clinical study of this reflex cough that I was led to assume the existence of a certain area or areas in the nose, the irritation of which would culminate in a reflex act or in a series of reflected phenomena. The existence of such an area had been demonstrated in the larynx and trachea, and it seemed, therefore, legitimate to assume the presence of similar spots in the nasal chamber. The well-known occurrence of reflex asthmatic attacks in some cases of nasal polypus, and their absence in others, together with similar observations which I had made in regard to hypertrophic nasal catarrh, lent further support to the hypothesis of a reflex area.

In order, if possible, to throw some light upon this subject, I made a series of experiments upon a large number of hospital patients, upon myself, and upon several of my medical friends who were kind enough to place their nasal organs at the disposal of science. The experiments consisted essentially in the systematic irritation of all accessible portions of the nasal mucous membrane, the irritants used being silver and rubber probes and the steel wire, such as is used in the polyp-snare.

It may be here remarked that the nose of the negro is admirably adapted for experiment, on account of the great capacity of the nasal chambers anteriorly, rendering dilatation by artificial means unnecessary, and hence eliminating a source of error which might vitiate the result of the experiment. The great width of the vestibule, too, brings into greater prominence the anterior ends of the turbinated bones, or, rather, their mucous covering, which, in the black race, is much more puffy anteriorly than in the white man, giving the appearance of what in the latter would be taken for an anterior hypertrophy. It is also very flabby, collapses under the probe, and can be pressed with ease against the external wall of the nostril.

The patients experimented on presented varying degrees of susceptibility to irritation; in some instances, the slightest touch was sufficient to provoke the reflex act, while in others it was only excited by repeated irritation or long-continued pressure. In some cases no reflex whatever could be obtained. The results of these experiments may be briefly given as follows:

So long as the stimulation was confined to the vestibule—to the interior of the fleshy, cartilaginous part of the nose—the result was negative; no reflex action was obtained. The sensation created was simply that of a foreign body, or, if the stimulus was increased, a feeling of pain. So far I have been unable to excite cough by stimulation of this part of the nose. Irritation of the membrane clothing the anterior extremities of the middle and inferior turbinated bones was in some instances negative; in others a half-tendency to cough was produced, which increased as the irritant was applied farther back, and finally culminated in the act when it was directed upon the posterior half of the turbinated body. Irritation of the floor of the nose was negative in result. In cases where stimulation of the remaining portions of the nose failed to excite them, paroxysms of cough were induced when the irritant was applied to the mucous membrane

covering both the inferior and middle turbinated bones; but the act was most constantly obtained from the posterior end of the inferior turbinated bone and the portion of the septum immediately opposite. Indeed, my experiments seem, thus far, to show that these portions are the most sensitive spots in the reflex area. In passing along the pars nasalis of the roof, coughing was occasionally produced when the probe or wire impinged on the anterior extremity of the middle turbinated bone; but no decided results could be obtained from the upper olfactory region.

We have thus experimental proof that all parts of the nasal mucous membrane are not equally susceptible to the impression by which reflex cough is produced, and, furthermore, that the cough or reflex area is probably limited to the mucous membrane covering the middle and inferior turbinated bodies and the posterior half of the septum. Now, this is the area occupied by the erectile tissue of the nose, and it is hard to resist the conclusion that this structure is in some way connected with the evolution of the reflex act, and that the peculiar susceptibility to irritation is to a great extent intimately associated with its physiological functions, whatever they may be.

Roughly speaking, the greater the congestion, or inflammation, the more constant the reflex obtained. I have succeeded, however, in producing violent paroxysms of laryngeal cough by simply touching, with the aid of the rhinoscope, the posterior extremity of the inferior turbinated bone in persons whose noses were free from disease. In some cases, stoppage of the nostril with discharge of mucus was produced, while in others this was not observed.

That the sensitive area is principally confined to the parts already indicated—viz., the posterior half of the inferior turbinated body and septum—is furthermore rendered exceedingly probable by the following clinical facts:

(1) That in cases where reflex cough exists, these are the portions chiefly, if not solely, involved.

(2) That the act may be produced here at will by artificial stimulation of the parts invaded by the morbid process.

(3) That it may be dissipated by local applications to, or removal of, the membrane covering the diseased surface.

(4) That foreign bodies, such as pins, lodging in this area sometimes give rise to cough, which latter is not observed when they become impacted in other portions of the nose.

(5) That polypi give rise to reflex phenomena only when they arise from, or impinge upon, the sensitive portions of the area.

(6) That where complete atrophy of the turbinated structures exists, as, for example, in ozæna, reflex cough is not present, nor can it be induced by artificial stimulation.

These facts are the outcome of personal experience; and, as they represent the result of solitary observation, are, of course, open to correction. I have never seen, nor do I know of, a single case where a foreign substance impacted in the non-sensitive portions of the nose has given rise to cough; but I do know of cases where that act was excited by its presence in the reflex area. In regard to *reflex asthma* from polypi, the literature accessible to me shows that, where the position of the tumor is accurately defined by the reporter, it is always in the posterior portions of the nostril, in a situation which would lead to irritation of the sensitive tract.

So far as my experience goes, it would appear that the cough is present only when the growths spring from or are brought in contact, in some way or other, with a portion of the erectile area, and generally its posterior portion. Or, in other words, it is only when the polypus acts as a mechanical irritant by causing irritation of the mucous membrane, and thereby exciting reflex action, that the explosive cough is produced. The probability, therefore, of cough-excitation will depend, other things being equal, upon the position of the growth. Thus, for

example, a polypus situated high up in the nostril may fail to give rise to the reflex act which its presence lower down in the nasal fossa would excite. Or a movable growth in the more anterior portion of the nasal chamber may awaken no reflex when the head is in the vertical position, while, when the vertical diameter of the nostril becomes horizontal, as, for instance, in the recumbent position, the growth may by force of gravity be brought in contact with the posterior portion of the nostril or, what is the same thing, with the most excitable spot in the sensitive area. In the same way the asthmatic attacks, which have been observed in connection with nasal polypi, may be explained. At all events, such an explanation is more plausible than the assumption, which may be urged, of direct nervous irritation starting from the polypus itself; since the ordinary mucous polyp is destitute of nerves, and can, therefore, only awaken reflex phenomena in an indirect or mechanical manner. Moreover, I have tried to obtain the reflex by direct stimulation of the growth, but so far without success. Finally, I wish to observe that the change in position of the polypus does not depend altogether upon the law of gravitation, but in some instances may be due to an increase in volume, either from local irritation of various kinds or from the well-known hygroscopic character of the gelatinoid outgrowth. The augmentation in bulk thus brought about would obviously bring it into contact with parts which in its original position would not be encroached upon, and therefore not subjected to the pressure and irritation which it might occasion.

Nasal cough has become so common in my experience, that I have long since ceased to regard it as a curiosity. It is worthy of remark that in a fair proportion of cases there are few, if any, symptoms which would direct attention to disease of the nose; and this fact emphasizes the importance of examining the nasal chambers in all cases of the kind, even though the testimony of the patient may lead to neglect of their systematic exploration.

My clinical observation leads me to the belief that reflected irritation from nasal disease plays a not inconspicuous part in the etiology of laryngeal congestion and inflammation. The short, hacking cough and hyperæmia of the larynx which occur in acute coryza are probably more often explicable on the theory of reflex action than upon the extension of the inflammation to the laryngeal vestibule. The physiological explanation of this phenomenon may possibly be found in the doctrine of correlated areas, the reflex taking place through the vaso-dilator nerves from the superior cervical ganglion of the sympathetic. In chronic coryza, on the other hand, the constant laryngeal hyperæmia induced by reflex nasal irritation, augmented, perhaps, by the frequent occurrence of cough-paroxysms, may, if prolonged, eventuate in catarrhal conditions of that organ. In other words, on theoretical grounds, and clinical observation would seem to sustain them, it is legitimate to assume the existence of a *reflex laryngitis*, evoked through the constant irritation of the vaso-motor centres from chronic nasal inflammation.

Clinical and experimental investigation would appear, then, to lead to the following conclusions:

(1) That in the nose there exists a definite, well-defined, sensitive area, whose stimulation, either through a local pathological process or through the action of an irritant introduced from without, is capable of producing an excitation, which finds its expression in a reflex act or in a series of reflected phenomena.

(2) That this sensitive area corresponds, in all probability, with that portion of the nasal mucous membrane which covers the turbinated corpora cavernosa.

(3) That reflex cough is produced only by stimulation of this area, and is only exceptionally evoked when the irritant is applied to other portions of the nasal mucous membrane.

(4) That all parts of this area are not equally capable of generating the reflex act, the most sensitive spot being probably represented by that portion of the membrane which clothes the posterior extremity of the inferior turbinated body and that of the septum immediately opposite.

(5) That the tendency to reflex action varies in different individuals, and is probably dependent upon the varying degree of excitability of the erectile tissue. In some the slightest touch is sufficient to excite it; in others chronic hyperæmia or hypertrophy of the cavernous bodies seem to evoke it by constant irritation of the reflex centres, as occurs in similar conditions of other erectile organs, as, for example, the clitoris.

(6) That this exaggerated or disordered functional activity of the area may possibly throw some light on the physiological destiny of the erectile bodies. Among other properties which they possess, may they not act as sentinels to guard the lower air-passages and pharynx against the entrance of foreign bodies, noxious exhalations, and other injurious agents to which they might otherwise be exposed?

Apart from their physiological interest, the practical importance of the above facts in a diagnostic and therapeutic point of view is sufficiently obvious. Therein lies the explanation of many obscure cases of cough which heretofore have received no satisfactory solution, and their recognition is the key to their successful treatment.*

In calling attention to this area as containing the spots most sensitive to reflex-producing impressions, I did not, nor do I now (as has been wrongly inferred), desire to maintain that reflexes may not originate from other portions of the nasal mucous membrane. Indeed, wherever there is a terminal nervous filament it may be possible to provoke sneezing, lachrymation, and other reflex movements. My contention is simply this, that the area indicated in my original paper represents by far the most sensitive portion of the nasal cavities, and that pathological reflex phenomena are in the large majority of cases related to diseased conditions of some portion of this sensitive area. That all pathological nasal reflexes arise from irritation of this particular area is a proposition which I do not, and never have, maintained. The determination of these sensitive areas is of especial importance and interest in the solution of the pathology of the nasal reflex neuroses. Their location has formed the basis of the modern treatment of these affections.

These views of the *sensitive area* were, at their time of publication, opposed by Dr. Wilhelm Hack,¹ of Freiburg, who, in an exceedingly interesting and instructive brochure, maintained, as the result of his wide experience, that the anterior extremity of the inferior turbinated bone is the point from which all reflexes take their origin, and that those arising from stimulation of other portions of the nostril occur only secondarily, through congestion of the cavernous tissue of this circumscribed locality. In proof

* The above account of nasal cough and the reflex sensitive area is a verbatim abstract taken from my original article in the American Journal of the Medical Sciences. The remarks on the production of reflex cough by change of position in nasal growths are taken verbatim from an article in the Transactions of the Medico-Chirurgical Faculty of Maryland for 1884, entitled, "Cases of Reflex Cough due to Nasal Polypi, with Remarks."

At the time of publication of my original thesis I could find only two recorded cases of nasal cough.

Dr. Hack, in the Berliner klinische Wochenschrift, No. 25, 1882, S. 381, relates a case where paroxysms of spasmodic cough, induced by a fibrous polyp which sprang from the right middle turbinated bone, were dissipated by removal of the growth. He regards the case as unique, but adds that, in the course of some physiological experiments on the normal nasal membrane, he had, in a small proportion of cases, noticed convulsive motions of the laryngeal adductors, which sometimes amounted to complete closure of the glottis, followed by an explosive cough-like sound, and suggests that this may also happen under pathological conditions of the nasal membrane.

In the Archives of Laryngology, vol. III., No. 3, p. 240, 1882, Dr. Seiler reports two cases. In one, severe spasmodic cough, accompanied by a peculiar grunting or barking noise, was dependent upon a deflected septum and a large anterior turbinated hypertrophy; in the other, an ex-coriolation of the mucous membrane of the septum gave rise to reflex cough, which was relieved by treatment of the nasal affection. Dr. Seiler observes that he has not found a single instance in which the irritation causing reflex cough was seated in the nasal membrane. He seems, furthermore, to regard the direct irritation of the inter-arytenoid fold (laryngeal-cough centre), by mucus dropping from the post-nasal space, as an important factor in the production of the cough in the two cases described. It is quite certain that cough may be, and is, often produced in the manner suggested; but in that case it obviously cannot be regarded as nasal, i.e., due to an irritation originating in the mucous membrane of the nose.

of his contention he asserts that when the swelling of the anterior end of the turbinated body is present, if the external blade of the speculum be pressed firmly against the swollen turbinated tissues, the remaining portion of the nostril will remain insensible to the reflex-producing impression. In referring to my own conclusions, Dr. Hack suggests that it would be of great value if I should repeat my experiments from the stand-point of his own extensive experience. In a later publication, however, while still decidedly opposed to my doctrine, he has considerably modified his exclusive views upon the subject. He admits that secondary reflexes may take their origin from the middle turbinated bone, especially in the case of migraine, more rarely in that of asthma; he also makes the important admission that in certain cases, after careful extirpation of the swelling at the anterior end, sooner or later a return of the nasal obstruction and the nervous reflex phenomena is observed. In such cases the rhinoscope shows that the parts operated on are represented by a cicatrix so depressed that the parts can scarcely be distinguished, beyond which the cavernous turbinated body is seen, greatly swollen, in the deeper portion of the nostril at such a position that its appearance can only be made out by the most thorough illumination. In regard to the swelling of the posterior end, Dr. Hack observes that, while admitting its possible influence in bringing about the return of the reflex symptoms, his experience compels him to regard this as of infrequent occurrence, having observed only symptoms referable to purely mechanical obstruction, and never reflex phenomena originating in swelling of the posterior area. Hack, then, stands, as he expresses it, in direct opposition to my view, viz., that the posterior end of the inferior turbinated body and posterior half of the septum are the most sensitive spots in the reflex area, and seeks to reconcile the discrepancy in our observations by the supposition of the greater frequency of post-nasal catarrh in America, and the relative infrequency of that affection in Germany, thus affording different conditions for observation and experiment. He furthermore adds, in defence of his own view, that in a number of specimens removed by the galvano-cautery loop from the anterior and posterior extremities of the turbinated bones, and examined microscopically by one of his scholars, the cavernous cells of the anterior portions were very much dilated, and the glandular substance between them was very inconspicuous, while in the posterior portions the cavernous cells were much smaller, and between them the connective tissue was very markedly hypertrophied.

In defending my own position in the matter I wish, at the outset, to distinctly affirm that I do not for one moment call into question the accuracy of Dr. Hack's observations in this direction, which are entitled to the highest respect, and I gladly testify to the pleasure and interest which the perusal of his contributions has afforded me. I simply desire to record my own experience, which, as the result of solitary observation, is open, of course, to correction, and to offer some anatomical grounds for the localization of the most sensitive spots in the reflex area in the lower and posterior portions of the nostrils.

Since I became aware of Dr. Hack's interesting researches, and came into possession of his brochure, in which a repetition of my experiments from the author's stand-point is suggested, I have repeated my observations and put my own views in practice to careful and critical tests. The result has been that I have arrived at essentially the same conclusions as given in my original communication on the subject, viz., that while the reflex may be obtained from any portion of the nasal passages, and especially that portion covered by erectile tissue, the area occupying the posterior and lower portions of the nasal fossæ is that above all others specially concerned in the reflex excitation. Just as in the larynx, while a reflex (e.g., cough) may be obtained from any portion of its internal surface, both clinical and experimental observations have demonstrated that the most sensitive spots are localized in the interarytenoid commissure.

In this country, and I see no reason why the rule

should not apply elsewhere, according to my experience, inflammatory conditions of the nasal passages are most marked in the area covered by erectile tissue, and are more pronounced in the lower or respiratory region, in the bony nostril than in the vestibule, and in the posterior more frequently than the anterior portions of the nasal fossæ. The posterior end of the inferior turbinated body is, according to the united testimony of all observers, the most frequent seat of simple catarrhal inflammation and its consequences. Hence this portion of the nostril is the most commonly subjected to pathological irritation—a fact which may explain, in a measure at least, the relative frequency of reflex symptoms arising from this portion of the nostril as compared with those arising from the more anterior parts.

The tendency to sudden filling of the more anterior portions of the erectile tissues, or to permanent enlargement of the same, proceeds generally from two causes: (1) from existing disease of the posterior portion—simple inflammation, hypertrophy, atrophy—in which event it may be regarded, in the majority of instances, as a phenomenon of collateral engorgement; or (2) it occurs in connection with a general engorgement of the cavernous tissue, which may be limited to the respiratory passages, or may extend into the region of olfaction.

It may also be laid down as a rule that changes in the anterior extremity of the turbinated body rarely occur without corresponding, and generally more advanced, disease of the posterior parts of the nasal fossæ—a position which I think will be sustained by my colleagues on this side of the Atlantic; on the other hand, marked changes are frequently met with in the posterior portions of the nasal chambers without corresponding, or even appreciable changes in its more anterior segments. It is, therefore, highly probable, from an anatomical stand-point, that the swelling of the anterior end of the turbinated body occurs through influences which affect, either previously or coincidentally, its posterior portion.

Turning now to the anatomy of the turbinated corpora cavernosa, we find that the erectile tissue is most marked and exhibits more strikingly its cavernous nature in the lower and posterior portions of the nostril, and this is notably true of the posterior end of the inferior turbinated body, and the septum immediately opposite. As the more anterior portions of the nostril are reached this tissue becomes less conspicuous, and in the latter situation the mucous membrane is more closely adherent to the underlying tissue, while over the posterior part of the fossa it is loose and separated more completely from the periosteum by the erectile body, which becomes a thin layer as the anterior extremity of the turbinated body is reached. This affinity of the erectile tissue for the posterior portions of the nasal apparatus is strikingly shown in the fact that erectile tissue is found on the posterior ends of all three turbinated bodies. Now the most sensitive zone covers an area which corresponds to the distribution of the sphenopalatine branches of the superior maxillary nerve, as distinguished from the nasal branch of the ophthalmic. The former nerve, derived through the sphenopalatine ganglion, probably contains, therefore, the vaso-motor fibres which govern the erection of the turbinated tissue, and as the sympathetic filaments which have been traced to the nasal passages are found in greater abundance over this area, we may, for practical purposes, speak of a *nasal plexus* located in the sensitive area and intimately associated with the evolution of the nasal reflex. My clinical observation teaches me that this is precisely the area of greatest irritation and turbulence in the paroxysms of vaso-motor coryza and allied affections, and the localization of the sensitive area may be accordingly looked upon as a key to the mechanism of the attack.

I would like also to call attention to a property of erectile tissues which is consonant with the ideas of reflex excitability formulated above. In the human body, wherever erectile tissue is found, it is intimately related to reflex or sympathetic acts; there seems to be connected with it a certain receptivity to reflex-producing impressions, a certain power of reflex excitability depend-

ent upon its structure and functions. It is thus peculiarly a tissue of sympathy, in which we may most satisfactorily study the mechanism of purely reflex or sympathetic acts. Now, as the nasal corpora cavernosa belong to this class of sympathetic tissues, there will be little difficulty in explaining the rôle which they play in the paroxysms of affections which are probably connected with, if not dependent upon, an excitation of the sympathetic nerve-centres, and in more clearly defining the intimate relation which they bear to the reflex neuroses of the nose.

It seems to me, then, that the above anatomical and physiological considerations strikingly correspond with the results arrived at by clinical observation and actual experiment, and, while open at all times to correction, I cannot but feel that my former observations were at least in the main accurate, and that the most sensitive spot in the reflex zone is represented by the area indicated above.

Sneeze-cough.—I have never seen this condition referred to by writers, but, in my experience, it is of not very infrequent occurrence. It is a most peculiar sound, which, when once heard, is not forgotten, and can be best described, as I have said above, as the result of an attempt to sneeze and cough at the same time. It is neither a cough nor a sneeze, but partakes of the characters of both. In the cases in which I have had an opportunity to examine the nasal cavities and throat, it has apparently resulted from irritation of the lower and posterior portions of the nasal cavities. In two instances in which the sneeze-cough was very severe, the paroxysms were preceded by burning and tickling sensations, which the patients referred to the region above and behind the palate, where, upon examination, the posterior nares were very much congested and swollen, and exquisitely sensitive to the touch of the probe.

II. THE NEUROSES PROPER OF THE NASAL CAVITIES may be divided into *Sensory*, *Motor*, and *Vaso-motor* (*neuro-vascular*, *sympathetic*). All these varieties may exhibit themselves simultaneously, or at different times, in the same individual, or each may appear as an isolated phenomenon. Care should be taken to separate (1) those which are of purely nasal origin, (2) those which depend upon central disturbance, and (3) those which result from irritation reflected from more or less remote regions of the body. Or, in other words, it should be clearly determined whether the neurotic symptoms referable to the nasal apparatus and its appendages be due to a purely local intra-nasal affection, or whether they be the symptomatic expression of a more central or general neurosis, and the proper relation as to cause and effect between the nasal symptoms and those referable to other parts of the system should be accurately and intelligently made out.

As the neuroses of the nasal passages may be peripheral, central, or essentially reflex in origin, their classification upon a strictly logical and scientific basis is a somewhat difficult matter. For purposes of convenience, however, and bearing in mind the fact that the three varieties are often combined in individual cases, they will be described in this article as above—sensory, motor, and vaso-motor.

A. **SENSORY NEUROSES.**—The sensory neuroses of the nasal chambers may be divided into those which spring from interference with the functions of the fifth nerve and those which depend upon some lesion or abnormal condition in the domain of the olfactory.

I. **NEUROSES OF THE FIFTH NERVE.**—1. *Anæsthesia.* Complete anæsthesia of the nasal mucous membrane is very rarely met with, and, when present, is due to paralysis of the fifth nerve from central trouble, as syphilis, brain tumors, extravasations, etc. Less frequently the anæsthetic condition is the result of pressure on the nerve after its exit from the cranium. Occasionally a more or less anæsthetic state of the nasal passages is encountered in atrophic conditions of the mucous membrane. Anæsthesia of the nasal passages is commonly associated with a corresponding absence of the sense of taste.

2. *Hyperæsthesia* is, on the other hand, a very common affection, and may be physiological or pathological. It is occasionally observed during a physiological epoch, as,

for example, menstruation. Abnormal sensibility of the nasal mucous membrane may owe its origin to central or peripheral causes, or may be the result of reflected irritation from remote regions of the body. Excessive irritability of the nasal passages may be produced by neuralgic affections of, or pressure upon, the fifth nerve; it is often present in extremely neurotic, hysterical, and hypochondriacal persons. Almost any local pathological process in the nasal chambers is accompanied with varying degrees of hyperæsthesia, and the hyperæsthetic condition is especially well marked in the vaso-motor affections of the mucous membrane. It may also occur as a reflex vaso-motor phenomenon from irritation or disease of the eye, aural apparatus, lower respiratory, gastrointestinal, utero-ovarian, and genito-urinary tracts.

II. **NEUROSES OF THE OLFACTORY NERVE.**—The chief and most common of the olfactory neuroses is anosmia, or the loss of smell.

1. *Anosmia* may be congenital or acquired. When congenital both nostrils are commonly affected, and the loss of smell is complete and permanent, while in anosmia due to other causes the two sides may be equally or unequally affected, or the interference with olfaction may be limited to one nostril; the anosmia, too, may be complete or incomplete.

Congenital anosmia is generally due to absence or imperfect development of the olfactory nerves and bulbs, and it is conceivable that imperfect structural development of the olfactory region of the nasal passages themselves may be responsible for the anomaly, although no cases of this condition are, to my knowledge, as yet recorded.

Acquired anosmia may be due to centric or eccentric (peripheral) causes. Among central causes may be mentioned disease or wounds of the olfactory tract or centre, fracture of the base of the skull, dislocation of the olfactory bulbs from falls, concussion, etc.; compression of the anterior portions of the brain from tumors, abscesses, or hæmorrhagic, serous, muco-purulent, or fibrinous exudations; and plugging of the anterior or middle cerebral arteries (Hughlings Jackson,² Fletcher³). Partial or complete loss of smell may also result from atrophy of the olfactory nerve, either from disease or the degenerative processes of old age. Of central origin, too, may be regarded the loss of smell in syncope, hysteria, epilepsy, acute alcoholism, and other nervous affections.

All those influences that interfere with the physiological integrity of the olfactory region, or eliminate one or all of the conditions essential to the sense of smell, may be regarded among the eccentric or peripheral causes of anosmia. Thus (1) complete or partial destruction of the terminal filaments of the olfactory nerve, either from accident or disease, disappearance of pigment from the organ of Schultze (Hutchison,⁴ Ogle⁵); (2) all obstructive lesions of the nasal passages and pharynx which prevent the access of the inspired air and odoriferous particles to the olfactory region, and (3) unnatural dryness or loss of moisture in the latter diminish correspondingly the power of smell, or may cause its complete disappearance.

Under the first class of causes may be mentioned atrophy or destruction of the conductivity of the olfactory nerves from swelling or ulceration of the mucous membrane, the presence of inflammatory exudations, atrophy of the olfactory region, absence of pigment in the olfactory cells, blunting of the sense of smell from wounds, incautious surgical interference, the injudicious use of powders and liquids in the nasal cavities (as, for example, the constant saturation of the nasal mucous membrane which accompanies the prolonged use of the nasal douche, syringe, and similar contrivances); the application of strong solutions of such substances as zinc, carbolic acid, iodine, alum, etc.; the constant inhalation of noxious gases or irritating particles of solid matter, mechanical and chemical, such as sewer-gas, ammonia, or ether; the habit of snuff-taking; the inspiration of the floating dust in chemical works, etc.

Anosmia may also accompany the atrophic changes in the mucous membrane which follow paralytic conditions of the fifth nerve.

Under the head of obstructive lesions may be placed partial or complete closure of the meatuses from swelling, acute and chronic, of the mucous membrane and cavernous bodies; congenital or acquired malformations or abnormal positions of the septum and other portions of the bony and cartilaginous framework of the nostril; nasal, post-nasal, and pharyngeal growths and adhesions; foreign bodies; dried and accumulated secretion, crusts; inactivity of the dilatores nasi and orbicularis palpebrarum from paralysis of the facial nerve, etc.

The third class, finally, includes all those influences which cause an arrest of the secretion of the normal nasal halitus, or interfere with its properties as a solvent of odorous particles. Thus, in acute and chronic catarrhal inflammation the viscid, ropy condition of the exudation alters the physical quality of the nasal secretion and militates against the proper preparation of the odoriferous particles for contact with the olfactory nerves. In atrophic rhinitis, on the other hand, partial or complete anosmia may result from the dryness of the membrane and the disappearance of its glands and follicles.

The nasal mucous membrane is, as is well known, to a certain extent, supplied with moisture from the lachrymal apparatus. Anything, therefore, which interferes with the passage of the tears through the lachrymal duct will tend to militate indirectly against the proper appreciation of odorous bodies.

When no apparent cause can be made out for the loss of function, it is customary to describe the condition as "essential anosmia."

Symptoms and Diagnosis.—Bearing in mind the fact that anosmia is very commonly unilateral, the olfactory power of the two nostrils should be determined by separate tests. Care should also be taken to use only odoriferous substances, and not those which act by purely mechanical or chemical irritation.

The pathology and treatment of anosmia will obviously depend upon the lesion or condition of which it is the accompaniment or sequel; and the same may be said of the prognosis of the affection.

Parosmia.—Perversion of the sense of smell may be due to central or peripheral causes. Among the first class may be mentioned tumors, inflammation and degenerative processes of the brain or olfactory lobes, and hemorrhagic or serous exudation in the fore-part of the cerebrum, or in the region of the olfactory nucleus. Of central origin may be regarded, too, the olfactory hallucinations of the insane, and the curious disturbances of olfaction met with in the hypochondriacal and hysterical. Parosmia constitutes not infrequently the aura or premonitory symptom of an epileptic attack, or it may only make its appearance at the close of the paroxysm. The various idiosyncrasies in regard to olfaction may also be referable to central disturbance.

