

appear. Thus a fat, pudgy child, with subnormal temperature, especially in the morning, and showing perhaps fat pads over the clavicles and in the axillæ may prove to be a case of hypothyroidism with secondary deficiency of all the other glands. But this same case may also be one of hypopituitarism. Here, however, infantile genital organs and a feminine build if a boy, and other signs of this condition described under the preceding heading, will appear. If the case be one of hypothyroidia, the use of thyroid gland, 1 grain twice daily, with Bland's pill of iron 1 grain, and strychnine $\frac{1}{8}$ grain, exhibited in a capsule, will soon improve both body and mind by promoting the formation of hemoglobin and the vascular tone. If the pituitary be at fault, pituitary gland powder 2 grains with $\frac{1}{2}$ grain of thyroid, also in a capsule, twice daily, will prove beneficial, but not curative.

If the thymus be deficient for the child's age, which is often the case when larval myxedema is present, any mental torpor, the tendency to answer slowly and hesitatingly, is increased and the child's osseous system will most likely show deformities suggesting rickets and looseness of the ligaments. Cutaneous disorders, especially a tendency to warts and eczema, are sometimes observed. Powdered thymus gland, in 5-grain doses, gradually increased to 10 grains, with $\frac{1}{2}$ grain of thyroid gland, to each capsule, given in the course of each meal and 2 grains of calcium lactate after meals afford marked improvement in most instances. In some the general health is greatly improved, while the mental deficiency remains the same. In other cases the mental progress is commensurate with that of the body.

A freckled, weak child—weak in the sense of muscular debility and development, is apt to suffer from hypoadrenia. There is often a history of several children's diseases during which the adrenals, and often the thyroid and thymus, have become the seat of hemorrhagic lesions or have been exhausted functionally, thus retarding development, including that of the cerebrospinal system. Small doses of thyroid, $\frac{1}{4}$ grain, with 1 or 2 grains of adrenal gland and 1 grain of iron carbonate, mixed in a capsule, may be given after each meal to a child of 7 years. Sweets will probably be craved; the child should not be deprived of them (some parents being in the habit of forbidding

them altogether), as the treatment creates an increased demand for glycogen. Pituitary gland is sometimes more effective than the adrenal, being more lasting; the powder (Armour's) may be given in doses of 2 grains three times a day, iron carbonate 1 grain, and $\frac{1}{10}$ grain thyroid gland.

An important feature of the treatment is to adjust the work allotted to the child to his mental capacity. The Binet-Simon system, or one of its modifications—one of the satisfactory of which is that by Dr. Goddard, of the Vineland (New Jersey) Training School, is employed to establish accurately the degree of intelligence of the backward child. This being determined, the child is placed, where the municipality provides such, in a special class where studies are carefully adjusted to the degree of feeble-mindedness established by the Binet-Simon test in each case. Aided and encouraged, *but not goaded*, a backward child, thus working within the precincts of his abilities, often surprises his teacher by the progress shown, particularly when he is simultaneously treated organotherapeutically.

In the vast majority of communities special classes for backward children are not available. This is, indeed, poor economy, for while instruction and a trade suited to the degree of mentality present will in most instances enable a backward pupil of the poorer classes to earn his or her living, such individuals, unprotected by such instruction, will ultimately become a charge on the community, as a pauper, an idiot, or as a convict. Many years of total and therefore expensive dependence are thus substituted for a few years of inexpensive instruction. All communities capable of supporting a school should provide, singly or collectively, an ungraded class under a teacher specially trained in the management of the feeble-minded. The fact that the higher branches of study are not required simplifies the acquisition of the necessary knowledge by a lower-grade teacher—if temperamentally suited and well endowed with kindness and patience. Such teachers are increasingly in demand, not only for public and private schools, but also for families in which a defective requires competent training. Indeed, an essential feature of the whole question should never be lost sight of, viz., that a backward pupil, when roughly urged to use his brain beyond its powers on the plea of laziness, truancy, etc.,

may readily be converted into a criminal. Goaded and punished, the child struggles along for a time to keep up with his normal classmates, but discouragement eventually replaces willingness; he becomes irritable and stubborn, and finally leaves school or is dismissed as incorrigible. Such weaklings readily yield to the promptings of evildoers, and not infrequently find their way to the reformatory or prison.

THE PROPHYLAXIS OF MENTAL DEFICIENCY IN CHILDREN.

It has been estimated that several centuries would elapse before eugenics, which aims to improve mankind through heredity, would prove fruitful to any material degree. Dr. Kehoe, superintendent of the Kentucky Institution for Feeble-minded Children, for instance, in extolling the merits of the movement, estimates that four hundred years would elapse before statistics would show much progress. While this estimate is probably excessive, the fact remains that it will take several generations to attain the desired results. In the meantime the number of mental defectives is steadily increasing. The full meaning of this fact imposes itself when we realize that, as stated by Barr, of Elwyn, there are 350,000 avowed mental defectives in the United States, 328,000 of whom are at large "perpetrating unrestrained the defilement of the race." The Russell Sage Foundation has shown, moreover, basing its estimate on a study of the schools of thirty-one American cities, that over one-fifth of all the children in the public schools of the United States belong to the retarded class.