Of peripheral causes the most common are acute and chronic catarrhal rhinitis, or new-growths of the nasal fosse. In all cases there is a neurotic element present which must be looked upon as an essential etiological factor.

The pathology of parosmia is obscure. Future research will doubtless discover in some cases an essential anatomical lesion; but in many others the explanation of the condition must be sought for in the domain of metaphysics.

The prognosis will depend upon the cause, and the rational treatment involves the elimination, if possible, of the same.

B. MOTOR AND VASO-MOTOR NEUROSES (Nasal Reflex Neuroses—Coryza vel Rhinitis Sympathetica *).—Within the past few years the attention of the medical world has been more prominently called to a series of morbid phenomena, some directly referable to the nasal apparatus, others to regions of the body more or less remote from the nose, which seem to depend upon irritation or well-marked structural changes in the intra-nasal tissues, and which not infrequently disappear after removal of

the source of irritation within the nasal cavities. These seemingly purely neurotic conditions have received the name of the *nasal reflex neuroses*, and embrace a host of sensory, motor, and vaso-motor phenomena, varying greatly in nature and anatomical sphere of operation. Various neuralgic conditions of the branches of the fifth and other nerves, cough, asthma, vertigo, nightmare, "hay fever," various spasmodic affections, general convulsions, diseased states of the nose, eye, ear, larynx, and bronchial tubes, symptoms referable to irritation of the gastro-intestinal, utero-ovarian, and genito-urinary tracts, even chorea, epilepsy, melancholia, retarded sexual development, and exophthalmic goitre have been mitigated or known to disappear with the cure of the nasal affection.

While in some of the recorded instances of these "reflex nasal neuroses," the enthusiasm and hasty judgment of the reporters have carried them too far, and while in many cases the direct connection between the nasal disease and the reflected phenomena is not sufficiently evident, still the fact is established beyond the possibility of doubt that a causal relationship often does exist between certain conditions of the nasal passages and other portions of the respiratory tract, and a host of phenomena referable to other and remote organs of the body—a direct dependence or connection which justifies us in the belief of their reflex reciprocal relationship.

These affections are sensory, motor, or vaso-motor in nature. As all these varieties are intimately associated, and as their separate discussion would involve ceaseless repetition, they will be considered in this article under the common head of the reflex nasal neuroses.

At the present day, when, by common consent, our knowledge of this class of affections is confined within the narrow limits of scarcely two decades, it may be interesting to glance for a moment, away from the writers of the present epoch, to the literature of more remote times.

HISTORICAL SKETCH.*—"Nullum est jam dictum, quod non dictum sit prius" (Terence). "Multa renascentur, quæ jam ceciderunt" (Horace). In the "Symposium" of Plato, when the time came for Aristophanes to speak, he was seized with the hiccups, and upon requesting Eryximachus to stop them and speak in his stead, was told that, be the hiccups ever so violent, if the nose were tickled they would cease at once. This popular recognition of the sympathy between the nose and diaphragm is also distinctly affirmed in the sixth book of the "Aphorisms" of Hippocrates: "If sneezing comes upon a man in a fit of the hiccups, it puts an end to the disorder."¹

The consensus or sympathy between the nose and eye seems also to have attracted popular attention. Thus Aristotle² devotes two paragraphs of the thirty-third section of his "Problems" to the consideration of the question why rubbing the canthi of the eyes puts an end to sneezing. Avicenna,³ to prevent sternutation, recommends rubbing the eyes, ears, extremities, and palate; while Rhazes,¹⁰ in his chapter on acute and chronic obstruction of the nose (*De Alasemi*), mentions, among the symptoms of the latter, abrogation of the sense of smell, with a coexisting diseased condition of the eyes. Rhazes also recommends the induction of sneezing, "when the mouth is convulsed and drawn to one side,"¹¹ and mentions the fact that running at the nose, a cold in the head, and hoarseness may occur from the odor of violets, etc.¹²

The relation of certain affections of the head, and notably hemicrania to congestion, and even inflammatory disorders of the nasal apparatus, seems also to have been foreshadowed in the writings of the earlier physicians. Thus, in the "Medical Compositions" of Scribonius Largus[†] is found the following direction for the cure of

* In the American Journal of the Medical Sciences for January, 1886, I have given an account of the earlier literature of so-called "hay asthma" and "rose cold."

† Scribonius Largus: De compositionibus medicamentorum, liber unus. Parisiis, 1529. Ed. Vnechel, comp. vi. The ancients included under the generic term headache the affections known as cephalalgia, cephalica, and hemicrania or heterocrania, the latter term being employed by Aretæus (De caus. et sig. morb. chron., liber i., cap. ii.). Aretæus says the sense of smell is vitiated in heterocrania.

* The substance of this section was communicated to the Clinical Society of Maryland in April, 1885, and an abstract of the paper was printed in the Maryland Medical Journal of April 11th of the same year.

certain forms of headache: "Oportet vero permanente capitis dolore, materiam quoque detrahere ex eo nares, vel os."

The dependence of catarrh, coryza, asthma, syncope, convulsions, and a host of other phenomena upon the presence or odor of roses, lilies, peonies, and other flowers, has been recognized for centuries. For, although Pliny* informs us that the seed of the rose inhaled into the nostril has the effect of clearing the brain, there are many cases to be found among the older writers in which the odor of various substances, such as the rose, has been known to result in epilepsy, syncope, and even death; † and there is a tradition that the Roman ladies conceived an especial aversion to the odor of the queen of flowers.

The diagnostic acumen of Galen¹² led him to the observation that in certain persons the presence of various foods is sufficient to excite a coryza, and, scattered here and there through the literature of succeeding centuries, isolated cases are found in which similar peculiarities in regard to flowers and other objects are recorded. ‡

In the light of our present knowledge of the affection known as "hay fever," it is scarcely conceivable that it made its first appearance at the beginning of the present century. As Dick, and afterward Matthew Baillie, thought that in describing their first cases of laryngitis they had discovered a new disease, so Bostock, in portraying the symptoms of "Catarrhus astivus," was led into a similar error. For no one can arise from the perusal of the older writers on asthma without the conviction, or, at least, the suspicion, that this disease has descended to us through the centuries as a species of the "convulsive asthma" and "periodic coryza" of the more ancient nosologists, who, in their state of medical science did not resort to the nosological refinements which proceed from the more advanced pathological research of the present day and century.

I have shown elsewhere¹⁴ that the so-called "idiosyncrasy," by virtue of which the presence or odor of certain flowering plants is sufficient to create disturbances referable to the nasal chambers and other portions of the respiratory apparatus, was familiar at a remote period of medical history. In the days when medical writings were published in Latin, the necessity of recording one's observations in a foreign tongue led to a terseness of style and incompleteness of description which often surrounds with uncertainty the exact nature of the cases reported; but whether the records referred to were examples of true vaso-motor coryza or not, they may be placed in the same category of affections, and the predisposing influences may be considered identical with those provocative of the disease called in the present century "rose cold."

To Voltolini (1871) is universally and erroneously attributed the credit of pointing out the interesting relationship between asthma and nasal disease. I have shown elsewhere,¹⁵ however, from the writings of Aurelian, Zecchi (1650), Schneider, Floyer (1726), Bree (1811), Trousseau, Follin and Duplay, and Ferber (1869), that the association of these two conditions was known long before the time of Voltolini. Among these writers Ferber, referring to the frequent association of sneezing, migraine, hay fever, and bronchial asthma, advanced the theory

that these phenomena were the expression of a neurosis of the trigeminal nerve—a view which has recently been resurrected in a modified form by Schadewaldt (*vide infra*).*

In 1682 Wedel¹⁶ treated of the association of vertigo and sneezing, and in the same year Van Helmont, † in several chapters of his work, discussed the effects of sweet odors in the production not only of epilepsy, but headache, nausea, vomiting, cough, hiccup, vertigo, apoplexy, dysentery, and other affections. He also alludes to the fact that, while sweet odors give rise to asthma in some, in others they produce, instead of asthma, hemicrania, palpitation, and syncope. This writer regards such disturbances as of frequent occurrence, and is looked upon by some as the first to recognize the affection known as "hay asthma."¹⁷

In the early part of the last century Baglivi¹⁸ called attention to the fact that irritation of the nostrils by snuff (or tobacco) may provoke a desire to go to stool. This same observer also called attention to the association of asthma and urticaria (see below, under Pathology).

A few years after the publication of Baglivi's work Gumprecht¹⁹ discussed the sympathetic troubles connected with the inhalation of vapors into the nostrils, and explained them on the theory that the vapor taken into the nose affects preternaturally the branches of the fifth pair of nerves, and is reflected to the fauces, stomach, heart, and lungs through the medium of the intercostal and eighth pair (Willis).

This nerve theory, which was the outcome of the neuro-pathology of Willis²⁰ and Vieussens,²¹ was subsequently insisted upon by Henricus Josephus Rega, in an elaborate general discussion of the sympathies between the different organs of the body.²²

During the first part of the last century there appeared a ponderous work by Johan Jacob Wepfer,²³ consisting of a collection of cases illustrative of the external and internal diseases of the head, in which the relationship of hemicrania and other pathological phenomena to nasal inflammation and obstruction was distinctly and emphatically announced. Nothing seems to have escaped the far-reaching experience and accurate observation of this writer, to whose powers of description and diagnostic acumen it would be difficult to do justice within the limits of this review. So instructive is every case and page that it is hard to make a selection, and I shall, therefore, only refer briefly to the following:

Obs. 34, pp. 75, 76. Association of cephalalgia with stertoration, sneezing, cough, and coryza, supposed to be due to irritation of the dura mater.

Obs. 36, pp. 80-82. Paroxysms of violent headache, vertigo, pain from the nucha to the head, debility of memory and vision, tremor, cough, pain in the eye and about the nose, due to obstruction of the nostril from abuse of tobacco, which caused retention of mucus within the nostril, and awakened the above symptoms from the sympathy of the latter with the meninges about the torcular herophili.

In this case the mucus retained in the deeper portions

* Nat. Hist., lib. xxi., cap. 73. The same writer (lib. vii., cap. 7) also observes that the smell of a lamp which has been extinguished will often cause abortion, and that the latter ensues should the female happen to sneeze just after the sexual congress.

† While there is a remote possibility that this observation of the ancients, which finds its reflection in the poetic imagery of Pope, may have some slight foundation in fact, it is extremely doubtful whether, in the cases referred to, death was due to the simple inhalation of the odorous particles of the flower, for in some of the recorded instances the victims were confined to closed chambers, and were possibly poisoned by the displacement of the oxygen of their bedrooms by the noxious exhalations from the plants. It should also be remembered that our less civilized and punctilious brother-man of a few centuries back did not hesitate to dispose of an enemy through the covert instrumentality of poisoned flowers and other equally insidious devices, by means of which the deadly agent was introduced into the system through the respiratory mucous membrane.

‡ In certain individuals, or even families, this peculiar antipathy or susceptibility to particular flowers or foods takes the form of nose-bleed; in others violent purging occurs, or even epileptiform convulsions.

* The association of epileptiform seizures, or even true epilepsy, with some irritation in or about the nasal passages, or peculiar susceptibility on the part of certain individuals to be thrown into epileptic convulsions through the application of some forms of matter to the nasal mucous membrane, seems to have been familiar from the earliest times. We learn, for example, from Aretæus (*De causis acut. morborum*, lib. I., cap. 1, Ed. Boerhaave, Lugd. Bat., 1735) that the gagate stone (a species of hard coal or jet) was utilized by the ancients as a test for epilepsy, for when applied to the nostrils the sufferer was thrown into epileptiform convulsions. Pliny (lib. xxxvi., c. 34) also alludes to this test, and to the power of the same arising from burning goat's horns or deer's antlers in accomplishing the same result (lib. xxviii., cap. 63). According to this historian the secundines of a she-ass, placed under the nostrils of the patient when the fit is approaching, will effectually dispel it. It is also a curious historical fact that Avicenna (*Op. omnia*, Venet., 1608, lib. iii., Fen. i., tract. v., cap. 8, p. 409) mentions (l. c., Fen. v., tract. ii., cap. 15, p. 585) "rosa cum sulis pilis" among the milder measures resorted to to provoke stertoration, and regarded sneezing itself as a mild form of epilepsy (*epilepsia levis*), and that a similar opinion was entertained long afterward by the learned Ferninus (*Medicina*, Lutetia Parisiorum, 1554, de epilepsia).

† Johan Baptist van Helmont: *Op. omnia*, Francofurti, 1682. Imago fermenti impregnat massam semine, p. 110, § 10, p. 344, § 10, and p. 348, § 41. This author also refers to the case of a monk, employed in pulling down buildings, who grew asthmatic from the constant inhalation of dust.

of the nostrils (*profundè intra cavernas narium retentus et inspissatus ab aère ex pulmonis expirato præservido*) was supposed to draw the meninges into consent.

Obs. 38, pp. 84, 85. Association of pains in the head, tinnitus, pains in the humerus, various nervous symptoms, and vomiting, with inflammation of the fauces. A very interesting case.

Obs. 40, pp. 94. Says he has frequently observed hemicrania due to obstruction of the nares.

Obs. 42, pp. 100-102. Case in which intense paroxysms of periodic cephalalgia and hemicrania were preceded by stupor of the head with gravedo. The patient suffered from obstructed nostrils, with tendency to somnolence and delirium. When the acme of the paroxysm was reached, vomiting of a tenacious mucus with bile occurred, with relief to the symptoms.

Obs. 43. Case of a man suffering from obstructed nares, who was troubled for seven years with daily pain in the head in the morning, when he arose from his couch, to which were soon added heaviness of vision, vertigo, tinnitus aurium, debility of the joints, with tremulous movements of the same. These symptoms were relieved by drawing the mucus from the head and nose into the fauces. The mucus was removed with difficulty, owing to the narrowness of the nostrils from obstruction. He explains the case on the theory of sympathy, and laxity of the pores in the spongy bones. Wepfer believes the trouble to have been an invasion of the spongy (turbinate) bones, and observes that in such cases the indication is to remove the inspissated mucus from the nares. A most interesting case.

Obs. 44. Hemicrania from an acrid serous discharge.

About the middle of the last century Daniel Langhans²⁴ published an elaborate dissertation, which deserves special mention, in which he adverts to the rôle of the superior cervical ganglion in the evolution of sympathetic (reflex) acts, such as asthma, cough, etc., from irritation of the stomach, uterus, and other organs of the body.

In 1760 Morgagni²⁵ explained more fully the sympathy between the nostrils and the diaphragm and abdominal viscera, calling attention at the same time to the communication between the fifth pair of nerves and the intercostals (Willis). In illustrating his theory, he called attention to the case of a nobleman in whom epileptiform convulsions were preceded by a fetid smell only perceptible to himself; also to that of an old drunkard who sneezed for two or three years, for a quarter of an hour each day, and finally died suddenly. On post-mortem there was discovered hypertrophy of the heart.²⁶ In another place he tells of a man of forty, an habitual drinker, who suffered for some time from dyspnea (asthma), with frequent and severe fits of sneezing. One day, in a paroxysm of sneezing, he felt a sudden contraction of the heart, sneezed once more, and died.

In 1761 H. Boerhaave,²⁷ speaking of sneezing in connection with intestinal parasites, makes the assertion that if a healthy man fasts longer than is his wont, he feels a disagreeable sensation about the præcordia, sneezes, and then vomits. Following Avicenna, he compares the sneezer to the epileptic. In the same year Thomas Bartholini²⁸ tells us that, after phlebotomy, when the wound is closed and the cicatrix is yet tender, some are taken with sneezing. In commenting on this remarkable association he states that he has observed sneezing during coitus.

In 1765 appeared a thoughtful treatise on nervous diseases by Robert Whyte,²⁹ of Edinburgh, in which he calls attention to the fact that "several delicate women, who could easily bear the smell of tobacco, have been thrown into fits by musk, ambergris, or a pale rose, which, to most people, are either grateful, or at least not disagreeable" (p. 125). He also mentions similar antipathies in regard to cinnamon and other substances. Whyte alluded to the sympathies between the larynx, pharynx, and ear, and advanced the doctrine that the impressions made upon the terminal filaments of the nerve (as, for example, in ear cough) must be first referred as a particular feeling to the sensorium commune, before being reflected to other parts of the body.

In 1785 Tissot³⁰ called attention to the fact that very violent paroxysms of migraine are sometimes terminated by slight hæmorrhage from the nose, and relates the case of a man of his acquaintance, an habitual sufferer from migraine on the same side in which he had a polypus in the nose, and to which it owed its origin.³¹

In 1797 we find Darwin³² reporting a case of nasal polypi, due to the irritation of worms in the intestines; and, in 1801, Gruner³³ alludes to sneezing in hysterical women as a prodrome of the attack, and in retention of the after-birth; to the same reflex in the dissipation of cough, hiccup, and allied evils; to its occurrence in those suffering from hernia, in pregnancy, and skin eruptions. This writer says³⁴ the nose becomes warm and red in the hysterical, in women at the menstrual period, and in the victims of onanism.

In 1802 Heberden³⁵ observes that "a large suppuration of an inflamed sore throat has been attended with a considerable quantity of pus at the bottom of the vessel which held the urine, for three or four days. As soon as the abscess broke and discharged itself, this purulent appearance in the urine ceased." Heberden, as is well known, was supposed to have approached very nearly the discovery of the disease known as "hay fever."³⁶

In 1804 Deschamps³⁷ maintained the view that hemicrania is a disease of the frontal sinus, and related some experimental observations illustrative of the great sensibility of this cavity; and in the same year Portal observes that he has seen pains, vertigo, and even epileptic affections in connection with disease of the nasal membrane, and refers to a case accidentally cured by the fumes of cinnabar, given with other intention.

The limited space allotted to the present article precludes a critical review of the diversity of opinion with which the different theories concerning these neuroses have been received. Those who wish to familiarize themselves with the recent literature of the nasal reflex neuroses should consult, in addition to the writings already referred to, the subjoined list of articles which represent the principal contributions to the discussion of the subject.

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In 1871 Voltolini,⁸⁸ of Breslau, reported a case of asthma cured by removal of nasal polypi—an observation which attracted considerable attention, and which was followed, shortly, by communications on the relation of asthma to nasal disease, by Hänisch,³⁹ Porter,⁴⁰ H. Hartmann,⁴¹ Schäffer,⁴² Daly,⁴³ Spencer,⁴⁴ Todd,⁴⁵ B. Fraenkel,⁴⁶ Mulhall,⁴⁷ Porter,⁴⁸ Rumbold,⁴⁹ Joal,⁵⁰ Jacquin,⁵¹ Bresgen,⁵² and others.

Among these writers Porter called attention to the rôle of hypertrophic nasal catarrh in the production of asthma, and pointed out the fact that obstruction of, or irritation in, the nares may cause the reflex affection, apart from the presence of a polypus. Among Rumbold's cases was one in which attacks of so-called "hay fever" were dissipated with the cure of the nasal disease. The mechanism of the asthmatic attack was variously interpreted. According to some, the irritation of the sensitive nerves in the pharynx and larynx by mouth-breathing, and the creation of a vacuum behind the seat of nasal obstruction, originated the impression, which was conveyed to the pulmonary branches of the pneumogastric; while others adopted the more natural explanation of irritation directly reflected through the sensitive branches of the fifth nerve.

In May, 1881, at the meeting of the American Laryngological Association, Dr. William H. Daly,⁵³ of Pittsburg, called attention to the fact that in a fair proportion of cases of "hay-asthma" there is local disease of the nose and nasal pharynx (from simple hyperæsthesia to pronounced structural changes, such as hypertrophic catarrh, polypi, etc.), without which the exciting cause (pollen, bacteria) is innocuous, and that the cure of the affection may be accomplished through removal of the local intrinsic condition (by cauterization with acid, electric cautery, etc.)—a position which he established by most convincing practical proof. To this observer belongs the credit of formulating the treatment of the disease by measures addressed to the nasal and naso-pharyngeal chambers. According to Daly, we are only justified in looking upon "hay fever" as a neurosis when the affection persists after removal of the local nasal disease. Daly attempted no explanation of the mechanism of the disease, but simply announced a clinical fact and the treatment based upon it.*

The following year, Dr. Roe,⁵⁴ of Rochester, published the successful results of his treatment of the disease by the operative method, and related a number of cases in which a cure had been effected. According to him, the affection is due to the action of pollen upon the nasal mucous membrane, which in some persons is rendered peculiarly susceptible by active or latent disease of the naso-pharynx associated with hypertrophic catarrh of the nasal passages. The asthma and other manifestations of the paroxysm are due, he believes, to reflex congestion of the mucous membranes of the several organs in which their effects are manifested. While Dr. Roe believes the exciting cause to be pollen, he at the same time contends that, in order to the production of a paroxysm, "latent or active" nasal disease must be present, that

* Dr. Edson (letter to *N. Y. Medical Record*, 1878, vol. ii., p. 317) had previously called attention to the fact that all cases of the disease presented one or more of certain symptoms referable to the nose, such as great sensitiveness of the nasal membrane, coryza, persistent stertoration, naso-pharyngeal catarrh, etc.

the nervous symptoms are secondary to the hyperæsthetic condition of the nostrils, and that the latter is not the effect but the cause of the neurotic feature of the disease.

At the meeting of the Verein der Aerzte Steiermarks, 1881, Dr. Josef Herzog³⁵ advanced the view that "hay-asthma" is simply a form of the neurasthenic condition described by Beard, and held that local treatment is of secondary importance.

In the same year in which Roe's papers appeared I published the results of some experiments made by me with reference to the production of nasal cough and the localization of reflex sensitive areas in the nasal passages, which, I ventured to think, threw some further light upon the subject of reflex nasal neuroses. These observations, and the views of Professor Hack upon the subject, have already been considered at the commencement of this article. Hack's able monograph, which was published in Wiesbaden in 1884, was based upon a series of instructive cases, including nightmare, asthma, migraine, cough, *muscæ volitantes*, supra-orbital neuralgia, vertigo, epilepsy, swelling and redness of the external nose, "hay-fever," etc., reported in the *Wiener Medizinische Wochenschrift*, in the latter part of 1882 and in 1883, and is a most valuable contribution to the literature of the nasal reflex. It excited a great deal of comment, and was followed rapidly by a number of communications on the subject.

Hack holds that the reflex excitability of the mucous membrane in this class of neuroses is dependent solely upon the tendency to sudden swelling of the cavernous bodies, and he explains the mechanism of the reflex as follows: When an irritant is applied to the nasal mucous membrane, the first thing that happens is swelling of the erectile bodies from a determination of blood to their cellular spaces. The extreme tension of the mucous membrane, thus brought about by the engorgement of the cavernous bodies beneath it, acts as the exciting stimulus to the terminal filaments of the sensitive nerves, with the subsequent production of the reflex. The chain of events is then (1) swelling of the cavernous bodies; (2) tension of the mucous membrane; (3) irritation of the terminal nerve-filaments; (4) the reflex phenomena. Hack maintains, furthermore, that should the irritation start from portions of the mucous membrane other than that covering the anterior end of the turbinated bone, the swelling in the latter circumscribed situation occurs only indirectly or secondarily through the influence of "nervi erigentes." This turbinated engorgement then forms the connecting link between the nasal symptoms and those referable to other parts of the body, and *must* be present in order to the production of the reflex. As the presence of an inflammatory condition prevents or interferes with the cavernous swelling, he maintains that the frequency of nasal reflexes is in inverse ratio to inflammatory conditions of the mucous membrane.

Like Daly and Roe, Hack holds that morbid conditions of the nose itself play the essential part in the etiology of the disease, and believes that the neurasthenic symptoms are secondary to the nasal affection, calling attention at the same time to the fact that the latter may coexist with a general neurosis without having any connection with it.

In 1884 a still more exclusive view was put forth by Dr. Harrison Allen, of Philadelphia.

According to Allen, "hay-fever" and allied neuroses depend solely upon obstruction of the nostrils (from deflection of the septum, hypertrophy of soft parts and bone, turgescence of the nasal mucous membrane), and that the cure consists simply in removing the obstruction (or tendency thereto) in the nasal chambers. According to his experience, sufferers from these affections have one feature in common—the inferior turbinated bones lie well above the floor of the nostril, an anatomical peculiarity which subjects their overlying mucous membrane to additional irritation from extraneous substances.

It would appear, then, that the truth is irresistibly emerging into recognition that certain abnormal conditions of the nasal passages are necessary to the produc-

tion of the *ensemble* of phenomena which form the clinical picture of so-called hay-asthma and allied nasal neuroses. Although the results arrived at by different observers, working independently of each other, and starting out in some instances from different stand-points, are not altogether harmonious, they present, nevertheless, a singular unanimity in their convergence to a common point—in their recognition of the importance of remedial measures addressed to the nasal chambers as a prime factor in the therapeutic management of the disease.

Several months after the publication of Dr. Allen's view I endeavored to reconcile the discrepancies met with in the results of different observers,³⁶ and in several subsequent publications advanced the doctrine which is advocated in the present article (see Pathology and Treatment).

NOTE.—Since the completion of the above historical sketch, Dr. Schade-waldt, of Berlin (*Die Trigemino-neurosen*, Deutsche med. Wochenschrift, Nos. 37 and 38, 1885), has advanced a theory very closely resembling the one insisted upon by Ferber, of Hamburg, in 1869 (see Historical Sketch). According to Schade-waldt, "nasal asthma," cough, and various other well-known nervous phenomena referable to the respiratory tract are to be regarded as the symptoms of a neurosis of the trigemino nerve, as functional disturbances of the normal reflex function of sneezing—"qualitative changes with quantitative exalted reflex excitability." To illustrate—the physiological results of irritation of the nasal fossæ are, in the order in which they occur, swelling, secretion, sneezing. It often happens, however, as in chronic inflammation, that only one of these elements (swelling) is present, sneezing and secretion being replaced by cough, which latter may be regarded as their pathological vicarious representative. This cough, then, may be looked upon as the pathological inversion of the act of sneezing, and the rational method of therapeutic procedure would therefore involve, for the dissipation of the cough, the production of both secretion and sneezing. Asthma likewise represents a pathological disturbance of the normal nasal reflex. Schade-waldt's observations on the subject of cough tend to substantiate, essentially, the results arrived at by me, viz.: that the lower and posterior parts of the nasal fossæ are the spots generally most sensitive to the reflex-producing impression.

Since the appearance of Schade-waldt's article, Dr. Bosworth (N. Y. Med. Journal, April 24 and May 1, 1886), of New York, has modified the obstruction-theory as follows: Bosworth argues that, as the mucous membrane of the air-passages is endowed with no special secretory apparatus, and as its glands secrete mucus alone, the surplus moisture taken up by the inspiratory current during the day cannot possibly come from that structure. As, furthermore, the delivery of such a large amount of moisture to the inspiratory current by the respiratory membrane would involve the destruction of the latter by producing excessive dryness, he assumes that the erectile tissue of the turbinated bodies is endowed with that peculiar privilege, and that "the respiratory function of the nose is simply an exosmosis of serum." Starting out with this physiological postulate, he theorizes as follows: The essential anatomical feature in this class of cases is stenosis of the anterior portions of the nasal fossæ. In such an event every act of inspiration causes rarefaction of air behind the point of obstruction, from diminution of atmospheric pressure and the production of a vacuum (as pointed out by Andrew H. Smith), and that not only in the nasal cavities, but along the whole naso-bronchial tract. This finally begets a tendency on the part of the mucous membrane "to sag down or pouch into the cavity," a condition attended with dilatation of the blood-vessels, especially those of the turbinated tissues, and tending to local inflammation—a sort of dry-cupping process, as it were. This results finally in a weakening of the muscular fibres which regulate the calibre of the vessels, and "their escape, to a certain extent, from the control of the vaso-motor nerve"—a vaso-motor paralysis which leads to an enormous transudation of serum, with a sodden condition of the membrane, and "an unlocking of the whole activity of the respiratory function," which causes a "flooding of the membrane rather than a flooding of the cavity, and therefore causes extreme turgescence of the blood-vessels, with complete stenosis of the passage." The sodden, prolapsed membrane pressing on the terminal nerve-filaments gives rise to the nervous phenomena. Although the latter are the result, therefore, of nerve-pressure, Dr. Bosworth, singularly enough, denies that a reflex agency is necessary to their production (see N. Y. Med. Journal, February 26, 1887, p. 246); indeed, he is disposed to think there is no such thing as a reflex disorder, and considers that "direct continuity of surface from the nasal chambers to the bronchial tubes," and a relation between the blood-vessels of the larynx and those of the nose, so that a close sympathy exists between them, are sufficiently explanatory of the fact that congestion in one place may produce congestion in another.

The fallacies involved in the obstruction-theory will be sufficiently indicated below. Unfortunately for its advocates, in a large proportion of cases there is no nasal obstructive lesion whatever. The view violates the two most essential criteria of a logical hypothesis—the facts do not exist, and the assumption is inadequate to even partially explain the phenomena. To take one of a multitude of illustrations, how could rarefaction of air in the bronchial tubes, the result of nasal obstruction (even admitting the existence of such a fact) or of direct continuity of the nasal and bronchial tissues, account for the sudden and immediate production of a paroxysm of asthma, cough, or other reflex disorder from the simple contact of a probe or other indifferent substance with the nasal mucous membrane—a result which I have often observed?

ETIOLOGY.—*Age; Sex; Condition of Life.*—No age or condition is exempt. I meet with these reflex phenomena at all ages and in every condition of life, in private and in hospital practice. While the majority of cases

that apply for treatment come from the educated classes, it must not be forgotten that it is precisely persons of this class that seek intelligent medical advice or are likely to come across circulars distributed by those investigating the complaint. Several of my patients dated their trouble from infancy, and two of the most distressing and typical instances of asthma and vaso-motor coryza first appeared at the ages of two and three months respectively. I find these neuroses more common among women than is generally supposed, and am inclined to regard the question of sex as one of unimportant etiological significance.

Inheritance; Family Peculiarities.—I think there can be no doubt that a peculiar excitability or deranged condition of the nerve-centres may descend from father to son, and determine the appearance of the affection in the latter. The question of inheritance in regard to periodic vaso-motor coryza has been established beyond all question by the able researches of Wyman⁵⁷ and Beard,⁵⁸ and my own observations not only support their conclusions in this direction, but also demonstrate the certainty of transmission of other members of the group of "reflex neuroses" from generation to generation. It is not uncommon to find several members of the same family similarly affected, and it not infrequently happens that one or both of the parents of children suffering from this class of sympathetic rhinal disease either bear the exact reproduction of the affection in their own persons or labor under some allied respiratory neurosis. In a fair proportion of cases it will also be found that more remote relatives of the individual suffer from asthma and various other nervous conditions. In other instances the general family temperament is essentially neurotic, with a tendency to epilepsy, chorea, or some other pronounced nervous affection.

Temperament.—The predominant temperament among individuals affected with these reflex neuroses is unquestionably the neurotic. While they may, in many instances, not necessarily belong to the so-called "nervous" or "hysterical" variety of individual, while they may give no outward and visible sign of a deranged nervous system, there will generally be found, on careful examination, a delicacy or sensitiveness of the nervous apparatus, either in whole or in part.

Race Peculiarities; Origin.—Taking the view which I do of these affections, it does not seem to me justifiable to confine the operation of their causes within the limits of a particular century, or to explain their phenomena on the hypothesis of national or race peculiarities.

More accurate observations are necessary to the formulation of definite conclusions concerning the occurrence of these neuroses in the inferior races. While it is doubtless true that the physical and moral forces of civilization encourage their development in the higher walks of life, they probably do so only in so far as they predispose to abnormal excitability of the nervous system in general, or to catarrhal and asthmatic affections.

The absence of so-called "hay-fever" in the negro has been brought into prominence by recent writers on the subject, and notably by Beard, as an argument in favor of the important rôle which race is supposed to play in the etiology of that disease. I have recently,⁵⁹ however, pointed out the fact that this race is by no means exempt from this curious disease, and I now and then meet with reflex phenomena in the negro, referable to disease of the nose and belonging to the same category of affections; and it is possible that a fair proportion of cases of the convulsive asthma which occur in that race may have a similar origin. One of the most pronounced cases of "reflex asthma" which I have ever seen, and in which the asthmatic paroxysm could be produced at will by irritation of the nasal sensitive area with the probe, occurred in the person of one of the blackest representatives of the Ethiopian race. In this people the exquisite delicacy of the sense of smell, the prominent development of the turbinated bodies, and the consequent increased amount of surface exposed, would seem to invite the paroxysm

in those surrounded by the conditions that provoke it.*

Structural Peculiarities.—In persons affected with the sympathetic forms of coryza or rhinitis, the mucous membrane of the nasal passages, and, in some instances, of the whole respiratory tract, is the seat of a peculiar hyperæsthesia, whose origin and characteristics will be more fully discussed, later on, under Pathology.

During the paroxysm this hyperæsthesia is altogether out of proportion to that which is ordinarily met with in simple inflammation of the nasal passages, and is often increased by remedies which ordinarily control effectually the deranged sensibility of simple coryza or chronic rhinitis. Indeed, in a large number of the class of cases commonly known as "reflex nasal neuroses" this irritability is so exquisite as to render the contact of the blandest applications unbearable to the patient, and this apart from the presence of any of the exciting causes of the paroxysm. This often renders the topical treatment of existing nasal disease a matter of considerable difficulty, not only at the time of the paroxysm, but also in the interregnum of so-called immunity. It also often predisposes to coryza from apparently trivial causes.

The hyperæsthesia is commonly associated with a marked tendency to erection of the corpora cavernosa; and both hyperæsthesia and cavernous engorgement I believe, in opposition to Daly, Roe, and Hack, to be purely secondary phenomena, dependent, in all probability, upon some central irritation or paresis (see, also, section on Pathology).

The swelling of the corpora cavernosa is not, therefore, absolutely necessary to the production of the nasal reflex, and must be considered, in many instances at least, not the originator, but the vaso-motor accompaniment of the reflex act. Repeated or permanent engorgement of these bodies undoubtedly predisposes to and increases the reflex irritability of the nasal fossæ, and their erection may precede, in point of time, the evolution of the reflex act; but it is at the same time equally true that the latter may occur without any change in the cavernous bodies appreciable to the eye.

I have not been able to discover any structural peculiarities in the skeleton of the head which might serve to differentiate this class of cases from other intra-nasal processes. While in some the inferior turbinated bones, as pointed out by Harrison Allen, lie well above the floor of the nostril, I am inclined to regard this elevated condition as an inconstant anatomical feature.

Glasgow⁶⁰ has observed in cases of sympathetic rhinitis an abnormal pallor of the mucous membrane, which he explains on the theory of spasm of the arterioles—due to an increased vascular tone caused by an augmented action of the vaso-constrictors. With this arterial spasm occurs general arterial tension, the onward flow of the more solid portions of the blood is prevented, and the cavernous bodies of the mucous membrane become infiltrated with escaping white corpuscles and the liquor sanguinis. This view, he thinks, is supported by the favorable action of remedies which cause arterial dilatation, such as atropin and amyl nitrite. This prominent feature—*i.e.*, pronounced paleness—disproves, he believes, the possibility of congestion of the cavernous bodies.

In the class of cases we are discussing, the nasal passages may be entirely free of any well-defined structural lesion; or, on the other hand, may be the seat of almost any pathological process met with in these cavities. A common condition is the hypertrophic stage of ordinary inflammation, or pronounced congestion of the mucous membrane, more marked over the area of the cavernous tissue. In another case we find a deflected septum, an unusually prominent turbinated bone, or other deformity of the intra-nasal framework; in still another, one or more nasal polypi, and so on. Sometimes the nasal fossæ are more or less completely obstructed, while in others the lumen of the nostrils is normal or even very

* Since reporting my first case of "hay-asthma" in the negro, two similar cases have come under my observation.

capacious. Atrophic conditions are very seldom met with;⁶¹ very extensive atrophy I have never seen.

The rôle of intra-nasal disease in the production of reflex phenomena will be considered under the head of Pathology.

The appearances of the pharynx and lower air-passages will depend usually upon the diseased condition of the nasal fossæ, and may accordingly be of the most manifold nature.

SYMPTOMS.—General Characteristics.—The attacks which characterize the affection are paroxysmal, occasionally showing a decided tendency to periodicity, and may occur at any time, but more commonly at night, when the recumbent posture is assumed, or when the patient lies on the more affected side. Varying greatly in duration from a few moments to several hours, the paroxysm either passes off spontaneously or is terminated by sneezing, with or without a copious discharge of mucus or serum from the nostrils. Several attacks may occur during the day or night, except when the paroxysm is prolonged, in which event only one seizure takes place during the twenty-four hours. The onset may be sudden and without warning, or it may be preceded by a variety of sensations either referable to the nasal apparatus itself or to a distant organ. Under the former head may be mentioned sneezing, itching, tickling, sense of a foreign body present, dryness or fulness of the nasal passage or throat, or sudden and complete stoppage of one or both nasal passages. Under the latter are itching and other sensations in the eyes or ears, or a sense of formication in various parts of the body, and a sense of fulness, dullness, or even pain in some organ remote from the nasal fossæ.

There are generally one or more symptoms which possess more prominence than the others; or a number may be prominently associated in the same individual, notably in the case of coryza vasomotoria periodica. The grouping together of several of the more common symptoms of this disease was formerly, and is now generally, known as hay-asthma. In some persons they only appear in connection with some physiological process, as menstruation, coitus, etc.; in others, only during certain months of the year or in the presence of brusque temperature-changes. When the paroxysms show a decided tendency to periodicity, coming on at or about the same hour every day, it will be observed that in this case a more or less pronounced neurotic temperament is present, and that apart from any so-called hysterical manifestations.

Analysis of Individual Symptoms.—Symptoms Referable to the Organs of Special Sense. Nasal Apparatus. The most prominent symptoms which arise from the peculiar irritability of the nasal passages in this disease are cough; perversion, abrogation, or complete suspension of the olfactory function; persistent itching, generally referred to the end of the nose; epistaxis; redness of the external integument, with occasional desquamation of the cuticle; sneezing, obstruction, and the discharge of a limpid fluid from one or both nostrils; pain along the bridge of the nose, with occasional tenderness on pressure.

Nasal cough is exceedingly common, is always paroxysmal, and varies in character from a short, explosive, cough-like sound to paroxysms of great violence. In one case under my observation these were so distressing and severe that the patient, a woman, on their approach had to kneel upon the floor and fix the body against some unyielding substance, so great was the convulsive bodily agitation.

The cough is generally short, dry, hacking, or barking* in character, and may be the only symptom for which the patient seeks relief. It is unaccompanied by expectoration, and may be preceded or accompanied by uneasy sensations (prickling, tickling, dryness, sense of foreign body, etc.) referable to the larynx, and generally to the region of the crico-thyroid space. In some per-

sons a distinct laryngeal cough is added to the nasal; that is to say, a double cough is present—a condition which may be described under the title *dibecheia*.

Itching at the end of the nose is very commonly a symptom of irritation about the posterior portions of the nasal fossæ, and the same may be said of the intense redness of the external nose so frequently symptomatic of nasal affections. The paroxysms of the disease are sometimes terminated by a copious hæmorrhage from the nose, or the latter may be present from the outset of the attack.

Sneezing is a prominent feature. It may occur at any period of the day or night; but most commonly early in the morning, on rising, or in the evening after sunset.

The paroxysms vary greatly in duration and severity, and are brought on by the most trivial circumstances. Getting out of bed, the exposure of the eyes to light, mental impressions, the slightest draught of air, opening a dusty book, and a host of such agencies are alone sufficient to provoke them. In one case they were excited whenever the patient cleaned his teeth; in another the simple act of combing the hair invariably gave rise to attacks of sneezing and tinnitus aurium. In both these cases a cure was effected by removal of the intra-nasal irritability.

A frequent nasal symptom is the copious discharge of a thin, watery fluid, which at times is sufficiently acid to excoriate the nares and upper lip. It varies greatly in amount; in some instances the patient has to sit for hours over a basin or bucket, into which the discharge literally pours.

Organ of Hearing. The symptoms referable to the organ of hearing are tinnitus, pain in the ear, itching of, and accumulation of wax in, the auditory meatus, sudden stoppage of the Eustachian tubes, redness of the drum-membrane, and clicking and snapping noises in the ear.

In 1883⁶² I called attention to certain reflex aural phenomena from nasal disease, to the recognition of which I was led by their accidental production during operative procedures in the nose; and suggested their probable dependence on morbid states of the turbinated bodies, for in certain cases I found that they could be reproduced by artificial stimulation of these structures. Quite recently Dr. C. H. Burnett,⁶³ of Philadelphia, in an excellent article, describes certain peculiar clicking or snapping noises in or about the ear, which he refers to reflected irritation from the turbinated bones to the muscular tissues of the velum and the superior pharyngeal constrictor and pterygoid muscles, producing clonic spasm. In one instance Dr. Burnett produced the sounds artificially, when the medicated substance was pushed along the inferior turbinated bone into the nasal pharynx.*

Occasionally a peculiar beating noise is heard, apparently upon the drum-membrane, which may possibly be due to spasm of the tensor tympani. The tinnitus which occurs from nasal disease is inconstant, and often dependent upon the condition of the turbinated tissues. Itching of the auditory canal is often a prominent symptom, and the physician is not infrequently consulted on account of this condition alone. If the nasal symptoms are inconspicuous, as they sometimes are, and if nothing wrong is discoverable by physical examination of the ear, the case is liable to be looked upon as one of hysteria, or as the expression of some illy-defined neurosis.

The diagnosis of the reflex nature of these phenomena depends upon the absence of disease of the Eustachian tubes and auditory apparatus, their immediate disappearance with the cure of the nasal affection, and, in some cases, the possibility of their artificial reproduction by irritation of the nasal mucous membrane.

Now and then an enormously swollen and congested condition of the auricles, coming on suddenly and disappearing as rapidly, is observed, which may be regarded

* The so-called hysterical, barking cough of children sometimes finds its explanation in irritation about the nasal cavities which is overlooked by the attendant.

* Clonic spasm of the soft palate, with objective noises in the ear, dependent upon neuralgia of the trigeminal, have since been observed by Schech (Münchener med. Presse, 1885, No. 22, Reprint).

as analogous to the appearance of these structures after section of the sympathetic in the neck. It is sometimes associated with intense itching of the auditory meatus.

Organ of Vision. The congested and, in some instances, inflammatory condition of the conjunctiva, which is so often observed in connection with nasal disease, is generally explained on the theory of extension of inflammation through the nasal duct; but it is probable that such an event occurs less frequently than is generally supposed, and I am inclined to regard the dilatation of the conjunctival vessels, in a large proportion of cases, as a reflex vaso-motor phenomenon, the vessel-dilatation being kept up by constant irritation of the most sensitive spots in the nasal passages. In the same manner may be explained the recurrent herpes and keratitis which are observed in connection with nasal diseases, the phenomena in these cases being called forth by trophic disturbances.⁶⁴ In long-standing cases the conjunctival vessels may become permanently dilated, and even varicose, a condition best seen on eversion of the lids. Added to this there is generally irritation of the Meibomian glands, and a tendency to the collection of yellowish secretion at the inner canthi. Itching in the latter locality is not uncommon. Associated with these symptoms is a more or less constant sense of constriction about the forehead and between the eyes, and a dull feeling, sometimes amounting to pain, in the eyeballs.

During the paroxysm there is increased lachrymation, the eyelids become puffy and oedematous, and even a state of chemosis may develop. Sometimes vision is completely interfered with, and everything becomes blurred before the eyes until the attack passes off. *Muscae volitantes* have been not infrequently observed.

I have several times seen a peculiar spasmodic twitching of the eyelids which seemed to depend upon reflected irritation, for it occurred only during the temporary aggravation of the nasal affection. The abnormally hyperæmic condition of the orbital tissues may lead eventually to increased intra-ocular pressure and the consequences dependent thereon.

Organ of Taste. Owing to the close physiological alliance between the senses of taste and smell, morbid conditions of the former are frequent accompaniments of the impeded discharge of the latter function. The reflex neuroses of taste are imperfectly understood; they usually consist in abrogation, perversion, or destruction of the special sense. The perversion of taste is sometimes so great as to interfere with digestion, by creating a distaste for food and the consequent interference with its proper reception by the digestive apparatus.

Pharynx, Larynx, Mouth. Patients suffering from rhinitis sympathetica frequently complain of tingling or itching sensations in various portions of the larynx, pharynx, and roof of the mouth. In the larynx they create a tendency to cough; in the mouth and pharynx there is, in addition, often an irresistible desire to scratch the itching surfaces. Sudden congestion of the oropharyngeal and laryngeal membranes is not infrequently observed, alternating sometimes with pronounced pallor of the parts. The engorged conditions of the vessels is occasionally such that rupture occurs, with considerable loss of blood. In a professional colleague the prostration from the hæmorrhage was sufficiently great to confine him to bed for several days.

Marked increase in the amount of the salivary secretion, a swollen, sodden condition of the gums, and herpetic eruptions about the mouth and throat, are also observed in connection with the paroxysms of this class of neuroses.

Lower Respiratory Apparatus; Dyspnoea, Asthma. The dyspnoea which proceeds from reflected nasal irritation varies greatly in degree. At times it is slight, provoking only a faint oppression or consciousness of obstruction to the respiratory forces—a perceptible sense of antagonism between the acts of expiration and inspiration. At others the difficulty in breathing is violent, spasmodic, and, in some instances, apparently dangerous to life. This symptom is one of the most interesting of the phenomena of sympathetic rhinitis.

Dyspnoea may be the result of purely mechanical causes, or, as in the case of sympathetic rhinitis, may be due to reflected irritation from the nose. It is generally supposed that difficulty of respiration from the former cause only occurs when the impediment to breathing is situated in the lower meatus, which latter channel has, by common consent, been invested with the peculiar and exclusive privilege of conducting the air to and from the lower air-passages. It is therefore stated authoritatively that the difficulty of breathing through the nose, which may be termed *nasal dyspnoea*, occurs only when the inferior meatus is in some way or other obstructed. This is in part erroneous, for I now and then see cases in which slight nasal dyspnoea is a prominent symptom, and in which the lower meatus is perfectly free, the obstruction being confined to the upper and middle channels. The cause of the dyspnoea in these cases springs, it seems to me, from a twofold source: (1) From obstruction to the air-current; and (2) from disturbance of the physiological relations between the olfactory sense and the respiratory process.

Not infrequently the dyspnoea assumes the form of a distinct asthmatic attack, which comes on, as a rule, suddenly and lasts for a few moments only, or may be prolonged for hours. During the paroxysm the patient presents the characteristic distressing appearances of one suffering from so-called nervous asthma. He breathes with open mouth, and the sibilant and sonorous râles are generally loud enough to be heard without auscultating the chest. The paroxysm, which may be occasionally excited by artificial stimulation of the nasal mucous membrane, passes away gradually, sometimes as suddenly as it came, leaving the patient in a state of great weakness or nervous prostration. The nose is usually filled with a more or less fluid mucus, upon the expulsion of which the paroxysm subsides.

Children are by no means exempt from the asthmatic manifestation; on the contrary, I am inclined to regard it as of frequent occurrence in early life. I have met with well-marked asthmatic paroxysms of the greatest severity in children suffering from this affection at the ages of one month, two years, and five years, and in one case the parents stated that the child had suffered from asthma ever since it was born. In the asthma of childhood the nasal passages should always be systematically and carefully explored, to exclude or determine the presence of any source of reflected irritation.

Especially remarkable is the association of reflex asthma in children with affections of the skin, and notably milk-crust and nettle-rash.

Nervous System. The symptoms referable to the nervous system proper are sufficiently numerous. The most frequent, perhaps, are those which are referable to disturbance in the domain of the fifth nerve, its branches and connections. Of these, the most commonly encountered are supra- and infra-orbital, facial, occipital, and dental neuralgia. Less frequently met with are neuralgic affections of the pharynx, larynx, and neck.

Headache of varying intensity is often associated with swelling of the intra-nasal tissues, and it is not improbable that a certain proportion of the headaches occurring at the menstrual epoch may depend upon the physiological erection of these tissues which is sometimes seen at the monthly period.

It has been known for a long time that convulsions, and even a condition resembling acute hydrocephalus, may every now and then occur in connection with the ordinary nasal inflammation of childhood. The dependence of choreiform attacks and epileptic seizures upon affections of the nasal passages has also been inferred from their complete dissipation with the cure of the nasal disease. I have once seen marked choreic convulsions disappear during the treatment of a nasal catarrh, and it is quite possible that in the cases of epilepsy in which the "aura" starts in the nose it may be connected in some way with structural disease of that organ.

Among the symptoms referable to disturbance of the nervous apparatus may be mentioned cardialgia, attacks resembling angina pectoris, rheumatic pains, itching,

horripilation and formication in various parts of the body, spasm of the laryngeal adductors, of the muscles of the face, neck, etc., and functional and spastic aphonia.

In some cases of long standing the whole nervous apparatus is profoundly involved, and there is scarcely a known neurotic symptom which may not make its appearance at some period or other of the disease.

EXCITING CAUSES OF THE PAROXYSM.—The exciting causes of this form of neurosis are legion. Anything that tends to increase the unnatural hyperæsthesia of the respiratory membrane may provoke an attack (see article on Larynx, Catarrhal Affections of the, in vol. iv.).

My own observations, based on the analysis of a large number of cases, teach (1) that there is practically an infinite number of causes which may precipitate the attack; (2) that one irritant is of itself insufficient to produce the paroxysm, the latter being only possible from abnormal functional activity of the nerve-centres, inherited or acquired; (3) that in the majority of cases the paroxysms are induced by a variety of agencies differing entirely in character and mode of operation, and even in those cases in which there is apparently only one exciting cause it will generally be discovered that there are conditions which bring about the attack other than the alleged solitary exciting cause; (4) that the latter may be operative only during certain periods of the year, or may provoke a paroxysm, without regard to season, whenever applied; (5) that it may be said, in general, that the exciting cause may produce its effect by direct or indirect (reflex) irritation of the sensitive nerves of the nasal and other mucous membranes, through olfactory impression or through simple association of ideas, or the same result may be brought about by physical or mental over-exertion or emotional excitement; (6) that typical paroxysms occur in some persons at any season of the year, from a variety of causes, but especially from sudden changes in the temperature, or from electrical disturbances of the atmosphere; (7) that paroxysms may be produced as reflex phenomena from irritation of a distant organ, or from some excitation starting in the nerve-centres themselves; (8) finally, that pollen is only one of a host of exciting causes, and there is reason to believe that in some cases in which it is supposed to be the excitant it has little or no influence at all.

As an illustration of the effect of a purely psychical impression in the production of the paroxysm, I would call attention to my experiment with an artificial flower, related at the seventh annual meeting of the Laryngological Association,⁶⁵ and reported afterward in full in the *American Journal of the Medical Sciences*, January, 1886.

PATHOLOGY.—We are at present passing through a revolution of sentiment in regard to the pathology of certain affections whose external phenomena, at least, are chiefly or wholly manifested in the respiratory apparatus, and notably its upper segments. Phenomena inexplicable on commonly accepted beliefs have received their fitting explanation in morbid conditions of these structures, linked to a disordered state—imperfectly defined, it may be—of the vaso-motor sympathetic. Especially is this true of that interesting group of symptoms known as "hay-fever," but for which, I think, the term coryza vasomotoria periodica is a more appropriate appellation.

The various theories advanced in explanation of the nasal reflex neuroses have already been considered, and it remains for me to recapitulate, as briefly as possible, the principal articles of my own belief.

According to my conception, as outlined in several articles published during the last few years, the so-called nasal reflex neuroses, whether taken singly or collectively, as in the case of the *ensemble* of phenomena known as "hay-fever," may be regarded as the protean manifestations of a morbid condition to which I have given the name rhinitis, or coryza sympathetica, and which is characterized by a hyperæsthetic condition of the vaso-motor nerve-centres, linked to a peculiar excitability of the nasal mucous membrane and cavernous tissues. For, if we inquire what condition or conditions are common to them all, what morbid process is capable of producing them,

either singly or in combination, and how phenomena apparently so widely different in character and anatomical sphere of operation may be traced to a solitary source, we find the answer in certain more or less clearly defined changes in the nasal apparatus, and in a certain exalted state of the sympathetic nervous system, to which latter we instinctively turn as the organ most conspicuously concerned in the evolution of purely reflex acts. In whatever relation the local nasal affection and the condition of the sympathetic stand to each other in the matter of cause and effect, they must both be regarded as inseparable factors in the production of the phenomena under consideration. It matters not to what hypothesis the path of speculation may lead. Of this we can be reasonably sure, that in order to the production of the characteristic symptoms of this disease a certain excitability of the nasal passages is necessary, plus an exalted state of the central nervous system.

From our present knowledge of the disease falsely called "hay-fever," for example, it seems difficult to escape the conclusion that its pathology is intimately interwoven with a morbid condition of the vaso-motor sympathetic, and probably a hypersensitive state of the nerve-centres themselves. When we recall the fact that in the famous section of the sympathetic in the neck, by Claude Bernard, symptoms similar, or closely allied, to the phenomena of hay-fever were produced; when we reflect upon the results reached by Prevost in his experiments on the spheno-palatine ganglion, is there not a clew to lead us through the labyrinth of our difficulties to a rational solution of the question? Whatever be the essential cause of the disorder, do not its phenomena point directly to a circumscribed disturbance of the vaso-motor sympathetic? What the histological condition of the centres or the nerves themselves may be, is, in the present state of our knowledge, a matter of conjecture; but this much is probable, that their normal impressibility is so increased that when subjected to various forms of stimulation an explosion of nerve-force takes place, which is represented to our senses by certain vaso-motor disturbances in the nasal passages and other portions of the mucous tract dominated by the cervico-occipital sympathetic. The organs which bear the brunt of the attack are the nasal passages, and the exalted condition, erythema of the turbinated corpora cavernosa, is therefore the leading, distinguishing, and characteristic feature of the paroxysm, constituting, as it were, the central symptom, around which the other phenomena of the paroxysm are grouped, and from which many of them proceed, either as the result of mechanical causes or from reflex action. Whatever be the exciting cause of the paroxysm, the tendency to secondary erection of this tissue plays an important rôle in its mechanism, and, just as in an ordinary coryza, the central symptom, the most prominent condition, is represented by the swelling of the cavernous bodies.

For practical purposes, then, we may regard the affection as a coryza dependent upon some derangement of the nerve-centres as its essential cause.

In calling special attention to the irritability of the nasal erectile—or contractile—tissue, I do not by any means seek to overlook the vaso-motor manifestations in other portions of the respiratory apparatus, and even in other organs not directly connected with it. On the contrary, the explosion of vaso-motor force expends itself upon other portions of the tract dominated by the cervico-occipital sympathetic. Just as in a cold in the head we have symptoms referable to the lower respiratory tract, aural apparatus, eye, etc., so in this form of sympathetic coryza we have disturbances in these and other organs of the body. But when the nose is the organ chiefly involved, the symptoms which stand out in conspicuous prominence are those which spring from the erection of the turbinated tissues. That the manifestations included under the head of asthma, cough, congestion of the conjunctiva, etc., may proceed from this source alone, is shown by their immediate dissipation upon the removal of the source of irritation in the nasal passages by topical applications, instrumental interference, or by the artificial contraction of the swollen

tissues. I have been able to illustrate this by the following experiment: In the course of treatment of one of my cases with the cautery, I noticed that, when the applications were confined to one nostril, the phenomena referable to the corresponding side of the head were completely dissipated, while those of the opposite side persisted and were only removed upon cauterization of the mucous membrane of that side.