Eugenics being unable to inhibit the propagation of these unfortunates for the time being, some other preventive measure becomes necessary. From my viewpoint, the ductless glands, which, as we have seen, have a controlling influence over the nutrition and development of the body, including the brain, supply the means to this end in respect to the various grades of idiocy and mental backwardness of children.

At the present time, the offspring of feeble-minded parents, though known in advance to be doomed to the same fate, is permitted *in utero* and after birth to follow the evil trend, in virtue it is thought, of transmitted hereditary traits. But the ductless glands tend to elucidate the nature of these traits.

Thus we have witnessed, in all the articles contained in the present and preceding chapters, the intimate functional relationship that exists between the ductless glands and the organ of mind. Not only, as is well known, are such disorders as Addison's disease, exophthalmic goiter, myxedema, acromegaly, etc., attended with abnormal psychic phenomena in a large proportion of instances, but mere deficiencies of functional activity, irrespective of any *active* pathological process in any one of the ductless glands, may so inhibit the nutrition of the brain as to produce the various forms of idiocy and mental backwardness described in the foregoing pages. It is thus apparent that when such diseases are met in the offspring of feeble-minded parents, it must have been through the inheritance of deficient ductless glands from the latter or through them from ancestors.

This imposes the necessity of showing that diseases, intoxications and other causes of idiocy are capable of provoking lesions in the ductless glands of the parents or ancestors. Ample evidence to this effect is available. Alcohol, gout, lead poisoning and infectious diseases all, we now know, impair the functional activity of the ductless glands either by provoking organic lesions in them or in their nervous supply or exhausting them functionally. Syphilis has been shown to do so by Fournier, Lacaze, Sirena, Furst, Gulecke, Marfan and others. Tuberculosis is a notorious offender in this connection, Addison's disease, in fact, being in most instances due to tuberculosis of the adrenals; but, as Rénon⁴⁸ states, moreover, all the ductless glands, the thyroid, adrenals, pituitary, etc., are the seat of degenerative changes in tuberculosis. Sabourin⁴⁹ has recently emphasized the frequent concurrence of hyperthyroidism with the latter disease—a sign that it is causing excessive functional activity of the thyroid. Rheumatism is so frequently accompanied by disorders of the thyroid that the connection is now generally recognized. Alcohol is also a common offender; the microphotograph opposite page 1332 in the second volume shows that even the pituitary body may become the seat of fibrous degeneration, which means, in the light of my interpretation of the function of this organ, insufficiency of all the major ductless

⁴⁸ Rénon: La Tribune médicale, July, 1911.

⁴⁹ Sabourin: Archives générales de méd., Jan., 1914.

glands, the circulation of which it governs. These few examples could be multiplied almost indefinitely. They will suffice to show, however, how exposed are these organs to functional deterioration by the very pathogenic factors in forbears to which idiocy in their offspring has been traced.

That so many different morbid conditions should be able to provoke mental deficiency is readily explained by the fact that *any disease capable of injuring the ductless glands sufficiently to inhibit their functional activity, or inherited insufficiency of these organs, impairs the development and functions of the brain, by reducing the supply of secretions this organ requires to carry on these physiological processes.* We shall see in a succeeding chapter that the adrenal secretion circulates in the nerve-cell. This fact, which I pointed out in the first edition of the present work in 1903, was sustained by the experiments of Lichwitz⁵⁰ in 1908. The thyroid secretion being necessary, as we have seen, to co-operate with the adrenal secretion to carry on oxidation, the thymus supplying the nucleins which are oxidized, it follows that deficiency of these glandular products must entail deficient nutrition of the cerebral cells and correspondingly defective mental power.

Under these conditions, a pregnant defective fails to supply her fetus the ductless gland secretions it requires. Why permit this? Why seal the child's fate through inactivity? It is my firm belief that, with what knowledge we have of the ductless glands even at the present time, *we could diminish the chances of such children developing into mental defectives by supplying them, through the intermediary of their defective mothers, and after birth through their food, the secretions they lack to complete their development.*

This opinion is based on the undoubted influence of the various ductless glands upon every phase of the process of reproduction. This is so well known that I will submit but a fraction of the testimony available to that effect. As stated by Telford Smith: "The thyroid gland of the mother increases during pregnancy and remains enlarged during lactation, showing," adds this author, "that it is connected with foetal development."

⁵⁰ Lichwitz: Arch. f. exper. Pathol. u. Pharm., Bd. 58, Hft. 3 u. 4, S. 221, 1908.