While, then, it is probably true that certain states of the nasal passages are necessary to the production of a paroxysm, it is, at the same time, equally demonstrable that these are not always dependent upon well-defined local nasal disease, but that, in a number of cases, such conditions are originally brought about by abnormal excitability of the vaso-motor centres from inherited or acquired disease. The problem, then, presents for consideration two important conditions—on the one hand, the local nasal phenomena, and, on the other, the etiological relations of the central nervous system. In allotting to each its respective causative significance, care should be taken, in avoiding the Scylla of the neurologist, not to be too closely attracted to the Charybdis of another form of specialism.

I am inclined, therefore, to transfer the point of greatest excitability from the peripheral ends of the nerve-filaments to the nerve-centres themselves. While I do not deny the possibility of a hyperæsthetic condition, or even of organic changes in the terminal filaments of the sensitive nerves, as an occasional factor, and while aware of the want of experimental proof in favor of the view advanced, still the theory of a central excitability seems to me to offer a more adequate and comprehensive explanation of the varied phases of the disease. Upon this theory can be best explained, moreover, the occurrence of paroxysms from irritation reflected from various parts of the body remote from the nasal passages. The weight of clinical evidence, too, is in favor of disordered functional activity of the nerve-centres, as against organic alteration of the peripheral sensitive nerves. Finally, it is probably not at the terminal ends of these filaments, but in the centres themselves, that the perception is awakened which differentiates one form of irritant from another; that the nerves themselves are but the passive channels through which the impression is transmitted, and that the production of a paroxysm by a given irritant will depend, other things being equal, upon the, so to speak, discriminating power or peculiar susceptibility of the centres themselves.

In accordance with the views expressed above, I proposed some time ago to substitute, for the various names given to this affection, the term *coryza vasomotoria periodica*—a term which, while it does not meet all the requirements of a logical definition, may nevertheless be used provisionally until more exact knowledge of this and allied processes furnishes data for the construction of a better.

In assigning to the condition that sets in motion this peculiar group of sympathetic acts, embraced under the common terms "hay-fever" and the "reflex nasal neuroses," the name rhinitis, or coryza sympathetica, as expressive of the two leading pathological factors in its etiology, I believe that the pathway will be opened for the more rational interpretation of this series of nasal neuroses, and the more scientific generalization of their phenomena.

Approaching the problem from this stand-point, and guided by my personal observation, I believe the pathology of the respiratory vaso-motor neuroses may be summed up in the following propositions:

That portion of the respiratory apparatus known as the naso-bronchial tract is, together with its appendages and connections, frequently the seat of certain periodical disturbances, in which paroxysmal explosions of nervous force play a conspicuous part, and which depend, it is reasonable to assume, upon some form of sympathetic or vaso-motor nerve-irritation. The vascular changes, with their associated nervous phenomena, may affect the upper respiratory tract in its entirety, either appearing simultaneously or successively in its different segments, or may

be chiefly manifested or localized in some individual portion of the tract (nose, pharynx, larynx, bronchial tubes). In the latter case the nasal cavities and the bronchial tubes are most frequently the areas upon which the nervous shock is expended, the two territories being seemingly held in close reciprocal relationship by virtue of a physiological law of sympathy between the two extremities of a mucous tract. In the one case a sympathetic coryza results; in the other a sympathetic bronchitis.*

In the evolution of these reflex phenomena two factors are conspicuously concerned—a depraved condition of the nerve-centres, and an abnormal excitability of certain portions of the naso-bronchial tract.

The derangement of the nervous apparatus may be transmitted from father to son, or it may be acquired in a number of different ways. Thus, for example, it may be the result of prolonged irritation of the respiratory membrane (*e.g.*, from nasal congestion and inflammation, polypi, etc., chronic affections of the larynx, pharynx, and bronchi), leading to repeated and continuous vascular disturbances over certain areas (as, for example, the frequent engorgement of that portion of the nasal cavities covered by erectile tissue), with subsequent abnormal irritation of the nerve-centres.

It thus comes to pass, after a time, that the constant excitation of the nerve-centres by the peripheral irritation so alters their reflex excitability that they respond more readily to reflex-producing impressions. When, therefore, an increase of peripheral irritation occurs, from either extraneous influences or internal causes, a corresponding excitation of the centres is produced, which expresses itself in a paroxysm. We might draw a parallel here between this chain of events and the mechanism of the epileptic attack, or the exaltation of the spinal nervous system from abuse or disease of the generative apparatus.

The exalted state of the centres may be conditioned in another series of cases, entirely independently of any local irritative process in the respiratory tract, by a constant wear and tear of the general nervous system from a multitude of causes—from the faulty nervous constitution which Beard has termed *neurasthenia*. Such a condition, it is not difficult to imagine, might produce in time a disordered state of the sympathetic and an abnormal functional activity of the vaso-motor centres.

In individuals affected with this form of *neurasthenia*, local organic irritation would be more likely to lead to reflex phenomena referable to the region of the affected part than in those whose nerve-centres had not been subjected to the same amount of functional strain. In the vaso-motor manifestations under review are found simply an application and illustration of this natural law. Or, to put it in other words, the area in which the vaso-motor reflexes occur will depend, other things being equal, on the seat of the local pathological process—on the localization of the area of peripheral irritability. A polypus in the nose, for example, would excite in such a person symptoms referable to the respiratory system, while a similar growth in the rectum would elicit reflex disturbances referable to the lower bowel. Now, as there is no tract more subject to direct irritation from the external world than the respiratory, we should naturally look to it for manifestations of central vaso-motor disturbance, and herein lies the answer to the question which may be propounded: Why is it that these vaso-motor disturbances are so often encountered in the respiratory tract, and notably in the nasal passages?

In still another class of cases the excessive irritability of the nerve-centres may find its predisposing cause in pathological states of the system as a whole, as, for example, certain diathetic conditions; or it may be the result of reflected irritation from individual parts of the body.

There are certain diseases that tend to abrogate the functional activity of the nerve-centres, and at the same

* Hence we may speak of coryza, pharyngitis, laryngitis sympathetica, and so on, according to the organ in which the vaso-motor phenomena are chiefly manifested.

time show a special proclivity to manifest themselves or leave traces of their existence in the respiratory tract. I might instance gout, rheumatism, certain fevers, syphilis, etc., and it is a clinical fact that the origin of the trouble may be traced to such a source. It is a familiar fact that vaso-motor coryza was, and is by some at present, supposed to be one of the protean manifestations of gout, from the alleged frequency with which it is encountered in those of a gouty diathesis. It is scarcely necessary, however, to point out the inadequacy of this theory, and to lay stress upon the proposition that gout enters as a factor into the etiology of the affection only in so far as it is one of a host of diathetic conditions which lead to weakness of the nerve-centres and inflammatory conditions of the respiratory tract.

I should like to call attention briefly to the occasional remarkable behavior of this group of respiratory neuroses under the influence of certain acute diseases. I have observed the whole group of symptoms—coryza, asthma, sneezing, cough, etc.—completely disappear during an attack of acute rheumatism, while in another case a recurrence of the nasal affection and asthma took place during an attack of measles after a prolonged interregnum of immunity from these conditions.

Let us now consider the hyperæsthetic condition of the respiratory membrane. Is this factor constant, is it primary, is it the *fons et origo* of these affections, or is it fugitive and secondary? Is it the result of purely local disease, or is it the peripheral expression of more central nerve-irritation? These questions have an important practical bearing on the treatment.

The existing confusion in regard to these questions arises from failure to separate the hyperæsthesia naturally associated with the local pathological process and the excessive irritability principally met with during the paroxysms of this class of affection. According to my belief, the intense hyperæsthesia characteristic of the paroxysm is, like the vaso-motor phenomena (engorgement, swelling, etc.) which accompany it, a purely secondary phenomenon, and occurs only through the intervention of central irritation or paresis. This characteristic irritability may pass away with the subsidence of the attack, or may be more or less constantly present in the interregnum, according, presumably, to the amount of structural injury which the nerve-centres have undergone. This secondary hyperæsthesia may be brought about, then, either by a direct impression made upon the terminal nerve-filaments in the respiratory mucous membrane, or by an indirect influence conveyed or reflected through the vaso-motor centres from a distant organ, or, finally, from an excitation starting in the centres themselves.

The hyperæsthesia met with in these conditions may be general, or localized in individual segments of the respiratory tract. In either case, while all portions of the tract, as a whole or in part, may share in the general hyperæsthesia, there are certain areas in which the latter is usually more pronounced, in which a greater susceptibility to the impressions by which reflex acts are produced is discoverable, and in which may be most conveniently and satisfactorily studied the vaso-motor manifestations of this special class of neuroses. These are: In the nasal passages, the area covered by erectile tissue, and chiefly that portion found in the lower and posterior portions of the nostril (posterior end of inferior turbinated body and erectile tissue in the septum immediately opposite—reflex sensitive area); in the pharynx, the vault and posterior wall; in the larynx, the inter-arytenoid commissure; and, in the trachea, certain areas along its posterior wall. It is worthy of notice that, roughly speaking, it is the lower and posterior portions of the individual segments of the respiratory apparatus where these sensitive areas have been shown to exist.

These affections, then, are intimately related to some disturbance of the sympathetic nerve, and probably to a deranged condition of the vaso-motor centres themselves.⁶⁵ The neurasthenic phenomena, whatever the condition may be upon which they depend, may, as has been pointed out above, be due entirely to a primary irritation or well-

defined disease in the nostril or in other parts of the respiratory tract; but until this condition is produced the case is simply one of ordinary nasal inflammation, and does not become true vaso-motor coryza until the nervous apparatus is markedly involved. In other words, we are dealing with a neurosis, or, at least, with an affection, in which the neurotic element plays the essential and most conspicuous part.

In support of this view I desire to call attention to the existence of a hitherto undescribed neurosis of the aural apparatus closely allied, or analogous in etiology, mechanism, etc., to vaso-motor coryza. Suffice it to say here that in this affection we have to deal with, if we may thus express it, a sort of hay-fever of the ear. When to this we add the recent observation of Dr. Gradle* concerning a periodical affection of the conjunctiva closely analogous to hay-fever, we have, it seems to me, additional evidence in favor of the sympathetic origin of the affection under review. In vaso-motor coryza the area over which the reflex vaso-motor disturbances are manifested is chiefly the territory which receives its vaso-motor nerve-supply from the sphenopalatine ganglion; in the aural neurosis the phenomena are localized or more pronounced in the area presided over by the otic; in Dr. Gradle's cases of recurring conjunctivitis the parts involved are supplied by the ophthalmic, and so on.

I would also refer to two additional observations which I have made, and which are of especial interest in view of the probable vaso-motor or sympathetic nature of the affection—viz., the occasional marked swelling of the thyroid gland, and to an enormously swollen and congested condition of the auricles analogous to that of the rabbit's ear in the famous experiment of Claude Bernard upon the cervical sympathetic.

I have said, above, that the two areas most frequently and notably concerned in these respiratory vaso-motor disturbances are the nasal passages and bronchial tubes. This leads me to refer briefly to the question of asthma and its relation to nasal disease.

The older writers, as has already been pointed out,⁶⁷ were doubtless familiar with the disease known as "hay-fever," which they considered as a species of, or identical with, the so-called bronchial asthma of the present day.

It was not until after the observations of Bostock that the asthma arising from the emanations of grasses was regarded as distinct from the asthma produced by other causes, while it has taken nearly a century for us to return to the simpler classification of the older nosologists. Even now our notions of the condition known as "asthma" are more or less vague and indeterminate. It is looked upon as a disease *per se*, as a distinct pathological entity; but if we consider exactly what is involved in the ordinary conception of this condition—that, like many other disturbances of respiration, it has no definite anatomical lesion, that it is common to an almost indefinite number of pathological states—we shall be forced to regard asthma as a symptom which, like cough, may be ushered in, follow, or occur simultaneously with irritation in various parts of the body, but which is most commonly symptomatic of some disorder of the respiratory tract. I do not propose to discuss the mechanism of the asthmatic paroxysm; whether the bronchial constriction be essentially a spasmodic phenomenon, or whether it be due to an engorged condition of the mucous membrane analogous to that seen in vaso-motor coryza—a transference, so to speak, of the nasal swelling to the bronchial tubes—are matters which do not come within the range of the present inquiry.

While there are many reasons for belief in the correctness of the latter view, which was advanced by Weber,⁶⁸ and which has recently found an eloquent defender in

* *Am. Jour. of the Med. Sci.*, April, 1886. Morill Wyman (Autumnal Catarrh, p. 20, New York, 1876) had before called attention to a certain conjunctivitis which is met with in June, which resisted ordinary treatment, and which he suspected owed its origin to a cause similar to that of "June cold."

Sir Andrew Clark,* and while such transference probably does take place in a large number of cases, still it were unwise, in the present state of our knowledge, to eliminate completely the element of spasm as a possible factor in other cases, and to lay down the law that the constriction of the bronchial tubes alleged to be peculiar to this condition can only be brought about by sudden swelling of the mucous membrane.

An interesting feature of a certain proportion of the class of cases we are now discussing is the occasional association of urticaria, asthma, and coryza. The relation of asthma to skin affections was familiar long before the days of Trousseau. Thus the illustrious Hoffmann † mentions, as a fact of common experience, that asthma sometimes follows the suppression of a cutaneous rash; and before him Baglivi ‡ had recommended, in such an event, that the patient should sleep with one having the "scabies," that, catching it, he might be relieved of his asthma. It is also related that William of Orange was cured of an inveterate asthma during the running of a sore on the shoulder produced by the famous cannon-ball wound received at the battle of the Boyne.

The coryza may precede the asthma and urticaria in time of appearance, disappearing or remaining after their eruption; or the asthma or urticaria may antedate the attack of coryza; or, finally, instead of alternating the one with the other, they may appear simultaneously in the individual. At the Eighth Annual Meeting of the American Laryngological Association I stated my belief that these phenomena seemingly depend on an imperfectly defined neurosis or vaso-motor influence (possibly some derangement of the cervico-occipital sympathetic), which is probably the connecting link between these affections. Now, in attempting to define the reciprocal relationship between this triad of conditions, we may regard the skin essentially as a part of the respiratory tract—as the external organ of respiration. To justify this assumption, it is only necessary to recall the physiological importance of the skin in respiration among some of the lower animals, and the embarrassment of respiration in man from pathological or experimental suppression of the cutaneous function. We may accordingly regard this neurovascular disturbance of the external surface as a natural symptom of the respiratory vaso-motor neuroses, and assume that, while the relation of asthma and coryza may be explicable by a possible normal sympathy existing between the two extremities of the internal respiratory tract, both asthma and coryza may be linked to the skin affection by a sympathetic bond which holds in equilibrium and close consent the whole mechanism of the respiratory function.

COMPLICATIONS AND SEQUELS.—The disease may lead to various structural changes, usually of an inflammatory nature, in the respiratory tract; or may induce a general depression of the nervous apparatus, with derangement of the bodily health; and its effect on the mental faculties may even lead to a condition of melancholia. I have known congestion of the lungs and extensive emphysema to occur in cases in which asthma is a prominent symptom. In one instance the termination of the asthmatic paroxysm was accompanied by a peculiar disturbance of the circulation in the extremities. The fingers and toes became purplish-black and cold—almost gan-

grenous—from localized arrest of the circulation, and at times the arms and legs were covered with small circumscribed areas resembling the spots of purpura. Occasionally the auricles become enormously swollen and congested, and the thyroid gland is distended and surcharged with blood. Various localized vaso-motor disturbances are also observed in other parts of the body. Thus I have known sudden reddening, accompanied by itching and burning sensations and a slightly swollen condition, confined to the fingers of one hand, to occur, and pass away at once with the subsidence of the paroxysm. In one patient—a boy, ten years of age—the application of medicines to the nasal mucous membrane invariably brought out an eruption resembling urticaria on the neck and chest, which necessitated a discontinuance of topical medication. In children, especially, eczema and tinea capitis not infrequently complicate the case, and seem to be directly related to the nasal disease through the nervous apparatus. In one child a vesicular eruption came and disappeared with the advent and subsidence of the nasal symptoms. Indeed, the skin seems to be unusually vulnerable and sensitive. Profuse sweating sometimes occurs, which may involve the general surface or be confined to individual portions of the head and neck—the parts most frequently affected being the forehead and cheeks.

The so-called "erysipelas" of the face, chiefly manifested on the cheeks and nose, may perhaps be regarded simply as a reflex vascular disturbance directly referable to central irritation or paresis, and comparable to an accentuation of the act of blushing.

DIAGNOSIS.—Whether a special sensitiveness in certain portions of the nasal mucous membrane exists or not, the agitation of the question has led to more rational methods of procedure in the treatment of a large class of nasal affections, and to more conservative methods in intra-nasal surgery. Before the location of the sensitive area or areas, the nasal tissues were destroyed with an almost ruthless recklessness.

The localization of the sensitive areas has not only greatly facilitated the treatment of this class of disease, but has also furnished us with what is often a ready means of diagnosis. In a fair proportion of cases it is possible to reproduce the attacks of cough, asthma, etc., by artificial stimulation of the nasal mucous membrane, either by means of a probe or similar contrivance, or by the electric current. Before coming to a decided opinion, other accessible portions of the respiratory tract should be systematically tested; for, as has been seen in the section on Pathology, there may be a number of sensitive points along the whole respiratory system and pharynx, whose irritation may awaken the reflex. If it be not possible to produce the reflex by stimulation of the mucous membrane, the diagnosis must be made by exclusion, and from the absence of disease in the regions in which the reflex symptoms are manifested of sufficient magnitude to cause the disturbance. At the same time it should be remembered that in long-standing cases structural changes of considerable importance take place, which may lead to confusion of cause and effect. The local use of menthol⁶² and cocaine, as a rule, temporarily dissipate the reflex symptoms, and may be regarded, within proper limits, as valuable adjuvants to diagnosis.

Finally, the amelioration or cure of the reflex disorder by local applications to the nasal passages will demonstrate the nature of the trouble.

PROGNOSIS.—In regard to prognosis I can only repeat * that it will depend, not only upon (1) the nature of the predisposing and exciting causes, and the facility with which they can be removed, but also (2) upon the amount of structural injury done to the respiratory apparatus, (3) to the central nervous system, and (4) to other parts of the body included in the arc of the reflex, neuro-vascular, and motor disturbance.

I have found children, as a rule, more amenable to treatment than adults, although the severest types of the

* American Journal of the Med. Sciences, January, 1886. In simple justice to Trousseau, whom some recent writers seem to overlook, it must be stated that he was the first to look upon the peculiar coryza (undoubtedly the hay-fever of the present day) occurring in connection with asthma (see above) as one of the manifestations of that disease, as a part of the asthmatic process; and also the first to suppose that the difficulty in respiration sometimes associated with urticaria was "occasioned by an eruptive or congestive state of the mucous membrane of the bronchial tubes analogous to the eruption and congestion on the skin" (op. cit., vol. II., p. 284).

† "Ita experientia docemur, a scabie retropulsa . . . a tinea capitis male curata . . . nostram passionem ecoriri." F. Hoffmann, Op. omnia physico-medica, part II., § ix., p. 257, Geneve, 1760. In speaking, too, of the symptoms of asthma, he adds, "Mucus per nares excluditur."

‡ Opera omnia med. practica, ed. octava, Lugduni, 1714, Prax. med., appendix de asthmate, p. 104. "Ex scabie retropulsa si asthmate fiat, cum scabioso dormiendum est, ut scabies revocetur, vel urticis cedenda cutis."

* See my former publications.

disease often occur at an early period of life; and in the management of this class I have been, almost without exception, successful.

Each case has its peculiarities and difficulties, and must be studied on its individual merits. It is therefore difficult to lay down any definite law which will apply in all instances. I believe, however, that with our advancing knowledge of the respiratory neuroses, and with a proper conception of these cases in all their bearings, the prognosis, in general, may be written down as good. If the above principles be faithfully carried out, relief can always be secured, and in a fair proportion of cases a permanent cure may be effected.

TREATMENT.—In the management of this form of neurosis we should at the outset carefully distinguish between two sets of cases, viz.—(1) those in which the nervous system is just beginning to suffer; and (2) those in which it is more markedly involved, or in which it is the starting-point of the neuro-vascular disturbances. To illustrate: A patient with disease of the nose, either well-marked or unsuspected, suffers from paroxysms of cough, becomes asthmatic, or is troubled with some other symptom referable to reflex agency or some other so-called "reflex neurosis." There are no other appreciable signs of a disordered nervous organization. Perhaps this is the sole symptom for which he seeks relief. He is otherwise in apparently excellent health. Examination of the nasal fossæ is made, with the discovery of a congested or catarrhal condition of the mucous membrane, a nasal polypus, or a deflected septum; and upon the removal of the local affection the asthmatic paroxysms cease, or the cough subsides, and the patient is restored to apparent health without the administration of constitutional agents.

Now, what is the explanation of this curious relationship? When we consider the fact that hundreds of this patient's neighbors suffer from precisely the same nasal affections, and that only a comparatively small proportion of them are affected with similar reflex troubles, there seems to be no escape from the assumption of an abnormally excitable nervous apparatus and its constant irritation by the pathological condition in the nose.

As the irritation produced by worms, or morsels of indigested food retained for a long time in the gastro-intestinal canal, sometimes gives rise to convulsions, cough, and other reflex disturbances through the constant irritation of the readily impressionable nerve-centres of the infant, so the prolonged excitation of the hypersensitive nerve-centres of the sufferer by the local pathological process may evoke the reflex disturbances which are under consideration. The cause of the convulsion is not the worm or the indigested particle of food, but the prolonged action of a local irritant upon a naturally excitable nervous organization. So in the hypothetical case which has been just considered. It is manifestly unwarrantable to assume that there is anything in a nasal polypus, an hypertrophied membrane, or a deflected septum to cause asthma and allied nervous disorders; but, in the absence of more definite knowledge, it is reasonable to infer that such an event or events probably occur through the intervention of a more central cause. The explanation suggests itself that, in this particular case, the nasal passages may be the sole avenues through which the nerve-centres are influenced; and with the removal of the irritant, and their consequent physiological rest, the disorder has been apparently, and, in the course of time, may be actually, dissipated.

Let us follow this individual a little farther on in his life-history. Perhaps the relation of his paroxysmal cough to the nasal affection has been unrecognized. In a little time asthma is added to his disease; later on, affections of the eye, ear, and other organs, with various other symptoms referable to a disordered state of the general nervous apparatus, develop. He has no longer one troublesome reflex symptom, but a dozen; he consults his physician, and if it be in the summer-time, is told he has "hay fever," and that pollen is responsible for his trouble.

I have called this an hypothetical case. It is not. It

is the accurate record of clinical fact. It is the historical narrative of *one* way in which the nervous system may be affected in the sympathetic affections of the respiratory tract.

The first thing to determine, then, in a given case of nasal reflex neurosis, is to ascertain whether the nervous phenomena be due primarily to respiratory irritation, to central causes, or to disease in remote organs of the body; whether the symptoms referable to the respiratory tract be primary or secondary, and if primary, to what extent the nervous system is involved. The class of cases in which relief and cure may be expected from local remedies alone is that in which the respiratory membrane is the primary seat of the disease, and in which the nervous system has not become markedly involved. In this set of cases, or, to look at the subject from another stand-point, at this *stage* of the disease, are included a number of the simple forms of nasal reflex neuroses. At this stage the removal of a nasal polypus may cure a troublesome asthma or cough, the cauterization of the nasal mucous membrane may dissipate an inveterate hemicrania, and so on. Even at the later stage, when the group of symptoms commonly known as "hay-fever" develop, it may be possible, by securing physiological rest for the nerve-centres, to give temporary and even permanent relief. But when the central nervous apparatus becomes more profoundly impressed, when nearly every organ of the body seems to be included within the arc of the neuro-vascular disturbance, when permanent structural changes occur in different parts of the respiratory and other systems, it is manifestly unnatural to expect that the disorder may be dissipated by the touch of the galvano-cautery, as the evil spirit disappears before the magician's wand.

The principles involved in the foregoing propositions have served as the basis and rules of my practice in this class of affections during the past four years, and with a most gratifying result. In that time a large number of cases of paroxysmal vaso-motor neuroses of the respiratory tract have come directly or indirectly under my professional observation. Of this number the nasal passages were most frequently the seat of the vascular disturbance, and next in frequency the bronchial tubes and pharynx. Occasionally the affection was more or less clearly localized in the laryngeal cavity, but, according to my experience, this is an exceptional event. While the sympathetic nerve-disturbances manifest themselves most frequently in the nasal cavities, in a certain proportion of cases the pharynx and larynx appear to be the starting-point of the trouble, and I have traced a number of reflex phenomena, such as asthma, cough, etc., to diseased conditions of these structures. The vaso-motor disturbances, of both the pharynx and larynx, are, however, commonly associated with, or preceded by, similar affections of the nasal cavities. In the pharynx and larynx they are characterized by an excessive degree of hyperæsthesia, the very act of opening the mouth giving rise in some cases to retching, and even vomiting. Indeed, a considerable number of cases of so-called hyperæsthesia and paresthesia of the larynx and pharynx are traceable to some vaso-motor disturbance or sympathetic nerve-irritation. The changes in the vascularity of the mucous membrane often take place with great rapidity, the vessel-dilatation being quickly replaced by a condition approaching pallor, while the latter as quickly gives place to the laryngeal or pharyngeal blush. In cases in which the neurotic feature is especially well marked, the alternate dilatation and contraction of the vessels can be most conveniently studied. The suffusion and swelling may be diffuse and uniformly distributed over the structures, or it may be more pronounced over certain areas, presenting a certain anatomical resemblance to a cutaneous eruption.

The secretion of colorless watery fluid is not so constant nor so abundant as in analogous conditions of the nasal passages, nor is the swelling of the mucous surfaces so conspicuous. The reflex phenomena symptomatic of this class of pharyngo-laryngeal neuroses need not detain us at present. Suffice it to say that they are sufficiently nu-

merous, and consist chiefly of various sensory and motor disturbances in the path of the nerves that radiate from the pharyngeal plexus, and in spasmodic contraction of the pharyngo-laryngeal muscles. In one case the spasm of the pharyngeal and palatal muscles was so great that it materially hindered the passage of air through the nares and laryngeal vestibule, causing the patient to start suddenly from his sleep with what might be termed a veritable naso-pharyngeal asthma.

In whatever portion of the respiratory tract these vasomotor neuroses are situated, the general principles of treatment are in each and every case essentially the same.

When, some time ago,⁵⁰ I formulated the view according to which the so-called nasal or respiratory reflex neuroses—the group of phenomena known as “hay-fever,” “asthma,” and other reflex conditions found in connection with nasal disease—may be classed as symptoms which, owing their origin to a common cause, form part and parcel of a single pathological process, I did so not merely upon theoretical grounds, but based my conclusions upon the results of clinical experience, upon the observation that the treatment of one of these neuroses was essentially the treatment for all; and whether we have to deal with paroxysmal cough, asthma, or with the *ensemble* of those phenomena known as “hay-fever,” “rose-cold,” etc., the therapeutic indications are identical.

With these brief prefatory remarks let us turn to the most typical and interesting of these affections, in which the nasal passages and adjacent organs are the most conspicuous seats of the vascular disturbances, and which we may designate coryza vasomotoria periodica.

The chief indications in the treatment of this affection are: (1) To remove any existing local respiratory disease or irritation; (2) to alter the nutrition of the nerve-centres that they may not respond so easily to reflex-producing impressions; (3) to search carefully for any pathological condition, systemic or local, which may be regarded as a source of direct or indirect irritation of the nervous or respiratory apparatus, and adopt appropriate measures for its relief; failing in the above measures, (4) the partial or complete destruction of the vessels or sinuses over the area or areas in which the vascular disturbance is most marked.

The first lesson to be learned in the treatment of this affection is that it is a chronic neurosis, and, as such, requires chronic treatment. It should be remembered that the peculiar condition of the sympathetic is, like epilepsy, with the patient by day and by night, in winter and summer, ready at any moment, under favorable conditions, to give expression to its presence by a paroxysm. Any treatment, therefore, undertaken a short while before the expected attack, or during its course, is almost wholly palliative, and can rarely, if ever, accomplish any permanent good. And thus the innumerable remedies (such as chloral, belladonna, opium, stramonium, etc.) which have been used from time to time can accomplish no lasting good, and in many cases either lose their beneficial effects altogether, or, in the end, by their constant physiological effects upon the nerve-centres, may tend even to aggravate the predisposition to the affection. In this category I would place cocaine. As I pointed out some time ago,⁵¹ and also at the seventh annual meeting of the Laryngological Association,⁵² the long-continued use of this drug in the nose and throat begets an increased irritability of these structures, due, probably, to the repeated contraction and consequent fatigue of the contractile elements in the smaller vessels and erectile tissues, which terminates in some cases in a subparalytic condition of these structures, and subsequent puffiness of the membrane. As the habitual use of cathartics eventuates, sooner or later, in constipation, so the prolonged use of cocaine will result, in a certain proportion of cases, in a hyperæsthetic condition of the mucous membrane. In the case of the erectile tissues it is especially open to the objection that, by bringing repeatedly into play the contractile power of these structures, it may ultimately weaken their walls and lay the foundation for a perma-

nent dilatation of the erectile cells. In calling attention to these disadvantages of its continuous use in these affections, I do not by any means desire to question the many excellent virtues of this remedy. In certain acute affections of the mucous membrane, and for its effect on the nasal erectile structures, pointed out by Bosworth, it is a Godsend, but I am convinced that at present it is too indiscriminately and injudiciously employed. In the disease under review, it has in my hands utterly failed to dissipate, except temporarily, its symptoms, or to abridge, in the slightest degree, its course. For a short while amelioration is secured, but at the expiration of a period varying from half an hour to two hours the symptoms recur, and the drug has to be used again and again.

My custom is to treat this affection as I would any other chronic disease of the nervous system. The commencement of the treatment, accordingly, should date from the first appearance of the patient for consultation, and terminate, it may be, long after he is apparently free from his disease. I cannot insist too strongly on the importance of prolonged and continuous tonic treatment addressed to the nervous apparatus. It may at first fail, and the paroxysms return again and again with all their accustomed severity; but if it be persisted in, the time will come, sooner or later—provided there is not some incurable lesion—when the intervals between the paroxysms will be longer, and the attacks themselves less severe, until finally they cease altogether.

The great mistake which is universally made, it seems to me, is the suspension of treatment upon the termination of the attack, and I therefore wish to emphasize the importance and necessity of continuous treatment throughout the interregnum of fancied immunity from the disease.

In carrying out this remedial course two difficulties will present themselves: The firmly rooted belief in the patient's mind that there is nothing the matter with him in the intervals of exemption; and his natural discouragement when, in spite of treatment, he may have an occasional return of his old disorder.

The general tonic and hygienic treatment will vary with the individual peculiarities of the subject and the conditions of his environment, and will usually consist, to speak in general terms, of prophylactic measures directed against the development of nervous and catarrhal affections.

Among the many remedies I have tried in the constitutional management of this class of affections, I would mention and recommend arsenic, phosphorus, zinc, quinine, and nux vomica. These drugs may be used alone or in combination for an almost indefinite time, if the usual precautions in regard to their physiological effects are exercised. The following method of administration, although it has failed me at times, has nevertheless been so generally beneficial in my practice that I do not hesitate to recommend it for trial:

- (1)
 ℞. Zinc phosphid. gr. $\frac{1}{8}$
 Quin. sulph. gr. ij.
 Ext. nuc. vom. gr. $\frac{1}{4}$
 M. Ft. pill. no. j.
 Sig.: To be taken before meals.

- (2)
 ℞. Liq. arsenic. et hydrarg. iodid., gtt. iij. ad v.
 Sig.: In a wineglassful of water, after meals.

Formerly I used Fowler's solution, but for the past year have substituted the iodide of arsenic and mercury (Donovan's). The quantity of the ingredients should be increased according to the judgment of the physician. Should the physiological effects of any of the remedies manifest themselves, it should be stopped for a week or so, and then resumed in the same or diminished doses.

I may add, in leaving the subject of constitutional treatment, that for several years I have employed the above-mentioned lines of treatment in simple inflammatory conditions of the nasal passages and throat, and have

found them important auxiliaries, especially in the earlier stages of the simple inflammatory process, when the vaso-motor element of inflammation is chiefly evident from the repeated and sudden erection of the turbinated structures.²³

I have also seen good effects from the continuous use of the bromides and the iodide of potassium. In two cases I have made use of the constant current (from ten to fifteen cells), placing one electrode over the nape of the neck, and passing the other extremity of the current alternately over the region of the superior cervical ganglion and through the nasal passages. In one, apparent, and in the other decided, relief to the symptoms was obtained. Although my experience with this agent has not been sufficient to warrant me in pronouncing either for or against its use, I consider it, nevertheless, worthy of further trial.

In one case a satisfactory result, as far as the amelioration of the symptoms was concerned, was secured by partial obliteration of the pharyngeal vessels with the galvano-cautery. The patient, a physician, suffered from the pharyngeal variety of vaso-motor neurosis, associated with an abnormally large, swollen, and varicose condition of the veins on the posterior wall. The vessels were cut across in a number of places, and since the operation the paroxysms have been notably less severe.

In regard to the topical treatment of existing nasal disease, I can only repeat what I have said over and over again, that any treatment addressed to the nasal chambers accomplishes one result, and one only—it closes one door against *ab extra* irritation of the nerve-centres. In many cases, it is true, this will be of itself sufficient. The nasal passages may be the sole avenues through which the nerve-centres are influenced, and, with the removal of the irritant and the consequent physiological rest of the centres, the disorder may be apparently, and in the course of time actually, dissipated. But there are other cases in which, from what I have indicated above, such a course will obviously fail.

In order to the intelligent appreciation of the local or topical management of this affection, the principles which underlie the etiology and mechanism of the paroxysms should be considered.

It should be borne in mind, in the first place, that the hyperæsthesia of the mucous membrane and the excitability of the turbinated nasal tissue are secondary phenomena, dependent, as a rule, upon a direct impression made upon the sensitive nerves of the mucous membrane and upon the terminal filaments of the olfactory; upon an indirect influence conveyed or reflected through the vaso-motor centres from a distant organ; or, finally, upon some excitation starting in the centres themselves. This stimulation of the nerve-centres, from whatever cause originating, is reflected outward, probably through the sympathetic filaments which reach the turbinated structures with the sphenopalatine nerves.

Now, as these nerves are distributed over the posterior and inferior portions of the nasal fosse (sensitive reflex area), the turgescence of the erectile substance is more noticeable over that particular area; and it will be found that this surface represents the most sensitive spot to reflex-producing expression—at least this is my experience.

If, then, we destroy the terminal filaments of the sensitive nerves, it follows that one avenue at least is closed against the irritative action on the nerve-centres of substances derived from the external world. My practice, therefore, is to simply sear the most sensitive portions of the membrane, as determined by experiment with a probe, with the flat cautery-knife, taking care to include only that portion in the operation which has been found most sensitive to irritation. I have found this procedure alone sufficient to arrest the paroxysms and give prolonged immunity from them.

In order to exclude completely the influence of *ab extra* irritation, it is necessary to remove all sources of local irritation, from whatever cause arising. If this be radically done, it will put a stop to the production of paroxysms from external influences acting directly on the

nasal mucous membrane—that is all. When paroxysms are induced by agencies operating within the organism, or from reflected irritation from other parts of the body, the destruction of the sensitive nerve ending in the nasal mucous membrane will obviously be insufficient to secure immunity from further attacks. The indication here is to search carefully for any such source or cause of irritation, and to direct treatment accordingly.

In the destruction of the vessels and sinuses over the most sensitive areas, the surgeon should proceed with caution, taking care to destroy as little tissue as is compatible with the radical removal of the disease. In the large majority of cases extensive destruction of the cavernous tissue is neither necessary nor advisable. Total extirpation of the corpora cavernosa is a practical impossibility. Even if practicable, it would be warrantable only as a last and desperate resource. The amount of tissue to be sacrificed must be determined by the exigencies of each particular case. Having determined the area or areas of special reflex excitability, the nerves of the mucous membrane and cavernous structures may be destroyed by an acid (chromic, glacial acetic, nitric, etc.), or extirpated with the cold-wire snare or cautery.*

In this country and in Germany, where the surgical treatment of nasal neuroses had its origin, the operators invariably start out with the idea of *extirpation* of the cavernous tissues. To that end large portions of the offending bodies are removed *en masse* with the cautery-loop, or allowed to slough off after numerous incisions and punctures with the knife-electrode. I have rarely found such procedures necessary, and believe that I accomplish an equally good, if not better, result by operating on a somewhat different principle. Having mapped out the area of most pronounced vascular disturbance, I make a stellate incision through the mucous membrane and cavernous body with the cautery-knife. The vessels in the pathway of the incision become thereby obliterated, a star-shaped cicatrix results, resembling somewhat a syphilitic scar, and the mucous membrane and turbinated tissue become, so to speak, bound down or depressed upon the bony wall of the nostril. In order to avoid extensive sloughing, the incisions may be made at different sittings. By means of this method a sufficient patency of the nostril is secured, the erection of the turbinated bodies is brought under control, and the patient escapes with a comparatively small loss of function.

In answer to the question as to whether the operation should be performed during the so-called "season," or whether it were better to wait for the interregnum of immunity from the attacks, I would answer that there is nothing to be gained by delaying radical treatment, and it has therefore always been my custom to operate in the interval between the paroxysms. By this means I have succeeded in preventing their return, even when the individual has been exposed to the exciting causes of the attack.

If the theory upon which I base my plan of treatment be accepted, it will readily be seen that those who consider the removal of nasal obstruction or irritation as the sole remedy for this disorder base their belief upon an incomplete conception of its pathology.

The value of the galvano-cautery and other therapeutic measures addressed to the nasal passages will depend, to a large extent, upon whether the existing nasal disease is the primary cause of the central irritation, whether it is the sequel of repeated attacks of vaso-motor coryza, or whether it is a purely accidental phenomenon. Whether primary, secondary, or accidental, it always acts as an

* In regard to the operative measures to be used in a given case of hypertrophic inflammation of the nasal passages, the following are my rules of practice:

1st. Posterior hypertrophic enlargements of the turbinated bodies are most satisfactorily removed, if practicable, with the cold-wire snare.

2d. For destruction of anterior hypertrophic swelling, both of the turbinated bodies and septum, and in the rare cases when operation is necessary on the enlarged erectile bodies of the posterior portion of the septum, the galvano-cautery is the most available and satisfactory agent.

3d. Extensive destruction of cavernous tissue is most satisfactorily accomplished by means of the galvano-cautery or electrolytic process.

excitant of the disease, and it is of the utmost importance that it should receive the most careful attention. But it must not be forgotten, at the same time, that behind the nasal, throat, and head phenomena stands the neurosis, and that, until the sympathetic nerve-irritation is overcome, we cannot expect to thoroughly eradicate the disease.

ADDENDUM.—In L'Union Médicale for January 22, 1884 (La toux nasale), M. Longuet believes, with me, in the existence of a tussigenic area (zone tussigène) in the posterior end of the inferior turbinated bone and septum, which he compares to the hystero- and epilepto-genic zones found elsewhere in the body by Brown-Séquard. Professor Baratoux, of Paris (Revue mensuelle de laryngologie, d'otologie, etc., décembre, 1885), in calling attention to the general acceptance of the fact that the posterior ends of the turbinated bodies are the seat of a sensitive area endowed with peculiar properties, states that, according to his experience, it is not the turbinated bodies that this peculiar property should be attributed to, but a circumscribed area on the septum, viz.: the posterior part of the septum. Professor Baratoux thus believes that the sensitive area is represented by only a circumscribed portion of the area located by me in 1883. Dr. Hering, of Warsaw, on the other hand (Annales des maladies de l'oreille, du larynx, etc., février, 1886), writing some time afterward, says: "While many authors call into question the existence of the sensitive area of Mackenzie, my experience justifies me in admitting it, but with a certain restriction. I believe that it must be made to embrace the whole segment of the mucous membrane which covers the nasal septum, and not alone the posterior part, as claimed by Mackenzie."

Finally, I would call attention to some exceedingly interesting experiments made by Dr. L. Lichtwitz, at the Hospital of Saint-André, in Bordeaux, under the direction of Professor Pitres (see Revue mensuelle de laryngologie, etc., décembre, 1886; Des zones hystéro-géniques observées sur la muqueuse des voies aériennes supérieures et des organes des sens). Without going at length into the important experiments of Lichtwitz, suffice it to say that in all the six cases (hysterical and hystero-epileptic) experimented upon, the nasal fossæ were the seat of "spasmodic" zones. Six times they were bilateral; once they existed only on one side, while in the other side there was found a "hypogénic" area. The spasmodic areas were found in the posterior portions of both nasal fossæ; touching them provoked the crisis. The right area seemed to be more sensitive than the left.

John Noland Mackenzie.

¹ Ueber eine operative Radical-Behandlung bestimmter Formen von Migraine. Asthma, Heufieber, etc. Wiesbaden, 1884.
² Medical Times and Gazette, August 13, 1864.
³ British Medical Journal, April 30, 1864.
 I am indebted for these references to Spencer Watson's work on Diseases of the Nose.
⁴ Ogle: Am. Journal of the Med. Sciences, vol. xxiii., 1852.
⁵ Medical and Chirurgical Transactions, 1870, vol. liii.
⁶ Plato: Symposium, § 13.
⁷ Aph. 13. Compare also Celsus, lib. ii., cap. 8.
⁸ Opera omnia græco-latina, vol. iv. Problem xxxiii., 2 and 8. Paris, 1858. Ed. Didot.
⁹ Op. omnia, Venet., 1608, lib. iii., Fen. 5, tract. 2, cap. 14.
¹⁰ Opera medica, Basilie (date uncertain; 1544 or 1450). Lib. S. G. O.) Divisionum, lib. I., cap. 43.
¹¹ Op. cit., Ad. mansor. de re med., lib. ix.
¹² Ibid., cap. xiii.
¹³ Fragment. ex Aphor. Rabi Moyses. Good: Study of Medicine, Boston ed., 1823, vol. i., p. 311.
¹⁴ Trans. Med. Chir. Fac., 1885; Am. Journal of the Med. Sciences, Jan., 1886.
¹⁵ N. Y. Medical Journal, February 26, 1887.
¹⁶ Dissertat. seger vertiginæ laborans. Jenæ, 1682. Diss. de vertiginæ. Jenæ, 1707 and 1741.
¹⁷ Bergeron: Thèse d'agrégation, 1872, referred to by Louis Villedems. Thèse de Paris, No. 494, 1872. Étude sur le cat. spasmodique d'ébé, etc.
¹⁸ In op. infra citat., spec. lib. I., cap. x., p. 342 et seq.
¹⁹ Georg Gottlieb Gumprecht: Diss. de consensu partium præcipuo pathologiæ et praxeos medicæ fundamentum. Halle-Magdeburgicæ, 1717.
²⁰ Cerebri anatomie cui accessit nervorum descriptio et usus. Amstelodami, 1666, inter al. cap. 21, 25, 26, and 27.
²¹ Neurographia universalis. Lugduni, 1685, lib. iii., caput v., de nervis intercostalibus, eorumque munis.
²² De sympathia seu consen. part. corp. humani, ac potissimum ventriculi, in statu morbo, diss. medica. Harlemi, 1721.
²³ Observationes medico-practica de affectibus capitis internis et externis. Scaphusii, 1728.
²⁴ Diss. de consensu part. corp. humani. Gott., 1749; also in Haller's Collect. dissertat. pract., vol. vi., No. 230.
²⁵ De sedibus et causis morborum. Epist. xiv., 28.
²⁶ Op. cit., xxvii., 281.
²⁷ Prædilectiones academicae de morbis nervorum, etc. Lugd. Bat., 1761, tom. ii., p. 835.
²⁸ Historiarum anatomicæ et medicæ rariorum, cent. v. et vi., ed. Hafnise, 1761, v., p. 184.
²⁹ Observations on the Nature, Causes, and Cure of those Diseases which have been commonly called Nervous, Hypochondriac, and Hysterical. Second edition, Edinburgh, 1765, p. 125.
³⁰ Œuvres. Lausanne, 1788, vol. ix. Traité des Nerfs et de leurs Maladies. A Genève, 1785, chap. xxii. De la Migraine, p. 105.
³¹ Op. cit., p. 169.
³² Darwin, Charles: Experiments establishing a criterion between mucuginous and purulent matter.
³³ Christian Gottfried Gruner: Physiologische u. pathologische Zeichenlehre, etc. Jena, 1801, p. 122.
³⁴ Op. cit., p. 377.
³⁵ William Heberden: Commentaries on the History and Cure of Diseases. London, 1802; also published in Latin, chap. cl., p. 472.

³⁶ Op. cit., chap. 24., p. 135, 136.
³⁷ Traité des mal. des fosses nasales, etc. Paris, 1804.
³⁸ Ueber die Anwendung der Galvanokanistik, etc. S. 249, 312. Wien, 1871.
³⁹ Berliner klin. Wochenschrift, 1874, No. 40, S. 503.
⁴⁰ N. Y. Medical Record, October 11, 1879.
⁴¹ Deutsche med. Wochenschrift, 1879, p. 373.
⁴² Ibid., 1879, Nos. 32 and 33, Fall 12, p. 419; and 1882.
⁴³ Meeting of Am. Laryngological Assoc., 1880. See Archives of Laryngology, April, 1881, p. 147.
⁴⁴ Quoted by Porter and Todd.
⁴⁵ Trans. of the Missouri State Medical Assoc., 1881.
⁴⁶ Berliner klin. Wochenschrift, 1881, 16, 17.
⁴⁷ St. Louis Med. and Surg. Journal, February, 1882.
⁴⁸ Archives of Laryngology, April, 1882, p. 112.
⁴⁹ Ibid., p. 118.
⁵⁰ Gazette des Hôpitaux, 1882, No. 56, 13 mai.
⁵¹ Ibid., No. 64, 3 juin.
⁵² Volkmann's klinische Vorträge, No. 216, 1882.
⁵³ Archives of Laryngology, April 1, 1882.
⁵⁴ N. Y. Medical Journal, May 12 and 19, 1883.
⁵⁵ Quoted by Hack, op. cit.
⁵⁶ A Contribution to the Study of Coryza Vasomotoria Periodica, etc., N. Y. Med. Record, July 19, 1884. Trans. Amer. Lar. Assoc., 1884, p. 113. Coryza Vasomotoria Periodica in the Negro, etc., N. Y. Med. Record, October 18, 1884. Rhinitis Sympathetica, Maryland Med. Journal, April 11, 1885. Origin and Cure of Coryza Vasomotoria, etc., Trans. Med. Chir. Faculty of Maryland, 1885. Review of the Subject in Am. Journal of the Medical Sciences, October, 1885, pp. 511-528. Production of Rose Cold by an Artificial Rose, etc., ibid., January, 1886, etc.
⁵⁷ Autumnal Catarrh (Hay Fever). New York, 1876.
⁵⁸ Hay Fever, etc. New York, 1876.
⁵⁹ N. Y. Med. Record, October 18, 1884.
⁶⁰ Trans. Am. Laryngological Assoc., June 24, 1885, p. 26 et seq.
⁶¹ See my paper in Am. Journal of the Med. Sciences, July, 1883.
⁶² Trans. Medico-Chirurgical Faculty of Maryland, 1883; Trans. Am. Laryngological Association, 1883; Trans. Virginia State Society, 1883.
⁶³ Trans. of the American Otolological Society, 1884, p. 273. Reprint.
⁶⁴ See Trans. Med. Chir. Fac. of Maryland, 1883.
⁶⁵ See Transactions, 1885, pp. 31, 32.
⁶⁶ For an elaboration on this point, see, especially, Am. Journal of the Med. Sci., October, 1885, loc. cit.
⁶⁷ Trans. of the Med. Chir. Fac. of Md., loc. cit.; Am. Journal of the Med. Sci., January, 1886.
⁶⁸ Ueber Asthma nervosum. See Tageblatt d. 45. Versammlung deutsch. Naturforscher u. Aerzte in Leipzig, 1873, p. 159.
⁶⁹ A. Rosenberg: Berliner klinische Wochenschrift, 1885, No. 48.
⁷⁰ Maryland Med. Journal, April 11, 1885.
⁷¹ Discussion on Cocaine, May 15, 1885, Trans. of the Med.-Chir. Fac. of Maryland, 1885, p. 189.
⁷² Discussion, June 26, 1885, Trans. of the Am. Laryngol. Assoc., 1885, p. 142. I may add that since then Beverly Robinson (Med. Record, October 17, 1885), Ingals (Journal of the Am. Med. Assoc., February 20, 1886), and others have recorded similar observations.
⁷³ See article by the writer in the Medical News, Philadelphia, April 4, 1885.

NOSE, TUMORS OF THE. Neoplasms of the nose may be of a benign or of a malignant nature. It may be said of them, in general, that all varieties ordinarily found in other organs or upon other parts of the body may be found in the nasal fossæ. Some forms, however, are so rare as to be little more than pathological curiosities. Of benign growths the variety most commonly met with is the simple myxoma, or so-called mucous polypus. More rarely are found the adenoma, angioma, or erectile tumor, papilloma, enchondroma, and osteoma. There have also been found growths composed of some of the elements of a dermoid cyst, and somewhat analogous to these formations, a hitherto nameless variety presenting a structure similar in its elements and in their arrangement to the helix of the ear. The latter, springing from the inferior aspect of the retro-nasal space, generally in the vicinity of the floor of the nose and the soft palate, are more properly classed as growths of the pharynx.

I.—BENIGN TUMORS.

NASAL POLYPI; MUCCOS POLYPI; MYXOMATA.—The term nasal polypus should, properly speaking, refer to any tumor of the nasal passages. By derivation and by general consent, however, it is understood to describe (as defined by Mackenzie) a new formation, generally of the nature of a myxoma, but sometimes containing a small amount of fibro-cellular tissue; it is usually pedunculated, and round, oval, or pyriform in shape, of pale pinkish color, semi-transparent, and varying in size from a currant to an acorn, but occasionally larger, giving rise to more or less obstruction of the nasal passages, with its associated symptoms. The slight resemblance in external appearance which it bears to certain low forms of marine life has probably suggested its name.



Nomenclature.

Nose.

REFERENCE HANDBOOK OF THE MEDICAL SCIENCES.

2. Reduction of uterine inversion by pressure upon the fundus by means of a cup having at its base a short staff terminating in a steel spiral spring, which rests against the operator, counter-pressure being made above.

Wickerkiewicz's Operation. The removal, by means of a small, sharp spoon, of the diseased tissue in stubborn scleritis.

Wilde's Incision. An operation for securing local depletion in commencing inflammation of the mastoid. The skin and subjacent tissues, inclusive of the periosteum, are divided by an incision extending from the base of the mastoid process—on a level with the upper margin of the auditory meatus—very nearly to its apex (see vol. ix., p. 669).

Wilde's Operation. An operation for staphyloma, very similar to Critchett's.

William's Tracheal Tone. The peculiar resonance sometimes found in the second intercostal space in cases of very large pleural effusions. It is a dull tympanic resonance, which becomes higher on opening the mouth, and arises from the vibrations of air in a large bronchus surrounded by compressed lung.

Willis's Disease. Diabetes.

Winckel's Disease. A form of acute fatty degeneration of the new-born, characterized by cyanosis, jaundice, and hæmoglobinuria, death occurring usually in about two days.

Wladimiroff's Operation. The same as Mikulicz's operation.

Wladimiroff-Mikulicz's Operation. The same as Mikulicz's operation.

Wolfe's Operation. 1. The operation of transplanting skin or conjunctiva *en masse*, in the treatment of deformities of the eyelids, etc.

2. Corneal transplantation.

Wölfler's Operation. The establishment of an opening between the stomach and the upper portion of the small intestine, in cases of malignant stenosis of the pylorus.

Wood's Method. A method of operating for the cure of hernia (see vol. iii., p. 639).

Wood's Operation. An operation for the cure of ectropion of the bladder.

Wright's Method. A method of extracting cataract. The incision is made with a Beer's knife, and is entirely within the cornea. The puncture and counter-puncture are made near the sclero-corneal border, about one-third the way down from the upper border of the cornea, and the knife cuts upward and outward at an angle of forty-five degrees with the plane of the iris. The upper border of the incision is then depressed with the finger, and the lens removed; without, if possible, either rupturing its capsule or performing iridectomy, although either or both of these operations may be performed if necessary.

Wutzer's Method. A method of operating for the cure of hernia (see vol. iii., p. 637).

Young's Rule. A rule for dosage of children: Give so much of the adult dose as is represented by a fraction formed by dividing the age of the child by the age plus twelve; thus for six years, the fraction will be $\frac{6}{6+12} = \frac{1}{3}$.

Zenker's Degeneration. A peculiar change in the muscles, occurring occasionally in severe attacks of typhoid fever, or other febrile diseases. *J. F. Baldwin.*

¹ See How to Work with the Microtome. Bausch & Lomb, Rochester, N. Y., 1886.

NOSE; ABSCESS OF THE SEPTUM. Abscess of the nasal cavity rarely occurs excepting in the septum, and even here it is seldom met with. It is generally due to traumatism, but may be caused by extension of inflammation from a furuncle, or, more rarely, may occur as the result of irritation from chronic or purulent coryza. It is sometimes symptomatic of general affections, such as small-pox, scarlet fever, typhoid fever, and phlegmonous erysipelas. In rare instances, one of which has been reported by the writer, it has been idiopathic.

The symptoms of acute abscess vary in intensity with the severity of the causes by which the abscess is produced, and with the extent of the abscess itself. There

is more or less febrile movement, headache, throbbing, and lancinating pain, which is increased on pressure, or upon blowing the nose. The inflammation at the same time extends to the face, giving it an œdematous or erysipelatos appearance. The nasal passages are obstructed, with the result of shutting off nasal respiration, and causing loss of the olfactory sense and change in the quality of the voice. Secretion is diminished until opening of the abscess takes place, when it becomes purulent or sanious. Examination of the nares reveals a swelling, usually symmetrical, on both sides of the septum, and generally well down toward its anterior and inferior part. The tumefaction, if at all pronounced, effectually cuts off further examination of the nasal cavity by anterior rhinoscopy. The mucous membrane is red and sodden, and fluctuation may often be detected. The septum is likely to suffer perforation from destruction of more or less of the cartilaginous part, so that the abscess-cavities coalesce, and pressure upon one produces fluctuation in the other.

Cold abscess of the septum must be extremely rare, although such cases have been reported. Their onset is gradual, and unmarked by the acute symptoms described above. The course of acute septal abscess may be rapid, and early diagnosis is, therefore, of great importance, since, if treatment be delayed, extensive destruction of the septum and marked external deformity of the nose may result. In the case of an acute abscess the diagnosis may be made with comparative ease. Chronic abscess may be identified by the presence of fluctuation, particularly if the septum has become perforated, and, if necessary, aspiration may be resorted to as an aid to the diagnosis.

Abscess of the septum may be complicated with facial erysipelas, destruction, more or less extensive, of the bones and cartilages of the septum, and even of the nose itself, and possibly by meningitis and phlebitis. Of the sequels most likely to follow, loss of the septum and consequent deformity of the nose will take precedence.

Treatment should be both general and local. The former will be suggested by the necessities of the case in hand. The local condition should be treated with great promptness and thoroughness. If an abscess is impending, efforts should be made to dissipate it, by means of inhalations of steam. As soon as the presence of pus can be detected free incision should at once be made into both sides of the septum and at a point from which the cavity can be well drained. Should the septum be perforated, drainage may be effected by means of several strands of lamp-wick, or other suitable material passed through the incisions. Meanwhile, absolute cleanliness of the nasal passages by means of some mild antiseptic solution should be maintained. *D. Bryson Delavan.*

NOSE: AFFECTIONS OF THE NASAL PHARYNX.
ANÆMIA.—The pharyngeal membrane shares in the general pallor of the mucous membranes of the body in loss of blood from any cause, or in derangements of its circulation, and in all diseases in which the number of its red globules is diminished. It occurs in hysteria, and is characteristic not only of the incipient stage of tuberculosis but also of the later throat history of that disease. It is met with in atrophic conditions of the mucous membrane, and may occur suddenly from emotional excitement or from depression of the nervous apparatus in syncope or shock. Wendt¹ observes that the approach of fainting, during the examination of the pharynx, may be frequently recognized by the coldness and pallor of the mucous membrane.

Inspection reveals the dark-purplish or wine-colored vessels thrown on the yellowish or whitish background of the anæmic membrane. The follicles often appear as small, transparent, shining nodules, scattered in profusion over the bloodless membrane. In some diseases, as in hysteria and tuberculosis, the reflex excitability of the pharynx is very pronounced, while in others, as in glosso-laryngeal paralysis, it is diminished or almost destroyed.

HYPERÆMIA AND HÆMORRHAGE.—Hyperæmia and hæmorrhage of the nasal pharynx are of frequent occur-

rence as the result of direct injury, either chemical or mechanical; as sequels of a host of blood diseases, including purpura, scurvy, hæmatophilia, the exanthemata, erysipelas, typhoid fever, septicæmia, diphtheria, etc.; in poisoning from various drugs, as iodine, mercury, phosphorus, etc.; they may be due to mechanical obstruction to the venous circulation in the neck, thorax, or abdomen, or occur as complications of organic disease of the kidney, heart, lungs, etc. They may also follow overfilling of the vessels from increased arterial tension, or proceed from various constitutional affections, such as syphilis and tuberculosis, from ulceration of various kinds, morbid growths and obstruction in the nasal passage. An occasional cause of naso-pharyngeal hæmorrhage is encountered in a varicose condition of the pharyngeal veins.

The bleeding comes generally from the rupture of superficial vessels; but in affections of the blood it is often parenchymatous. The amount may be very slight and the rupture be represented by a small extravasation or ecchymosis, or extensive hæmorrhagic infiltration of the tissues may occur, constituting a veritable blood tumor or hæmatoma.

ACUTE INFLAMMATION.—Acute inflammation of the retro-nasal space may occur as a primary affection from operative interference in that region, or from the application of chemical irritants to its mucous membranes, and possibly from the inhalation of irritating vapors and dust through the nostrils. It may also occur as a symptom of morbid growths and ulceration of the upper pharynx and pharyngeal tonsil. Localized inflammation of this region is not uncommon after diphtheria and scarlet fever and other blood diseases. It is generally, however, due to an extension of inflammation from the nose or lower pharynx, or occurs as a part of general diffuse inflammation of the upper respiratory tract (see also article on Catarrhal Inflammation, vol. iv., p. 400).

The rhinoscopic appearances are those of intense hyperæmia, either diffused over the whole space or localized in individual parts, with swelling of the mucous membrane. The mouths of the Eustachian tubes are swollen, and give to the eye the appearance of an enlarged inflamed cervix uteri. Their calibre is diminished by the swelling, and thick shreds of mucus hang from their orifices. Especially noticeable is the increase in volume of the pharyngeal tonsil, which presents a great variety of appearances, and is occasionally so much enlarged as to exert considerable pressure on the Eustachian tubes and produce obstruction of the posterior nares. The upper portion of the posterior edge of the septum is generally swollen and presents a more or less heart-shaped appearance; its vessels are enlarged and tortuous.

In some blood diseases, as in small-pox, pyæmia, scurvy, purpura, etc., hæmorrhagic, and even purulent infiltration of the mucous and submucous tissues takes place; this may be quite extensive or may occur as minute extravasations or capillary apoplexies.

Sometimes a granular condition of the mucous membrane is a conspicuous feature, and is due to participation of the follicles in the inflammatory process. I have never observed ulceration in this cavity from an acute simple inflammation.

Secretion is always profuse; at first it is mucous, glairy, tenacious, and sometimes streaked with blood; later it becomes muco-purulent or purulent, accumulates rapidly, and fills the cavity with a yellowish discharge. This is partially removed by inspiration through the nostrils and hawking; or it gravitates into the lower pharynx and is expectorated. Its voluntary removal here is, however, more difficult than in the lower pharynx, and hence inspection always reveals more or less secretion adhering to the vault and pharyngeal walls.

The accumulation of secretion and the swelling of the mucous membrane occasionally produce obstruction of the posterior nares, with its consequences (see article on Chronic Nasal Catarrh, in the Appendix). If the secretion be allowed to remain in the retro-nasal cavity, headache, general malaise, slight febrile movement, and

symptoms referable to obstruction of the Eustachian tubes develop. During convalescence from diphtheria, scarlet fever, and similar affections, I have observed considerable elevation of temperature produced by the retention and decomposition of the secretion in the retro-nasal space.

The inflammatory process not infrequently extends into the nose and lower pharynx, or through the Eustachian tubes to the middle ear, and its symptoms are lost or become inconspicuous by comparison with those of the disease to which it leads.

Pathology.—The affection is a simple inflammation of the retro-nasal space, and presents no characteristics which differentiate it from the ordinary forms of catarrhal inflammation. Occasionally the inflammatory exudation assumes a membranous form, especially in congenital syphilis.

Prognosis, Course, and Sequels.—Recovery here is, as a rule, less rapid than in acute inflammation of the lower pharynx, and the tendency to result in chronic inflammation is greater. This is probably due to the fact that, as the symptoms of ordinary subacute cases are such as give rise to comparatively slight discomfort, the proper treatment of the affection is almost invariably neglected. The gravitation of the secretion into the lower pharynx leads the patient, moreover, to refer his trouble to that region, a diagnosis which is often accepted unreservedly by his medical attendant. The inflammation of the retro-nasal space which occurs in children, as, for example, after the exanthemata, is, as a rule, neglected, and the foundation thereby laid for chronic catarrhal disease of the nasal passages and middle ear in after-life.

Properly treated, a mild, uncomplicated, acute inflammation of the nasal pharynx will get well in a few days, but in cases of more than ordinary severity recovery may be delayed for several weeks.

Treatment should be conducted on the general principles which will be considered in the article on Chronic Nasal Catarrh, in the Appendix. The retro-nasal space should be kept as free as possible from secretion, and mild astringent and alterative remedies applied in the form of spray. Soothing inhalations through the nose may also be employed with advantage, and, as resolution occurs, may be followed by those of a more stimulating character.

CHRONIC CATARRHAL INFLAMMATION.—Chronic retro-nasal catarrh may be primary or secondary to inflammatory conditions of neighboring organs, especially of the nasal fossæ. As an independent primary affection it not infrequently occurs as the result of a subacute attack or repeated acute attacks, the tendency being somewhat greater here than in the lower pharynx, as above remarked, to pass into the chronic form of inflammation.

Chronic retro-nasal catarrh is due to the operation of causes similar to those considered in the article on Chronic Nasal Catarrh, in the Appendix. What influence, if any, the conformation of the retro-nasal space, as to breadth and depth, exerts as a predisposing influence, has not as yet been satisfactorily determined. Naso-pharyngeal inflammation prevails in every country in which the intense, frequent, and rapid changes of atmospheric conditions occur which have been discussed under the head of Etiology of Catarrhal Affections in General, vol. iv., p. 400.

Anatomical Changes.—Changes in color. The mucous membrane may be uniformly hyperæmic, presenting a diffuse injection varying from a yellowish-red to a deep bluish hue, or the hyperæmia may be more pronounced in certain situations than in others. Small extravasations of blood are common, and result from the rupture of capillaries and enlarged veins. These appear generally in the form of ecchymoses; but in some cases, as in the retro-nasal catarrh of certain blood diseases, the hæmorrhagic infiltration may be considerable; or true bloody tumors may be formed. Anæmia, or at least a less pronounced coloration of the mucous membrane, is common in those diseases characterized by impoverishment of the blood, and especially is this true of the form which accompanies pulmonary tuberculosis. In these conditions

the enlargement and overfilling of the venous plexuses is most conspicuous. Later on, when atrophy of the membrane supervenes, the prominence of the veins becomes more pronounced. A varicose condition of the vessels on the posterior edge of the septum is not infrequently encountered, and those surrounding the orifices of the Eustachian tubes are often dilated and tortuous, forming a more or less vascular, wine-colored net-work which extends into the nasal fossæ and ramifies over the inferior and middle turbinated bodies. Occasionally the vessels show signs of atheromatous degeneration.

There is almost always more or less swelling of the mucous membrane of the parts. This is most marked on the pharyngeal tonsil and the septum. The swelling of the former is at first inconsiderable, but later in the disease hypertrophy of its tissues takes place and it appears as a well-defined, irregularly lobulated mass, or a uniformly smooth, sessile tumor. This hypertrophic condition of the pharyngeal tonsil is at times so excessive as to materially diminish the lumen of the Eustachian tubes and posterior nasal orifices. Occasionally it presents a nodular appearance or is covered by grooves or furrows with corresponding elevations of tissue. In other cases the hypertrophy of the glandular tissue of the vault exhibits itself as a mass of adenoid or polypoid vegetations, and especially is this true in children, as the result of the naso-pharyngeal complications of acute febrile disease, and notably after diphtheria and scarlet fever.

The orifices of the Eustachian tubes are generally enlarged, tumefied, and reddened; they are dilated and patulous. This gives the tube the appearance of an enlarged cervix uteri in a state of chronic hyperplastic inflammation. Occasionally a granular condition is observed, due to swelling of the muciparous glands of the tube (tubal tonsil of Gerlach). The tubes themselves are sometimes occluded, or their orifices displaced by pressure of the enlarged pharyngeal tonsil, and, in rare instances, of the hypertrophied turbinated bodies.

In long-standing cases there is almost always a corresponding hypertrophy of the posterior half of the septum, which causes a bulging on either side of the median line, which, with the central depression, presents sometimes a heart-shaped appearance.

In cases of long duration, too, true papillary growths develop, which should not be confounded with the so-called adenoid vegetations of this region. I have met with these papillomatous formations more frequently on the posterior part of the palate and septum; but they may occur also in other parts of the cavity.

In other instances, simple thickening of the epithelium occurs, which gives the membrane an irregular, nodular appearance. The changes in the granular or glandular disease of the naso-pharyngeal space will be given in the article on Chronic Nasal Catarrh, in the Appendix.

We cannot confirm the observations of certain German writers, that well-marked ulceration occurs in this locality as the result of simple inflammation.

Erosions and small follicular ulcerations occur; but the former are usually the result of accident (*e.g.*, from separations of crusts, etc.) and the latter are of minor clinical importance.

On the other hand, cystic formations are frequently met with, especially in the substance of the pharyngeal tonsil. They vary greatly in size, from a pin's head to that of a hazel-nut, and are filled with an opaque, colloid substance containing cholesterine, fatty débris, and sometimes calcareous matter. These cysts may be formed in the usual way, by closure of the gland-ducts, or, as Wundt² has pointed out, may originate from newly formed depressions of the mucous membrane, due to hypertrophic enlargement in ridges, or to swelling of the membrane and the consequent temporary interference with their communication with the external surface.

The mucous glands and lacunæ are generally enlarged and surcharged with secretion, and hæmorrhages occasionally take place into the latter.

The appearance of the posterior nares will be given in the article referred to above.

Changes in secretion. The changes in quantity and quality of the naso-pharyngeal secretion are the most conspicuous clinical features of the disease. The pharyngeal tonsil is generally covered with a thick, tenacious, yellowish-white or greenish-yellow secretion, which is often further discolored by the admixture of extraneous particles of matter from the atmosphere, the rupture of cysts, and small hæmorrhages from the mucous membrane. The exudation soon loses its aqueous constituents by evaporation, and tough masses are formed, which cling with great tenacity to the walls of the pharynx, become impacted in the fossæ of Rosenmüller, in the posterior nares, or, finally, hang from the orifices of the Eustachian tubes. When they are not removed they become so dense in consistence as to resemble a leathery or membranous formation, and come away as casts of various portions of the cavity. The tenacity with which the dried secretion adheres to the membrane is sometimes so great as to require instrumental aid for its removal.

Symptoms.—The most prominent symptom of retro-nasal catarrh is the accumulation of the secretion in the back of the nose and upper portion of the pharynx, from which it is sometimes poured out as from some inexhaustible reservoir. This is removed by forcible inspiration through the nose, followed by hawking, or by the forcible contraction of the pharyngeal and palatal muscles in the acts of deglutition and sneezing. In the latter case it is expelled through the nasal passages or mouth, according to the completeness with which it is separated from the pharyngeal walls. It may also be loosened and discharged by various methods of expiration or by the rapid alternation of inspiration and expiration through the nose. Occasionally the tongue of the patient becomes the medium of its removal. A number of cases illustrating this abnormal motility of the tongue have been reported. One of my patients, a physician of Baltimore, and suffering from posterior hypertrophic catarrh, made a complete and accurate diagnosis of the condition of his upper pharynx and posterior nares by means of his tongue, with which organ he was also accustomed to remove the secretion from the retro-nasal space.

When the tongue is depressed a more or less tenacious, thick, ropy mass of secretion is seen hanging down from behind the palate, or appears in a few seconds on the contraction of the pharyngeal and palatal muscles. The presence of this post-nasal plug is characteristic of the disease. Occasionally a frothy liquid discharge precedes the descent of the plug. Another characteristic to which we would also call attention is the peculiar odor of the post-nasal pharyngeal secretion, which is of considerable diagnostic value. It is altogether peculiar and sickening, and when once appreciated by the sense of smell is never forgotten.

The voluntary removal of secretion from the retro-nasal space is, for obvious anatomical and physiological reasons, not accomplished with the same facility as it is from the lower pharynx. Hence accumulation and inspissation are more likely to occur in the former locality. It is probable, too, that the toughened secretion gains in hardness and tenacity by the admixture of colloid material from the cystic formations which constitute such a striking anatomical feature of the disease.

A certain amount of dulness of the head accompanies the retention of these masses, and the patient becomes irritable and incapacitated for vigorous mental labor. Much of the exudation gravitates into the lower pharynx and is swallowed, producing irritation of the stomach, with a host of symptoms referable to disordered nutrition; or the masses become loosened during sleep, and, falling within the laryngeal vestibule, excite choking sensations or veritable spasm of the glottis. This latter may be produced also by reflex action from the irritation induced by the presence of the inspissated mucus in the naso-pharyngeal space. Various other reflex phenomena are also observed, which will be discussed farther on, under the head of Neuroses.

In some persons, especially those predisposed to hyperæmic conditions of the air-passages in general, quite extensive hæmorrhages occur upon exposure to appar-

ently trivial causes. In this way several ounces, or more, of blood, may be lost. The blood is swallowed and vomited, or it may excite cough and be expectorated, and create in the mind of the patient and his attendant a belief in its pulmonary origin. This post-nasal hæmorrhage usually takes place suddenly and during attempts to forcibly clear the nose.

The symptoms of retro-nasal catarrh are always aggravated in the morning upon rising, but are diminished in severity after the moistening of the throat and the deglutitory movements which take place during the morning meal. They are also increased by excessive smoking, drinking, and other unnatural indulgences. The breath is more offensive after talking or confinement in close or crowded rooms.

Complications.—Retro-nasal inflammation derives much of its importance from its intimate relation to catarrhal affections of the Eustachian tubes and middle ear. Besides these common complications, it may lead to insufficiency of the palatal muscles, various laryngeal, nasal, œsophageal and gastric disturbances, and to a host of neurotic phenomena (see farther on, in article on Neuroses).

Diagnosis.—The diagnostic characteristics of the disease have been given in connection with its clinical and pathological history. When rhinoscopic examination is possible there will be no difficulty in recognizing the affection. If this be not practicable, as, for example, in young children, the introduction of the index-finger behind the velum will determine the presence or absence of adenoid growths, polypi, and hypertrophic conditions of the posterior nares with which the disease may otherwise be confounded.

Prognosis.—The prognosis in catarrhal affections of the nose and nasal pharynx will be more fully discussed in the article on Chronic Nasal Catarrh, in the Appendix. Suffice it here to say, that in simple, uncomplicated inflammation of the retro-nasal cavity that has not lasted for over a year, the prognosis is good. It is also favorable when the morbid process proceeds from neoplastic changes in the pharyngeal tonsil, and when it depends upon some removable nasal affection. As the local expression of a constitutional condition, as, for example, gout, rheumatism, chronic alcoholism, etc., it is a more difficult affection to deal with. Whether simple, complicated, or symptomatic of diathetic conditions, chronic nasal pharyngitis is one of the most difficult of all inflammatory troubles to cope with. The more experience the physician has in the management of this affection the less inclined will he be to paint its prognosis in roseate colors. Given an inflammation of several years' duration, more or less clearly confined to the nasopharyngeal space, without obstructive lesions of the nose or nasal pharynx removable by surgical means, in an individual subjected to improper hygienic conditions and surrounded by the constant changes of temperature of a capricious climate, the chances of complete recovery are decidedly problematical and unfavorable. Marked relief may be given, and the affection be even temporarily dissipated, but sooner or later the inflammatory process reasserts itself, and perfect cure is only secured in an equable climate and under favorable hygienic conditions. There are exceptional cases in which this rule does not hold good, but they are, unfortunately, in a deplorable minority.

It may be said, in general, that the disease is more amenable to treatment in early life, less so in manhood and after forty, while later in life it furnishes the most striking confirmation of the Hippocratic dictum that, "Catarrhs in the aged are not concocted."

Treatment.—As I have stated elsewhere,³ I regard the retro-nasal cavity as practically an accessory nasal chamber, and the management, therefore, of inflammatory conditions of its membrane will be governed by the laws which regulate the treatment of catarrhal affections of the nasal passages. These will be fully discussed in the Appendix.

Of prime importance is the hygienic management of this affection. Next in efficacy is the surgical—not a

meddlesome surgery—but a surgery inspired by a proper conception of the physiological importance and pathological conditions of the structures to be dealt with. Less reliance can be placed on topical applications. While in some cases they accomplish all that can be desired, in many others they are worse than useless, and may tend even to aggravate the inflammatory condition. (For the treatment of Catarrhal Inflammation of the Nose, see article on Chronic Nasal Catarrh, in the Appendix; also the one on Catarrh, Nasal, vol. ii.)

ATROPHY.—Concerning the etiology and pathological nature of this condition, see articles just mentioned.

The disease is most frequently met with in adults or in old persons, rarely in children. Occasionally it seems to develop at some physiological epoch, as at the age of puberty, in subjects whose blood is contaminated by some constitutional taint or whose nutrition is impaired from insufficient nourishment or improper hygienic surroundings. In most instances it is the sequel of a pre-existing chronic retro-nasal, pharyngeal, or nasal catarrh.

The condition of the mucous membrane, as revealed by rhinoscopy, is one of atrophy, either affecting the whole region, or confined to individual portions, as the pharyngeal tonsil, the posterior wall, orifices of the posterior nares, fossæ of Rosenmüller, etc. The tenuity of the membrane is sometimes so great that the underlying muscular fibres may be easily distinguished.

The microscope reveals a process of contraction of the different layers of the mucous membrane; partial or total disappearance of the glandular elements, degenerative changes (fatty degeneration, total loss) of the epithelium, and the development of dense fibrous bands from hyperplasia of the submucous connective tissue.

The principal symptoms are excessive dryness of the throat, and, in many instances, a disagreeable odor of the expired breath. In other cases the secretion is more profuse, and the same tendency to crust-formation exists, which will be considered under the head of Chronic Nasal Catarrh, in the Appendix. The removal of crusts from this region often takes place with considerable difficulty, and can in some instances only be accomplished by instrumental aid.

The disease is incurable. Relief to the symptoms can almost always be obtained by stimulating the healthy tissues to vicarious action and by thorough, systematic cleansing of the retro-nasal space (see article mentioned above), but restoration of function in the atrophied structures is obviously out of the question.

John Noland Mackenzie.

¹ Ziemssen's Cyclopædia, Am. Ed. (Buck), vol. vii., p. 33, 1876.

² Op. cit., p. 41.

³ See article on Etiology of Chronic Catarrhal Affections, vol. iv., p. 406; also, Trans. Am. Laryngological Assoc., 1885.

NOSE, ANATOMY AND PHYSIOLOGY OF THE.

The nose is the special organ of the sense of smell. Besides this it performs other important functions, and through its free communication with the cavities of the pharynx, mouth, and lungs is concerned in respiration, voice production, and taste. Through the muscles upon its exterior it assists to some extent in the production of expression. It consists of two parts: one external, the nose; the other internal, the nasal fossæ.

The nose is the anterior and prominent part, composed of bone, cartilages, and muscles which slightly move the cartilages. It is of triangular form, directed vertically downward, and projects from the centre of the face immediately above the upper lip. Its summit is connected with the forehead. It possesses two orifices, the anterior nares, which open downward. The lateral surfaces of the nose form by their union the dorsum, the direction of which varies in different individuals. The dorsum terminates below in a rounded eminence, the lobe of the nose.

The nose is composed of a framework of bones and cartilages, covered externally by integument, internally by mucous membrane, and supplied with vessels and nerves. The bony framework occupies the upper part of the organ. It consists of the nasal bones and the nasal

processes of the superior maxillary. The cartilaginous framework consists of five pieces, the two upper and the two lower lateral cartilages, and the cartilage of the septum. The upper lateral cartilages are situated in the upper part of the projecting portion of the nose, immediately below the free margin of the nasal bones. Each cartilage is flattened, and triangular in shape. Its anterior margin is thicker than its posterior, and is connected with the lateral cartilage of the opposite side above, and with the cartilage of the septum below. Its inferior margin is connected by a fibrous membrane with the lower lateral cartilage. The posterior edge is inserted into the ascending process of the superior maxilla and the free margin of the nasal bone. One surface looks outward, the other inward toward the nasal cavity. The lower lateral cartilages are thinner than the preceding, below which they are placed, and are curved in such a manner upon themselves as to form both the inner and the outer walls of each orifice of the nostril. By this arrangement they serve to keep the nostrils open. The outer portion is somewhat oval and flattened, or irregularly convex externally to correspond with the ala of the nose. Behind, they are attached to the margin of the ascending process of the superior maxilla by a tough fibrous membrane, in which are two or three cartilaginous nodules, the cartilagine minores, or sesamoid cartilages; above, they are fixed, "also by fibrous membrane," to the upper lateral cartilages, and to the lower anterior part of the cartilage of the septum. Their outer extremity, free, rounded, and projecting, forms,

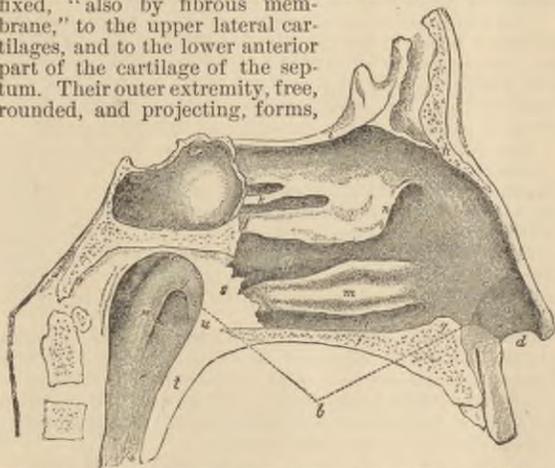


FIG. 2501.—Vertical Antero-posterior Section of Skull and Soft Parts immediately to the Right of the Nasal Septum. The pharyngeal tonsil is not shown. a, Vestibule; b, nasal fossa; c, anterior naris; d, nostril; e, naso-pharyngeal cavity; f, floor of nasal fossa, raised in front into the eminence g; h, roof of nasal fossa, anterior ascending portion; i, roof of nasal fossa, middle horizontal portion; j, roof of nasal fossa, posterior descending portion; k, superior turbinate body; l, middle turbinate body; m, inferior turbinate body; n, anterior border, middle turbinate body; o, inferior-border, middle turbinate body; p, inferior meatus; q, middle meatus; r, superior meatus; s, posterior part of septum, left *in situ*; t, soft palate and uvula; v, Eustachian orifice; w, salpingo-pharyngeal fold; z, roof of naso-pharynx; y, Eustachian cushion; x, salpingo-palatine fold; aa, fossa of Rosenmüller. (Cresswell Baber.)

with the thickened integument and subadjacent tissue, the lobe of the nose. The lower and most prominent part of the ala of the nose, like the lobule of the ear, is formed of thickened skin with subjacent tissue, and is unsupported by cartilages.

The cartilage of the septum has a somewhat triangular outline, and is thicker at the edges than near the centre. It is placed nearly vertically in the middle line of the nose, and completes anteriorly the separation between the nasal fossæ. The anterior margin of the cartilage, thickest above, is firmly attached to the back of the nasal bones near their line of junction. Below this it lies successively between the upper and lower lateral cartilages, united firmly with the former and loosely with the latter. The posterior margin is fixed to the lower and central plate of the ethmoid bone, and the lower margin is received into the groove of the vomer, as well as into the median ridge between the palatal processes of the superior maxillæ.

That part of the nasal canal which is surrounded by the anterior cartilages of the nose, as above described, is sometimes called the vestibulum nasi. It is covered with a continuation of the exterior skin, which gradually assumes the characteristics of a mucous membrane, and possesses several layers of pavement epithelium, the uppermost of which is composed of horny cells. This epithelium extends backward to the anterior margin of the inferior turbinated body and the inferior meatus, where it becomes ciliated. The integument has also vascular papillæ, with both simple and compound loops, and, in the lower part of the nose, long, stiff hairs, called vibrissæ, as well as large sebaceous follicles. It is sparingly supplied with blood-vessels. The nerves are derived from the trigeminus, and consist of filaments, which probably end in terminal bulbs.

The nasal fossæ proper,* with the exception of a limited

* The following description of the bony structures, of the nasal cavity, from Gray's Anatomy, is appended, in order to render the general description more clear:

"The nasal fossæ are two large irregular cavities, situated in the middle line of the face, extending from the base of the cranium to the roof of the mouth, and separated from each other by a thin vertical septum. They communicate by two large apertures, the anterior nares, with the front of the face, and with the pharynx behind by two posterior nares. These fossæ are much narrower above than below, and in the middle than at the anterior or posterior openings; their depth, which is considerable, is much greater in the middle than at either extremity. Each nasal fossa communicates with four sinuses, the frontal above, the sphenoidal behind, and the maxillary and ethmoidal on either side. Each fossa also communicates with four cavities: with the orbit by the lacrymal canal, with the mouth by the anterior palatine canal, with the cranium by the olfactory foramina, and with the sphenomaxillary fossa by the sphenopalatine foramen; and they occasionally communicate with each other by an aperture in the septum. The bones entering into their formation are fourteen in number: three of the cranium, the frontal, sphenoid, the ethmoid, and all the bones of the face, excepting the malar and lower jaw. Each cavity is bounded by a roof, an inner, and an outer wall.

"The upper wall or roof is long, narrow, and concave from before backward; it is formed in front by the nasal bones and nasal spine of the frontal, which are directed downward and forward; in the middle, by the cribriform lamella of the ethmoid, which is horizontal; and behind, by the under surface of the body of the sphenoid and sphenoidal turbinated bones, which are directed downward and backward. This surface presents, from before backward, the internal aspect of the nasal bones; on the outer side, the suture formed between the nasal bone and the nasal process of the superior maxillary; on their inner side, the elevated crest which receives the nasal spine of the frontal and the perpendicular plate of the ethmoid, and articulates with its fellow of the opposite side; while the surface of the bones is perforated by a few small vascular apertures, and presents the longitudinal groove for the nasal nerve; farther back is the transverse suture, connecting the frontal with the nasal in front and the ethmoid behind, the olfactory foramina and nasal slit on the under surface of the cribriform plate, and the suture between it and the sphenoid behind; quite posteriorly are seen the sphenoidal or superior turbinated bones, the orifices of the sphenoidal sinuses, and the articulation of the ala of the vomer with the under surface of the body of the sphenoid.

"The floor is flattened from before backward, concave from side to side, and wider in the middle than at either extremity. It is formed in front by the palate process of the superior maxillary; behind, by the palate process of the palate bone. This surface presents, from before backward, the anterior nasal spine; behind this the upper orifice of the anterior palatine canal; internally, the elevated crest which articulates with the vomer; and behind, the suture between the palate and superior maxillary bones, and the posterior nasal spine.

"The inner wall or septum is a thin vertical partition, which separates the nasal fossæ from one another; it is occasionally perforated, so that the fossæ communicate, and it is frequently deflected considerably to one side. It is formed, in front, by the crest of the nasal bones and nasal spine of the frontal; in the middle, by the perpendicular lamella of the ethmoid; behind, by the vomer and rostrum of the sphenoid; below, by the crest of the superior maxillary and palate bones. It presents, in front, a large triangular notch, which receives the triangular cartilage of the nose; above, the lower orifices of the olfactory canals; and behind, the guttural edge of the vomer. Its surface is marked by numerous vascular and nervous canals and the groove for the naso-palatine nerve and is traversed by sutures connecting the bones of which it is formed.

"The outer wall is formed, in front, by the nasal process of the superior maxillary and lacrymal bones; in the middle, by the ethmoid and inner surface of the superior maxillary and inferior turbinated bones; behind, by the vertical plate of the palate bone, and internal pterygoid process of the sphenoid. This surface presents three irregular longitudinal passages, or meatuses, formed between three horizontal plates of bone that spring from it; they are termed the superior, middle, and inferior meatuses of the nose. The superior meatus, the smallest of the three, is situated at the upper and back part of each nasal fossa, occupying the posterior third of the outer wall. It is situated between the superior and middle turbinated bones, and has opening into it two foramina, the sphenopalatine at the back of its outer wall, the posterior ethmoidal cells at the front part of the upper wall. The opening of the sphenoidal sinuses is usually at the upper and back part of the nasal fossa, immediately behind the superior turbinated bone. The middle meatus is situated between the middle and inferior turbinated bones, and occupies the posterior two-thirds of the outer wall of the nasal fossa. It presents two apertures. In front is the orifice of the infundibulum, by

petent critics, both at home and abroad, has been that this is one of the best Pharmacopœias ever issued, and that it does not even suffer by comparison with works that have appeared later. It has long been felt that the Pharmacopœia contains a considerable number of preparations which are not frequently prescribed, and are only retained for the reason that, if called for at all, their uniform composition may be insured. There is a movement on foot, which it is hoped will relieve the Pharmacopœia of the task of providing a standard for such preparations. The American Pharmaceutical Association is engaged in the compilation of a "National Formulary of Unofficial Preparations" (to be subject to the approval of, and expected to receive the support of, the medical profession), which is primarily designed to establish uniform formulas for any compound used in legitimate pharmacy or prescribed by physicians, and for which there is no recognized official standard. This formulary may eventually be made the repository of all such pharmacopœial articles as are no longer deemed of sufficient importance to be included in the official list. The next convention for revising the U. S. Ph. will assemble at Washington on the first Wednesday of May, 1890.

General Pharmacopœias.—Many works have been published, designed to comprise the text of all, or at least the most, prominent Pharmacopœias. Among the earlier authors of such works are Lemery, Charas, Spielmann, Swediaur, Quincy, Brugnatelli, etc. Of more recent works the following deserve special mention: A. J. Jourdan, "Ph. Universelle" (Paris, 1828, second, ed. 1840); P. L. Geiger, "Ph. Universalis" (Heidelberg, 1835-45); B. Hirsch, "Universal-Pharmakopœe" (Leipzig, 1885, vol. i.).

International Pharmacopœias.—Many years ago efforts began to be made to bring about greater harmony in the different Pharmacopœias, and the proposition was finally made to inaugurate an International Pharmacopœia. Opinions differed greatly for a long time, not only as to whether the plan was feasible at all, but also in regard to details. Steps were finally taken to have a draft of the work prepared, but national jealousy on several occasions rendered its acceptance impossible. It was not to be expected that each civilized nation would abandon its own Pharmacopœia, specially adapted to the habits of its own people and its own domestic resources, for one elaborated without regard to such considerations, and possibly introducing unfamiliar preparations or changing the strength of such as were in common use. The utmost that could be expected was that the different nations, whenever revising their own Pharmacopœias, would gradually approximate such preparations as were regarded worthy of international regulation to the proposed standard. Another hope which was expressed was this, that the International Pharmacopœia might be used and followed as an *independent* work in different countries in this way, that prescribers would designate preparations contained in it in their prescriptions. At the last International Pharmaceutical Congress, held at Brussels in 1886, the draft of an international Pharmacopœia was presented by the President of the International Commission, Baron A. von Waldheim, of Vienna. Yet, in its preparation the other members of the commission had not been sufficiently consulted, and it is, therefore, not probable that the draft will be accepted in its present form.

While an international Pharmacopœia, in the sense in which it was first contemplated, is not likely ever to be established, it is, on the other hand, possible, by international conventions, to establish uniform *methods* for revising the several Pharmacopœias, so as to bring about, at least gradually, an equalization in the strength of the potent remedies and their preparations.

GENERAL REMARKS.—A Pharmacopœia is supposed to represent the broad results of therapeutic investigations and observations accepted by, or acceptable to, the medical profession at large in the country for which it is written. In general, therefore, it should not introduce insufficiently tried new remedial substances or methods, but should accept only such as have, by matured and

careful study, been found worthy of recognition. Exceptions to this rule are, however, admissible where it can be clearly demonstrated that an innovation will be an improvement. As an instance of such exception may be quoted the introduction of *abstracts* in the last U. S. Ph., these being merely dry extracts, brought into a definite proportion with the crude drug from which they are prepared (2 parts of abstract = 1 part of drug). In most countries the Pharmacopœia is recognized by law as the authority for deciding questions relating to the identity, quality, purity, or strength of all substances for which it provides a norm. In the United States it is thus recognized expressly by a number of States, as well as by the general Government for the public service. In most European countries the official text of the Pharmacopœia is written in Latin, as it is argued that this will insure better mutual understanding as well as a smaller risk of ambiguity in expression than if the vernacular were used. This argument, however, is becoming less valid in proportion as the rapid progress in chemistry and other sciences renders it constantly necessary to coin new words for expressing terms or methods. No objection, however, can be advanced against a Latin nomenclature of pharmacopœial titles, as this will insure uniformity in prescribing and safety in dispensing.

Since the medical and pharmaceutical professions are equally interested in the production of as perfect a work as can be produced, co-operation of the two professions in the revision is absolutely necessary, and the more unhampered the revisers are in the choice of their unofficial assistants, the better will be the result. It has been recognized that a successful periodical revision of a Pharmacopœia is much facilitated by the establishment of a permanent commission to collect and digest all criticisms and proposals for improvement that may be made in the interval between two revisions. The example set by the United States has been followed by several other nations, and the good results of this will become evident in the future.

Charles Rice.

PHARYNX AND NASAL PHARYNX, SYPHILITIC LESIONS OF THE. The initial lesion of syphilis is occasionally found in the pharynx, and almost invariably on one of the tonsils, the posterior wall being singularly exempt. Sometimes the upper pharynx is the seat of the primary sore, and not a few cases are on record in which the constitutional disease was communicated by means of the Eustachian catheter. The diagnosis of pharyngeal chancre is often a difficult matter, as the characteristics of the primary sore of syphilis are not always well marked, and the diagnosis must be made from the subsequent development of constitutional symptoms.

By far the most common lesions of syphilis in this region are erythema and catarrhal inflammation. A symmetrical arrangement of the erythematous patches is regarded as characteristic of syphilis. There is nothing peculiar to the pharyngeal catarrh of syphilis. In a certain proportion of cases, however, there is a somewhat characteristic discoloration of the mucous membrane, which is suggestive of the disease. When to this is added a tendency to symmetrical patches of cloudy swelling of the epithelium, suspicion of its specific nature may be aroused.

Mucous patches are constant accompaniments of pharyngeal syphilis, and are found most commonly on the soft palate, faucial pillars, and tonsils, rarely on the posterior wall. Varying in size, they appear as whitish or bluish-white elevations—circular, oval, or stratiform—arranged symmetrically on the swollen and hyperemic mucous membrane. They may be fugitive in nature, disappearing spontaneously in a few weeks, or the epithelium may be cast off and superficial ulcers result. The ulceration from a mucous patch is sometimes so extensive that it may be confounded with the destruction of a tertiary lesion.

The characteristic lesions of the tertiary stage, found in the pharynx, are gummata, diffuse infiltration, and ulceration. I have also met with extensive fibroid de-

generation of the pharyngeal structures similar to that described in the section on Larynx, Trachea, and Bronchi. Syphilis of the (vol. iv.). The mode of development of tertiary ulcers in the pharynx is identical with the manner in which they appear in the larynx (see section referred to). They are found in all portions of the upper and lower pharynx. When seated on the soft and hard palate they show a marked tendency to perforate.

The ravages produced by tertiary syphilitic ulceration of the pharynx are sufficiently familiar. In addition to the perforations already referred to, wide-spread destruction of the palate, tonsils, posterior wall, and other parts may occur; caries and necrosis of the posterior wall and pharyngeal vault may complicate the case, or extensive adhesions may form, with partial or complete obliteration of the pharyngeal cavities. Occasionally a perforating ulcer opens a large artery, and alarming hæmorrhage occurs, or the ulcerative process may extend to the brain or spinal cord, with a fatal result.

Of great interest are syphilitic affections of the pharynx in the congenital form of the disease. The fauces, velum, and posterior wall present simply an erythematous efflorescence, or are the seat of lardaceous infiltration. Occasionally the follicles seem to be the starting-point of the disease. They stand out prominently, are filled with a yellowish secretion, and are surrounded by a well-defined inflammatory areola.

Although mucous patches are frequently found on the uvula, tonsils, and faucial pillars, the posterior wall is singularly exempt. Hypertrophy of the tonsils is present in a large proportion of cases. It is simple in character, or the glands may be the seat of lardaceous infiltration. In the latter case they have a square outline, and a uniform, smooth, waxy appearance, in which it is difficult to recognize the mouths of the follicles and lacunæ.

Warty growths are found in the pharynx, both in the acquired and in the congenital form of syphilis.

With deep ulceration of the pharynx stomatitis is commonly associated. The parts are thickened, infiltrated, and present a characteristic albuminous appearance. On this pale ground ramify arborescent wine-colored vessels, and here and there small hæmorrhages are seen beneath the mucous membrane. There is often a scarlet line along the gums at the insertion of the teeth, which stands out in striking contrast to the surrounding pallor of the membrane. This is most easily determined by the carious condition of the teeth, and may be analogous to the inflammatory zone which surrounds other syphilitic lesions.

Morell Mackenzie has called attention to the absence of the characteristic notching of the teeth in those in whom the throat is affected. Out of seven cases examined by me in 1879, in reference to this point, there were three in which the notching was not present. In one of these there was a deficiency in the left central upper incisor, giving it a more or less V-shaped appearance, and in another, a roughening of the lateral edge of the lower central incisor of the right side. In the third, the teeth were apparently sound.

It is generally laid down in the text-books that deep ulceration of the mouth and pharynx, in congenital syphilis, is very rare; and Mr. Holmes¹ went so far as to say that the affection of the palate, so common in syphilis of the adult, is "so rare in children that it is doubtful whether the few cases which occur in infants during syphilis may not be mere coincidences." A great deal of confusion prevails concerning this question in consequence of the persistent adherence to the old superstition which regards them as of "scrofulous" origin. It is impossible to exaggerate the rôle of congenital syphilis in the production of the deep destructive pharyngeal ulceration of childhood. The subject is not one of purely pathological interest: under a misconception of its true nature, syphilis, uncontrolled, will lead to destruction and deformity, and influence for evil the future happiness and usefulness of the individual.

Deep ulceration may invade the bucco-pharyngeal cavities at any period of life from the first week up to the age of puberty. Out of thirty cases analyzed with refer-

ence to the period of invasion, fourteen occurred within the first year, a proportion of nearly one-half, and of these, ten within the first six months. Whitehead² has observed putrid ulceration of the throat in an infant three days old. Of the remaining cases, the majority occurred at a period more or less advanced toward puberty.

It is an accepted fact that syphilis may lie in a state of potential activity within the system for many years after birth. Lying thus quiescent, it seems to await the advent of some physiological epoch to call its phenomena into activity. Thus puberty and its surrounding years is often selected as the chosen period of its outbreak. When the eruption of the disease is thus deferred, it is on the palate and in the pharynx that it most frequently makes its appearance, and deep palato-pharyngeal ulceration often first attracts attention to the existence of a diathesis of which it is the sole pathological expression. Lesions of these structures are found with a peculiar constancy, and upon them syphilis apparently concentrates all its energy and exhibits most of its virulence.

Females are attacked more frequently than males. Out of sixty-nine cases of pharyngeal ulceration forty-one occurred in the female sex.

That the pharyngeal cavity should be frequently attacked is easily understood, when we reflect upon its great vascularity and the irritation to which it is constantly subjected. Ulceration may occur in any situation, but its favorite seat is the palate, and especially the hard palate. When it takes place at the posterior part of the hard palate the tendency is to involve the soft palate and velum, and thence to invade the posterior nares and naso-pharynx. Seated anteriorly it seeks a more direct pathway to the nose by perforation of the bone.

Simultaneous or consecutive ulceration of the palate, pharynx, and nose seems to be characteristic of syphilis.

The next most common seats of ulceration, in the order of their frequency, are the fauces, the naso-pharynx, the posterior pharyngeal wall, the nasal fossæ and septum, the tongue and gums.

A peculiarity of these ulcers, and especially those of the palate, is their centrality of position. They are generally found in the median line of the vault, at the junction of the palatal processes of the superior maxilla, and the areas of destruction on either side are equal and symmetrical.

Often more acute in their development, and advancing with more rapid strides than in the tertiary syphilis of the adult, the special tendency of these ulcerations is to attack the bone and lead to caries and necrosis. Disorganization of the bone occurs in over three-fifths of recorded cases. The great vascularity of the periosteum and medullary membrane in youth, doubtless, invites invasion of the osseous structures. This, however, is contrary to the experience of Colles,³ who never saw a case; of West,⁴ who has seen necrosis only once; of Holmes,⁵ who has seen sloughing of the soft palate, but not excavated ulcers or caries of the hard palate; and of Cooper Foster,⁶ who has never met with an example in which syphilis had advanced to disease of the bone.

The tendency to necrosis exists at all periods of life; but especially in early youth, at which time it is more destructive and less amenable to treatment. When ulceration occurs on the hard and soft palate, perforation of these structures takes place in very nearly one-third of the cases.

As a rule, the ulcers originate upon the palate or within the pharynx, but they are also consecutive to deep, ulcerating syphilides of the nose and face. Whatever their point of departure, the palate is often the structure upon which the destructive process ultimately descends.

The palate, pharynx, and nose, then, constitute a well-defined territory singularly obnoxious to these ulcerative products, and within whose confines we may best study the development and growth of these degenerate lesions of syphilis.

Ulceration of the tongue occurs in a certain proportion of cases. I have met with it three times in congenital syphilis. In the first case the ulcer was situated on the

right side of the tongue, near its tip; in the second, in the left glosso-epiglottic fossa; while the third followed the breaking down of a large gumma on the upper surface of the tongue near its base.

The ravages of the disease present the typical appearances that are found in the tertiary syphilis of the adult. (For the diagnostic characters of the syphilitic ulcer, its differential diagnosis, the article on Larynx, Trachea, and Bronchi, Syphilis of the, should be consulted.) The appearance of the ulcer will vary to a certain extent with the general condition of the patient. In a badly nourished, cachectic child the granulations may assume a pale, unhealthy, and indolent look, and the red corona may fade into a purplish ring, or even be entirely wanting. But in all there is a strict adherence to the true syphilitic type of ulcer.

As a result of cicatrization, adhesions may form between the velum and the pillars of the fauces, or between the latter and the pharyngeal wall, and there may be stenosis and obliteration of the pharynx and naso-pharynx; in fine, all the sequelæ are found which follow constitutional syphilitic ulceration in these localities.*

The prognosis in syphilis of the pharynx is generally good, provided the patient be seen before extensive destruction has taken place. In congenital syphilis it is greatly influenced by the age of the patient; the earlier the pharynx is attacked, the graver the prognosis. Pharyngo-laryngeal ulceration occurring within the first year is almost invariably fatal. Pharyngeal ulceration appearing late, or as a manifestation of "tardy syphilis," yields readily to iodide of potassium, and the topical application of iodoform or the vapor of the iodate of zinc.

The separation of syphilitic ulceration of the pharynx from that of tuberculosis, lupus, lepra, and cancer should be made upon the principles of differential diagnosis laid down in the article on Syphilis of the Larynx. It should not be forgotten, too, that typhoid fever, diphtheria, and other acute systemic disorders may lead to destruction which resembles that of syphilis so closely as to render an appeal to the history of the case imperative. The soft palate and pharynx may also be destroyed by traumatic causes, or be badly scarred from chemical irritants. Sloughing may also occur from poisonous doses of drugs, such as mercury in its various forms.

Treatment should be carried out on the principles already indicated in the section on Syphilis of the Larynx. In my experience the best application to the mucous patch is the solid stick of silver nitrate, while for the tertiary ulcer iodoform may generally be relied upon as a rapid promoter of cicatrization. Adhesions may be divided with the knife or galvano-cautery, but unless serious interference with function is threatened, they had better be left alone. Partial stenosis of the upper and lower pharynx may be treated by systematic dilatation with sounds, by divulsion, or by the use of the cautery or knife. When the stenosis is complete, and the pharynx is filled with dense fibroid tissue, the treatment will depend upon the circumstances of the case and the ingenuity of the surgeon. In cutting through the new-formed tissue in the nasal pharynx, it is always best to previously introduce a catheter or similar contrivance through the nose, upon which to cut as a guide. The results of treatment in this class of cases cannot be said to be brilliant. The tendency to recurring stenosis is great, and the surgeon is fortunate who obtains a satisfactory permanent opening. Delavan, of New York, profiting by the observation of Andrew H. Smith—that the eschar after the use of monochloroacetic acid remains attached until cicatrization has taken place beneath it,—in a case of adherent velum, divided the adhesion with curved scissors and cauterized the raw surfaces freely with this acid. Although the surfaces remained in contact, no adhesion took place afterward, and the operation was a permanent success.⁷

John N. Mackenzie.

* The views and conclusions given above were first published by the writer in the American Journal of the Medical Sciences for October, 1880 (see also article on Larynx, Trachea, and Bronchi, Syphilis of the, in vol. iv.).

¹ Surgical Treatment of the Diseases of Children, p. 350. London, 1868.

² On the Transmission from Parents to Offspring of some Forms of Disease, p. 137. London, 1851.

³ Venereal Diseases, p. 271. London, 1837.

⁴ Lectures on Diseases of Children, p. 747.

⁵ Op. cit., p. 351.

⁶ Surgical Diseases of Children, p. 291. London, 1860.

⁷ See Trans. of the American Laryngological Association, 1883, p. 185.

PHARYNX AND PALATE, ANATOMY AND PHYSIOLOGY OF THE. The *pharynx* belongs to both the respiratory and the digestive tracts, although it is usually described as a part of the latter.

Its upper portion is concerned exclusively in respiration, while the lower regions participate in both functions.

Its relations to the formation of the voice are accessory to the respiratory function, and will be described in the article on the Voice.

It is a hollow, musculo-membranous structure, suspended from the base of the skull and reaching as far downward as the interspace between the fourth and fifth cervical vertebrae.

It is attached above to the pharyngeal spine on the inferior surface of the basilar process of the occipital bone, and to two membranous bands extending thence to the apex of the petrous portion of the temporal bone, on either side. It is then attached anteriorly to the posterior border of the internal pterygoid plate of the sphenoid, to the pterygo-maxillary ligament, to the posterior extremity of the mylo-hyoid ridge on the inferior maxillary, to the base of the tongue, to the mucous membrane of the mouth, to the posterior extremities of the greater and lesser cornua of the hyoid bone, to the thyro-hyoid ligament, to the posterior border and external surface of the ala of the thyroïd cartilage, and to the lateral aspect of the cricoid cartilage.

Posteriorly, it lies against the anterior surfaces of the five upper cervical vertebrae and the longus colli and recti anteriores muscles, from which it is separated by some loose connective tissue. Below, it is continuous with the œsophagus, which has its superior attachment to the posterior surface of the cricoid.

It communicates above, with the nasal passages and Eustachian tubes; below, with the mouth, larynx, and œsophagus.

The pharynx is divided, for convenience in description, into three portions: the superior, or naso-pharynx, the middle, or oro-pharynx, and the inferior, or laryngo-pharynx. The naso-pharynx is limited above by the roof or vault, and extends as far downward as the inferior border of the velum pendulum palati. It receives the orifices of the Eustachian tubes, and of the posterior nares, or *choanae*. The former orifices, which project into the pharynx somewhat as the cervix uteri protrudes into the vagina, are just posterior to the openings of the posterior nares. Anteriorly to them is a depression, on either side, bounded in front by the crescentic margin of the orifice, which has been named by Tortuol the *sinus pharyngis superior*. Posterior to them is a depression known as the fossa of Rosenmüller, or *recessus pharyngeus*.

The oral portion, or oro-pharynx, is that which extends from the level of the lower margin of the velum to the plane of the greater cornua of the hyoid bone. In front it looks toward the mouth and epiglottis, with the dependent uvula forming a very incomplete anterior wall. Two folds of mucous membrane, the pharyngo-epiglottic folds (see Larynx), help to bound it laterally.

The inferior or laryngeal portion (laryngo-pharynx), extends from the greater cornua of the hyoid bone to the inferior border of the cricoid cartilage. It looks anteriorly toward the epiglottis and ary-epiglottic folds, and is continuous, centrally, with the vestibule of the larynx; more laterally, with the pharyngo-laryngeal sinus, or *sinus pyriformis* (see Larynx).

The pharyngeal walls are composed of three layers: an internal or mucous, a middle or fibrous, and an external or muscular.

The muscles of the pharynx are fourteen in number, though two of them—one pair—are common to it and

the soft palate. They are the superior, middle, and inferior constrictors, which form the bulk of its walls and give to it its form and the greater part of its attachment; the stylo-pharyngei, and the palato-pharyngei. The muscles of the soft palate are intimately associated with its functions.

The superior constrictor (Fig. 2867) (*cephalo-pharyngeus*) is broad and flat. It takes its origin from the lower third of the posterior border of the internal pterygoid plate; from the pterygo-maxillary ligament, the base of the tongue, and the posterior extremity of the mylo-hyoid ridge. Those fibres which are connected with the base of the tongue enter its substance and pass inward; some of them penetrating as far as the fibrous septum. All the fibres pass backward and somewhat upward. The most superior are attached to the ligament which suspends it from the base of the skull, the *ligamentum suspensorium pharyngis*. The others, in part, interlace with those of the opposite side, while the remainder attach

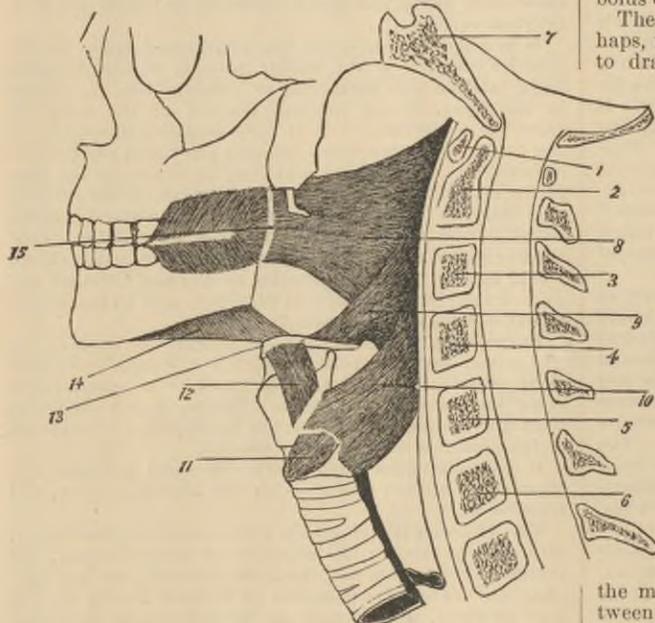


FIG. 2867.—The Constrictor Muscles of the Pharynx. (Drawn by Dr. A. H. P. Leuf.) 1, Anterior arch of atlas; 2, body of axis; 3, 4, 5, 6, bodies of third, fourth, fifth, and sixth cervical vertebrae; 7, basilar process of occipital and body of sphenoid; 8, the superior constrictor; 9, the middle constrictor; 10, the inferior constrictor; 11, crico-thyroideus; 12, thyro-hyoideus; 13, the body of the hyoid bone; 14, mylo-hyoid muscle; 15, buccinator.

themselves to the more or less distinct fibrous raphé which extends, in the median line, throughout the length of the pharynx.

The middle constrictor (*hyo-pharyngeus*) (Fig. 2867), arises from the greater and lesser cornua of the hyoid bone and the lower end of the stylo-hyoid ligament. From this narrow origin the fibres spread out in a fan-like shape. The more superior bundles pass upward and backward, on a plane external to the superior constrictor, ascending almost to its superior border. The middle fibres take a horizontal direction, and the lower ones pass downward, internally to those of the inferior constrictor. Part of the fibres end at the median raphé, into which they are inserted; the remainder interlace with those of the opposite side.

The inferior constrictor (*laryngo-pharyngeus*) is a somewhat quadrilateral muscle, situated at the lower portion of the pharynx on a plane posterior to the middle constrictor. Its origin is from the posterior border of the thyroid cartilage and the triangular space behind the oblique ridge into which the sterno-thyroid muscle is inserted, and from the lateral aspect of the cricoid cartilage. The superior fibres extend backward and slightly

upward, interlacing in the median line. The middle and inferior bundles pass horizontally backward in a similar manner. The lowermost bundles are in close contact with those of the œsophagus.

The stylo-pharyngeus (*levator laryngis*) is long and slender. It arises from the base of the styloid process of the temporal bone. Its fibres pass downward, forward, and inward. At first they lie in contact with the outer surface of the superior constrictor, but subsequently penetrate between it and the middle constrictor, and spread out in the fibrous layer of the pharynx, the pharyngeal aponeurosis. They are, finally, inserted into the superior and posterior borders of the thyroid cartilage.

The palato-pharyngeus will be described with the muscles of the soft palate.

The action of the constrictors is to contract the lumen of the pharynx in swallowing. This action begins in the superior constrictor, and extends from above downward in a vermicular or peristaltic manner, so as to carry the bolus onward into the œsophagus.

The action of the stylo-pharyngei, which might, perhaps, more properly be called the levatores laryngis, is to draw the larynx upward toward the base of the tongue. It, at the same time, raises the lower portion of the pharynx, shortens the tube, and facilitates the entrance of the morsel into the œsophagus.

The middle, or fibrous, layer of the pharynx, known to anatomists as the pharyngeal aponeurosis, is made up of tough, closely woven, fibrous connective tissue. Above, it is attached to the pharyngeal spine, on the basilar process of the occipital bone, by means of the suspensory ligament, and to the petrous portion of the temporal bone. Between these points it forms a festoon above the concavity of which the Eustachian tube passes downward, forward, and inward to its opening into the naso-pharyngeal space. Anteriorly it is attached to the internal pterygoid plate, the pterygo-maxillary ligament, the mylo-hyoid ridge, the cornua of the hyoid bone, the thyro-hyoid ligament, the superior and posterior borders of the thyroid cartilage, and the cricoid cartilage. Below, it blends with the fibrous coat of the œsophagus. The pharyngeal aponeurosis, besides giving strength to the pharynx, affords attachment to the free ends of

the muscular fibres. It is pierced, in the interval between the superior and middle constrictors, by the glosso-pharyngeal nerve, which lies just below the stylo-pharyngeus muscle, and between the middle and inferior constrictors by branches of the superior laryngeal branch of the pneumogastric. The posterior median raphé is a thickened portion of the fibrous aponeurosis. It is more marked above than below.

The mucous membrane of the pharynx is continuous with that of the nasal passages, Eustachian tubes, mouth, larynx, and œsophagus. Superiorly, it arches over, beneath the base of the skull, so as to completely close the cavity, forming the roof or vault of the pharynx.

It is closely attached to the subjacent tissues in the upper portions, but in the vicinity of the larynx its attachment is much looser, and it may, in the cadaver, be easily raised with the forceps. Above the level of the inferior border of the soft palate, that is, in the naso-pharyngeal space, it is covered by columnar, ciliated epithelium, throughout its entire extent in infancy, and in the neighborhood of the nasal and Eustachian orifices in adults.

In the oral and laryngeal regions, it is supplied with stratified pavement epithelium. The mucous membrane is liberally furnished with mucous glands, particularly in the lower regions. In the vault of the pharynx are many so-called follicular or adenoid glands, most numerous behind the orifices of the Eustachian tubes, and passing across from one tube to the other.

The glandular tissue of the vault, from its resemblance to that of the tonsils, was called by Luschka the pharyngeal tonsil. Beside these glandular structures, the con-

nective tissue of the mucosa contains many lymphoid cells.

Normally, the color of the mucous membrane of the naso-pharynx is a little paler than that in the oral and laryngeal portions.

The pharynx receives its vascular supply from the ascending pharyngeal, from the vidian and pterygo-palatine branches of the internal maxillary, and from the ascending palatine and tonsillar branches of the facial artery—all originating from the external carotid. Its veins are branches of the internal maxillary, inferior palatine, and internal jugular.

The lymphatics, which are numerous, are connected with the deep cervical glands in the neighborhood of the cornua of the hyoid bone, and in the pterygoid region.

The sensory nerves of the pharynx are the fifth, glossopharyngeal, and branches from the pharyngeal plexus,

which is made up of communicating fibres from the pneumo-gastric, glosso-pharyngeal, superior laryngeal, and branches from the superior and middle cervical ganglia of the sympathetic. The second division of the fifth supplies the vault of the pharynx and the upper portion of the opening of the Eustachian tube, while the lower portion of the naso-pharynx has some fibres from the inferior division. Below this the sensory fibres are from the glosso-pharyngeal and the pharyngeal plexus. The fact that abnormal irritations of the region supplied by the glosso-pharyngeus give rise to vomiting has led some to call this nerve "the nerve of nausea." The pharyngeal branches of the glosso-pharyngeus are not endowed with the gustatory sense.

Motor Fibres.—The stylo-pharyngeus is supplied with motor fibres by the glosso-pharyngeal nerve. The constrictors are supplied by the glosso-pharyngeus and the pharyngeal plexus. The inferior constrictor also receives a branch from the superior laryngeal branch of the pneumogastric.

Physiologically, the pharynx is concerned both in respiration and in alimentation. During the greater part of life it remains relaxed and open, so as to admit the free access of the current of air, as it passes downward from the nasal passages to the larynx and trachea. During deglutition the respiratory function is suspended; the mouth is closed, and communication with the naso-pharynx is entirely cut off by the elevation and tension of the soft palate.

The soft palate, *velum pendulum palati*, is a musculo-membranous curtain, depending from the posterior extremity of the palate plates of the palate bone. It inclines somewhat backward, and has a depth of from an inch to an inch and a half. Its thickness is from a fourth to

half an inch. It forms an arch, made double by the downward projection of the uvula from its highest central point. It separates the buccal from the pharyngeal cavity. The sides, or pillars, divide, as they descend, into two diverging columns called the anterior and posterior pillars of the fauces. The anterior pillar is continuous with the base of the tongue; the posterior shades off into the lateral wall of the pharynx. Between them, as they diverge, is a recess or cavity known as the *fauces*, in which the tonsil is contained. The space between the anterior pillars and the base of the tongue, which is closed during the second part of the act of deglutition, *i. e.*, after the morsel has reached the pharynx, is called the *isthmus of the fauces*.

The soft palate is covered by mucous membrane which, on its anterior or buccal surface, corresponds in structure to the buccal mucous membrane. It contains numerous conglomerate mucous glands, identical with the buccal glands which can be seen in certain inflammatory conditions, such as buccal catarrh, scarlatina, etc., as little round elevations on its surface. On the posterior surface are the follicular glands of the naso-pharynx, besides many mucous glandules. The epithelium on the anterior surface is of the stratified squamous variety. The posterior surface is covered by columnar ciliated epithelium near the orifices of the Eustachian tubes. Elsewhere it is squamous. In infancy the entire posterior surface is covered by ciliated epithelium.

The muscles of the soft palate are ten in number, five on either side. They are the levator palati, tensor palati, palato-pharyngeus, palato-glossus, and azygos uvule. The levator palati (*petro-salpingo-staphylinus*) (see Fig. 2869) is a rather broad muscular band, which has its origin from the inferior surface of the apex of the petrous portion of the temporal bone. Its fibres incline inward as they descend, and, spreading out, are inserted into the fibrous tissue of the velum; many of them pass over to the opposite side. This muscle forms a slight eminence under the base of the opening of the Eustachian tube, and when it contracts, during the first part of the act of deglutition, tends to close the tube. Its principal function, however, is to draw the velum upward and backward, against the posterior wall of the pharynx. The tensor palati, or circumflexus palati (*spheno-salpingo-staphylinus*), arises from the scaphoid fossa at the base of the pterygoid process. It descends perpendicularly to the outer side of the hamular process around which it curves. A bursa is interposed between the muscle and the bone. Its fibres then assume a horizontal direction and spread out in an aponeurosis, which is partly attached to the palate plate. This muscle lies in a plane anterior to the levator. The tensor palati performs two very important functions. First, it makes the velum tense and unyielding, as it is drawn upward and backward by the levator in swallowing. Second, by means of its attachment to the inferior aspect of the Eustachian tube, it draws it open and admits air to the tympanum.

The palato-pharyngeus (Fig. 2869) is a long, round muscle, arising in the substance of the soft palate as far inward as the uvula. In the velum, its fibres are separated into an anterior and a posterior fasciculus, by the levator palati. They join, below the latter muscle, to form a narrower portion which soon widens out again into two parts, an anterior and a posterior. The anterior portion joins with the stylo-pharyngeus and is inserted into the superior and posterior borders of the thyroid cartilage; while the posterior portion spreads out, some of the fibres being lost on the lateral and posterior walls of the pharynx, others passing entirely beyond the median line to interlace with those of the opposite side. This muscle, with the mucous membrane covering it, forms the posterior pillar of the fauces. When it contracts, it draws the larynx and laryngo-pharynx upward, and through the shortening and straightening of the posterior fibres, pulls the posterior pillar inward and backward, so that it forms nearly a straight line from before backward. The slight space left between the two pillars, as they are thus approximated, is closed by the uvula. In this way a complete septum is formed between the oro- and naso-

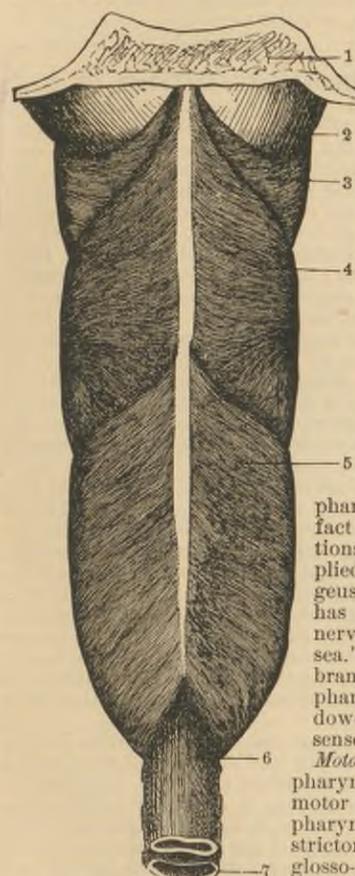


FIG. 2868.—Posterior View of the Pharynx. (Drawn by Dr. A. H. P. Leaf.) The median raphe is drawn too broad. 1, Base of the skull; 2, fibrous membrane of the pharynx; 3, superior constrictor; 4, middle constrictor; 5, inferior constrictor; 6, oesophagus; 7, trachea.

pharynx. In the absence of the uvula, the palato-pharyngei may, and frequently do, close this space (isthmus pharyngis), so that deglutition is not impaired.

The palato-glossus (*constrictor isthmi faucium*), with the fold of mucous membrane covering it, forms the anterior pillar of the fauces.

It is situated the most anteriorly of all the muscles of the palate. It arises in the median line. The fibres of the opposite muscles interlace, and continue from one arch into the other. Thence it passes downward and forward to the side of the tongue, where it is lost beneath the mucous membrane of the mouth.

The contraction of the palato-glossi approximates the sides of the isthmus, draws down the uvula, and, as the base of the tongue is raised in swallowing, cuts off all communication between the mouth and pharynx.

The azygos uvulae (Fig. 2869) is a small, slender muscular bundle which derived its name from the supposed

geal branches from the ascending pharyngeal, and the descending palatine from the internal maxillary.

The veins are collected into two plexuses, anterior and posterior. The anterior are connected with the veins of the base of the tongue, while the posterior communicate with those of the nose.

The motor nerves are branches of the second and third divisions of the fifth, the facial, and Meckel's ganglion. The tensor palati is supplied by a branch from the otic ganglion, derived, originally, from the third division of the fifth. The levator palati and azygos uvulae receive their motor innervation from the facial, by way of the great superficial petrosal and vidian nerves. The palato-glossus and palato-pharyngeus are supplied by twigs from the palatine branches of the sphenopalatine (Meckel's) ganglion. They also send some branches to the levator palati and azygos uvulae. The mucous membrane is supplied with sensory filaments from the palatine branches of Meckel's ganglion, and the tonsillar branches of the glosso-pharyngeus.

Benjamin F. Westbrook.

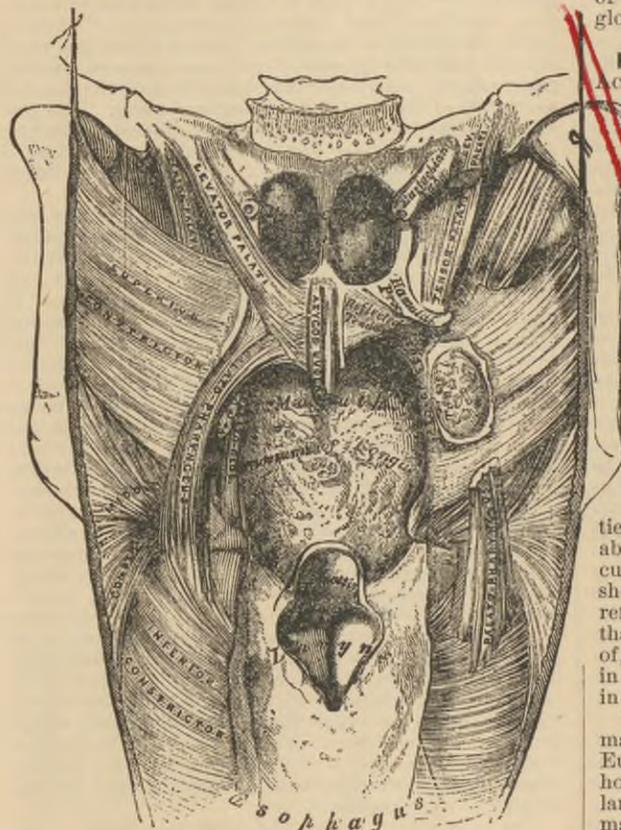


FIG. 2869.—Copied from Gray.

fact that it was single. It is now known to be bilateral, like the other skeletal muscles.

This is particularly well demonstrated in cases of bifurcated or double uvula, a not very uncommon anomaly. The azygos muscles, with their covering of mucous membrane, form the uvula, or central dependent portion of the velum palati. They arise together, partly from the connective tissue and partly from the posterior nasal spine of the palate bone. They diverge slightly as they descend, and are lost in the submucous connective tissue near the end of the uvula. When they contract they shorten and contract the uvula, and at the same time draw it upward and backward. This assists in closing the isthmus of the pharynx in deglutition, and is also an important factor in the production of speech (see Voice).

The arterial supply of the soft palate is derived from the ascending palatine and tonsillar branches of the facial; the dorsalis lingue from the lingual; the pharyn-

PHARYNX, CATARRHAL AFFECTIONS OF THE

ACUTE CATARRHAL PHARYNGITIS.—*Etiology.*—The causes of this affection are those of catarrhal inflammation of the upper air-tract in general, and have been considered elsewhere (see vol. iv., pp. 400-406). Among its most common exciting causes are the conditions embraced under the conception of "catching cold." It may also arise as one of the complications incident to mouth-breathing from nasal obstruction; from extension of inflammation from adjacent organs; from the suppression of a cutaneous exanthem; as a reflex phenomenon from gastro-intestinal or genito-urinary irritation; as the local expression of a constitutional dyscrasia or acute systemic infection; as the manifestation of organic disease of a distant organ, or as the direct result of local irritation. The improper use of the voice in the various forms of vocal strain is a fertile cause of pharyngeal affections.

Symptoms.—The severity of the symptoms will vary with the cause of the disorder. In mild cases there is little, if any, febrile disturbance, the patient complains of dryness of the fauces with a disagreeable sense of constriction about the throat, and of difficult or painful deglutition. There is often a peculiar, short, explosive cough which is easily recognized as a reflex act. Occasionally pain in the course of the nerves that radiate from the pharyngeal plexus is complained of, and the writer has met with intense, lancinating pain in the eyeball, brought about by localized inflammation in this region.

The disease is very frequently associated with inflammation of the naso-pharynx and may extend through the Eustachian tubes to the middle ear. Not infrequently hoarseness and the sensation of a foreign body in the larynx are added to the pharyngeal symptoms. This may be due to an irritation of the larynx, or to collateral or reflex hyperæmia of that organ, or to the presence of the pharyngeal secretion in the posterior portions of the larynx where it excites localized hyperæmia or acts as a damper on the vocal cord. The sudden loss of voice which occurs during the presence of pharyngeal inflammation is doubtless due to the latter cause.

At first, there is little or no secretion; the throat is dry and parched and is exquisitely susceptible to irritation. Later, a more or less profuse mucous or muco-purulent discharge occurs, which is expectorated by coughing or hemming.

The redness of the pharynx is generally diffuse; but is almost always more pronounced in certain portions. A common seat of the hyperæmia is along the inner and anterior aspect of the anterior faucial pillars and the palatal arcade. The veins of the posterior wall are often enlarged and prominent, and the tonsils swollen and engorged. There is slight œdema of the pharynx, which principally affects the uvula, probably owing to its dependent position, and the palatal muscles are somewhat restricted in their motions. In some cases, and especially

when the disease occurs in epidemic form, a yellowish-white pultaceous deposit takes place, which is distributed over the pharynx in small, easily detached patches. This thickened secretion is glandular in origin and it is accordingly associated with tumefaction and prominence of the pharyngeal follicles.¹ Occasionally cheesy masses are expectorated, but this is an uncommon symptom except when the acute inflammation is engrafted on chronic follicular disease.

In severe cases of acute pharyngitis the above symptoms are accentuated. Edema occurs, which may be so great as to threaten asphyxia, or to precipitate tracheotomy, owing to direct extension of the effusion to the submucous connective tissue of the larynx. The motility of the muscles of the palate and pharynx are interfered with, deglutition is rendered difficult or impossible, and the voice acquires the familiar nasal twang which is characteristic of paralytic states of the soft palate. The condition of the muscles here is generally that of paresis from inflammatory or œdematous infiltration, and disappears with the subsidence of the inflammatory process; but occasionally a true paralysis is produced which persists after the original cause has been removed.

Pathology.—The anatomical appearances are those of simple catarrhal inflammation—engorgement of the vessels, round-cell infiltration of the mucous membrane, enlargement of the glands, and serous infiltration of the submucous tissues and muscular walls.

Diagnosis.—The affection is at once recognized by inspection. Care should be taken not to confound the whitish patches on the tonsils and pharynx, as is often done, with follicular ulceration, nor to mistake the epidemic occurrence of pharyngitis with exudation for a mild type of diphtheria. The easy removal of the deposit, the absence of abrasion after its extrusion, its obvious origin from the glandules, and its pultaceous character are sufficient to differentiate it from the organized, closely adherent membraniform exudation of true diphtheria. At the same time it should be remembered that the latter affection may originate in the follicles of the pharynx, or develop from what may seem at the first sight a simple folliculitis.

Prognosis, Complications, Sequels.—The prognosis in simple acute pharyngitis is always good. The disease generally lasts from three to seven days and ends in resolution. Repeated attacks increase the susceptibility, especially in those suffering from constitutional diseases or impoverishment of the blood from any cause. The acute pharyngitis which occurs in blood-poisoning is often a dangerous affection, death taking place from suffocation from pharyngo-laryngeal œdema; or a paralytic condition of the muscles of deglutition may be induced with the consequences which the abrogation of their functions entails.

Treatment.—The general principles governing the constitutional and local treatment of pharyngeal inflammation are identical with those considered under the head of Acute Laryngitis (vol. iv.). Of constitutional remedies the most reliable are opium and quinine taken at the onset of the attack. Alcohol, in the form of whiskey-punch or like concoction, sometimes cuts short the duration of the disease. Local applications should be made with the spray or cotton-carrier. The act of gargling, so universally employed, is open to the objection that it brings into action parts which should be at rest. As a substitute for gargling irrigation may be resorted to or the fluid may be allowed to gravitate into the back of the throat. An excellent and simple method of overcoming the disagreeable symptoms of pharyngeal inflammation is to use in this manner, repeatedly through the day, very hot water, either alone or holding in solution soda, potash, boric acid, or allied substances. Potassium chlorate dissolved in claret wine is an agreeable and effective combination. Relief may also be had from sedative, demulcent, and astringent lozenges. Caution should be exercised in the use of cocaine. While it undoubtedly gives complete temporary relief, I am convinced that in many instances its employment prolongs the duration of the disease.

CHRONIC CATARRHAL PHARYNGITIS.—**Etiology.**—The

causes of chronic catarrh of the pharynx have been considered in another portion of this work (vol. iv., p. 400 et seq.). It may follow the acute or subacute form, or be due to the extension of chronic inflammation from neighboring organs, most commonly the nose and nasal pharynx. There is almost always more or less pharyngeal irritation or inflammation associated with obstructive diseases of these regions from the mouth-breathing which they necessarily involve. The habitual use of alcoholic drinks and the improper use of the voice are common causes of the disease, and in some persons the use of tobacco seems to play an important part in its production. It is occasionally the result of reflected irritation from various parts of the body or may occur as a complication of paralytic states of the muscular walls of the pharynx. It may also be the result of direct irritation from impurities in the atmosphere or from various articles of food and drink. The sudden changes from hot to cold, and *vice versa*, in the temperature of the ingesta and the injudicious stimulation of the palate by the use of condiments are sometimes important factors in chronic inflammatory conditions of the pharyngeal membrane.

Symptoms.—The symptoms of this affection are generally most marked upon arising in the morning or after prolonged and improper use of the voice and over-indulgence of the appetites. There is an accumulation of mucus in the throat which gives rise to various sensations, as of a foreign body, sense of constriction, etc. The throat is harsh and dry, the voice frequently hoarse, and the accumulated secretion, which is generally adherent, is removed by hawking or by a peculiar tickling reflex cough. These symptoms may disappear after breakfast, and in mild cases may be absent the remainder of the day. In severer cases there is a constant dryness of the throat with hawking and expectoration of viscid mucus. At night the patient may be awakened from his sleep by a sense of impending suffocation, which is only relieved upon moistening the throat and the removal of the inspissated secretion. These symptoms generally last for a long time without exciting alarm, but if neglected, the affection will ultimately end in atrophy. The membrane becomes glazed, dry, and presents a beef-tongue appearance; there is a tendency to crust-formation, and the symptoms detailed above are proportionately aggravated. As chronic pharyngitis is almost always associated with nasal or naso-pharyngeal catarrh, the individual will suffer, in addition, from the symptoms characteristic of these diseases.

Pathological Anatomy.—The anatomical changes consist in a dilated and varicose condition of the blood-vessels, especially the veins, with swelling and relaxation of the mucous and submucous tissues. The glands are enlarged and swollen, and present the appearance of minute and shining nodules scattered over the palatal arcade and uvula. In long-standing cases the contents of the follicles undergo caseous degeneration, and pellets or plugs of an offensive odor are formed, which impart a disagreeable odor to the breath (follicular pharyngitis). These are most commonly encountered in the follicular crypts of the tonsils and occasionally acquire a stony hardness (tonsillar calculus). Minute follicular ulcers often result from the discharge of the imprisoned contents of the closed follicle.

In the so-called glandular or granular pharyngitis, we may distinguish clinically and pathologically two varieties. In the one, the chief anatomical characteristic is the presence of elevations of various size and form on the free surface of the membrane (hypertrophy), and to this the term "granular" should be limited, or, perhaps, a better name would be *hypertrophic pharyngitis*; while in the other, changes in the pharyngeal follicles leading to caseous and calcareous degeneration of their contents are the distinguishing anatomical feature.

On inspection of the pharynx, the redness is found either uniformly distributed over the whole pharynx or confined to particular portions, as the palatal arcade, uvula, etc. In the pharyngitis of chronic alcoholism the mucous membrane acquires an angry red look and is

especially sensitive to local irritation. The inflammatory thickening is not always well marked, but a slightly oedematous condition, especially of the uvula, is frequently present. In many cases the whole mucous membrane presents a relaxed and flabby appearance. The pharyngeal vessels are commonly enlarged, congested, and varicose, and the glandules and follicles of the membrane are enlarged and filled with a whitish or yellowish secretion. Of common occurrence are the familiar pharyngeal granules whose nature has been variously interpreted. According to the old idea, they represented enlargements of the glands themselves. Stoerck, on the other hand, maintained that they are simply hypertrophies of the epithelium, while the researches of Saalfeld seem to demonstrate the fact that they consist of an increase in the lymphatic tissue which is found in the neighborhood of the glandules. In many cases these granules seem to constitute the sole pathological element of the pharyngeal affection.

Prognosis, Complications, Sequels.—In chronic pharyngitis dependent upon a removable nasal or naso-pharyngeal affection the prognosis is good. When due to chronic alcoholism, gout, rheumatism, and allied diseases, the prospects of permanent recovery are less favorable, while in the "dry" variety (pharyngitis sicca) temporary relief is, in the vast majority of cases, all that can be looked for. The most interesting complications of chronic pharyngitis are certain motor, sensory, and vaso-motor neuroses, which will be considered in the Appendix.

Treatment.—The treatment of chronic pharyngitis should be conducted on the same general principles which have been discussed in the article on Larynx, Chronic Catarrhal Inflammation of, and which will receive further mention in the section on Chronic Nasal Catarrh in the Appendix. The great secret of success in the management of this disease lies in the recognition of the fact that, in the large majority of instances, it is a purely secondary affection, and that the chief source of pharyngeal catarrh is an inflammatory condition of the nasal passages or retro-nasal space. It is worse than useless to spray a congested or inflamed pharynx with an untreated nasal obstructive lesion or retro-nasal catarrh.

The use of gargles, sprays, and the like in the granular forms of pharyngitis is a sheer waste of time. The granules should be destroyed, and the best agent for the accomplishment of this end is the galvano-cautery. My practice is to bury the end of a small spiral electrode in the centre of the granule, and, in cases in which the growth is nourished by enlarged vessels, to make a cross-section of the latter with the cautery knife. This soon causes atrophy of the granule and marked relief to the individual. *John N. Mackenzie.*

¹ Flint: Buffalo Med. Journal, vol. xli., p. 718.

PHARYNX, CONGENITAL MALFORMATIONS OF THE. Congenital malformations of the pharynx are of rare occurrence. Fistulous openings are sometimes found, communicating with the pharynx or the trachea, which are evidently of congenital origin. The condition has been described as an embryonic cleft-formation, and has sometimes been called *fistula colli congenita*.

Of congenital malformations of the neck, the pharyngeal fistula is by far the most common. To this class belong all fistulae which open into the pharynx, or in its direction. They are divided into two varieties, the complete and the incomplete. According to Dr. George Jackson Fisher, of New York, they are apt to be hereditary, and more than one member of a family may be afflicted. Again, it has been observed that cleft-formations in other parts of the body have occasionally been associated with this variety of malformation.

Pharyngeal fistulae are, as a rule, unilateral, and they occur more commonly on the right side than on the left. They are usually incomplete, and are found with equal frequency in males and females. Their external opening is always found upon the side of the neck, and it occurs anywhere between the sterno-clavicular articulation and the angle of the lower jaw. It may present the ordinary characteristics of a congenital fistulous opening,

or, in consequence of inflammatory irritation, it may be covered with granulations and hardly large enough to admit a probe. The internal opening is found in the lateral wall of the pharynx, behind the cornu of the hyoid bone and near the tonsil, or in the pharyngo-palatine arch. The canal varies in length and in diameter, is usually quite tortuous, and sometimes so much so as to be almost impassable to a probe. Its diameter is always greater than that of the external opening, and it can be much increased by retained secretions, when, for any reason, the opening has become stopped. The walls of the passage are thick, and they excrete a discharge which contains pavement epithelium. *D. Bryson Delavan.*

PHARYNX, TUMORS OF THE. I. FIBROUS TUMORS.

—These growths, of fibrous structure, are generally found to originate from the vault of the pharynx, whence they may extend considerably in many directions, causing absorption or destruction of the neighboring parts, and giving rise to much annoyance and danger to the patient. The disease is rare. Dr. R. P. Lincoln, of New York, has, however, succeeded in tabulating a list of fifty-eight cases, three of which are original. Of these, not less than thirty-eight were genuine fibromata. All occurred in males under the age of twenty-five.

Observers agree that this is a disease incident to youth, and almost unknown among females. Some believe that it may be caused, in some instances, by a scrofulous condition of the patient, or by bad hygiene, although there is little to support this view. More plausible is the explanation of Morell Mackenzie, who believes that the disease is probably due to the irregular evolution, during the growing period, of a tissue which, under normal conditions, is exceptionally abundant on the under surface of the base of the skull. The age (fifteen to twenty-five) at which these growths are prone to originate is precisely the time at which the greater part of the fibrous structures of the body are at the most important stage of their development. It is then that the articular ligaments are acquiring their firmness, and it seems not unlikely that it is to an exaggerated plastic activity during this phase of growth that fibrous tumors of the pharynx owe their origin.

The early symptoms are those of obstruction to the nostril, and of the presence of an unusual object in the pharynx. Obstruction to respiration increases with the enlargement of the growth, and in case the tumor extends far downward, dyspnoea may become severe. As in cases of adenoid hypertrophy at the vault of the pharynx, deafness may result, from pressure upon the orifice of the Eustachian tube, and the sense of smell may be lost. Articulation may become thick and indistinct, and, in certain cases, there may be severe dysphagia. The secretion is generally purulent, and it may be abundant and very fetid. Epistaxis is a common symptom. It is apt to be severe, and to recur often and under slight provocation, so that it may be a prominent and dangerous feature of the case. Mackenzie calls attention to the fact that marked drowsiness and a sense of great fatigue are often observed in this condition.

The appearance of the tumor is usually smooth, its consistence hard and unyielding, and its color red or bluish-purple. Its surface is often ulcerated. As to the exact seat of its implantation, Nélaton held that the primary point of origin is, in all cases, the periosteum covering a limited area on the under surface of the base of the skull corresponding to the basilar process of the occipital bone and to the body of the sphenoid. When the tumor appears to be attached to other parts, either in the naso-pharynx or in the nose, these are merely points where secondary adhesions have been formed in the course of the expansion of the growth. In the majority of cases, at least, this view is correct, as may be demonstrated by a careful exploration of the pharyngeal cavity. Later in its development it begins to cause deformity of the adjacent bony structures. The nature of this will depend upon the direction taken by the growth. Thus, it may push the soft palate forward and downward, cause exophthalmus, invade the maxillary antrum, causing