The adrenals are also known to be enlarged and overactive. Neu, moreover, found that the proportion of adrenalin in the blood corresponded quantitatively with the activity of the gestative process, including the period of pregnancy. As to the pituitary, it was found to be overactive during pregnancy by Comte Launois and Mulon and others. Swale Vincent states, in fact, that it may enlarge to two or three times its normal size. That the thymus is concerned with the development of the offspring both during uterine life and after birth needs hardly to be emphasized. We now know that its influence bears mainly upon the osseous and cerebrospinal systems.

As to the effects on the offspring of defective ductless glands in the parents, they may be illustrated by the statement of Hertoghe that "where the mother, for instance, has at her disposal a sufficient store of thyroid secretion the child does well, whereas if there is thyroid insufficiency, especially if there is a history of inherited disease, alcoholism, etc., the child will probably be a myxedematous cretin. . . . Should the maternal taint be slight, the child will be merely backward." That the deficiency of thyroid of a defective mother of the type referred to by Hertoghe influences her offspring is well shown by a case of Mosse's,⁵¹ in which a goitrous, feeble-minded mother gave birth to a puny, goitrous infant. The child being breast-fed, thyroid gland was administered to the mother, with considerable benefit to her, but with early disappearance of the goiter in the child, whose health, moreover, became excellent. This was evidently due to the action of the thyroid gland acting through her milk, for Bramwell⁵² observed a case in which hyperthyroidism was caused in an infant by administering thyroid gland to its mother, who nursed it. Everyone knows, moreover, that both thyroid gland and pituitary markedly activate lactation.

On the whole, the intimate relationship between the ductless glands and everything that concerns reproduction, the great relative size of these organs in the product of conception, and the teachings of practical experience in organotherapy, all tend to indicate that *whenever the father or mother is a mental*

⁵¹ Mosse: Bulletin de l'Acad. de Méd. de Paris, April 12, 1898.

⁵² Bramwell: London Lancet, p. 692, 1898.

defective or one or both parents show any sign of deficient activity of one or more ductless glands, or whose history includes syphilis, epilepsy, tuberculosis, or chronic alcoholism, organo-therapy should be instituted as soon as pregnancy is recognized.

PROPHYLACTIC TREATMENT.—To determine the course to follow, the stigmata of deficiency of each of the major ductless glands should be ascertained. In most cases the signs of deficiency of one of the glands predominate, and, such being the case, the use of that gland therapeutically as dominant constituent of the combination employed will procure the better results. These signs have been given in the foregoing articles of this chapter (see pages 279, 288, 300, 302, and 308), to which the reader is referred. If the myxedematous type prevail, thyroid gland should be the dominant constituent; if the Mongolian, the thymus, etc., the other organic products being given with it to provide for the developmental equipoise of the fetus, deficiency of one gland entailing deficient activity of the others. As we have seen also, all the ductless glands may be organically diseased or deficient in the parent, in tuberculosis for instance; in such a case the stigmata of several glands may appear, though not prominently. For the diagnosis and treatment of such cases, the general lines advocated for backward children (see page 311) will serve, the doses being increased to those suited for an adult. Additional hints are given at the end of the present article.

The pregnant mother having been carefully treated organo-therapeutically according to the stigmata she presents, the infant will be supplied *in utero* with the secretions required to build up, not only its nervous elements, but also its osseous, muscular, cardiovascular, cutaneous and other systems. It will also be prepared to develop normally after birth, provided the treatment be continued. This may be done, as previously stated, either through the maternal milk or, if the infant be fed artificially, by adding the organic agents to its milk. Besides protecting the child, organo-therapy protects the mother against renal disorders, eclampsia, etc., by increasing the antitoxic power of the blood and thus preventing the accumulation of toxic wastes which cause these disorders.

The continuation of prophylactic treatment through the maternal milk after birth will do more than approximately

restore the developmental balances, physical and psychic, of the child; it will serve to protect it against disease. Indeed, the milk of a normal woman does more than feed her suckling; it is now known to protect the infant against infection by means of ferments which correspond in their physicochemical properties with those of the ductless glands. In a mentally defective woman, however, the probability (shown by autopsies) that one or more glands may be defective gives her milk a doubtful character; hence the need of continuing the use of organic products. Cows' milk contains all the defensive ferments referred to, but, unless it can be administered absolutely fresh, its protective properties disappear, the milk then becoming an excellent culture medium for pathogenic organisms. Cows' or goats' milk fed to the infant immediately after being drawn from the udder, and not Pasteurized—since this measure destroys some of the ferments—will alone sustain the effects of the treatment begun *in utero*. Even under these conditions, however, the use of organic products with the milk is advisable, the tendency of all children thus treated being to recede unless this is done, at least until their own ductless glands acquire sufficient power to carry on their functions normally. The results in these little patients, especially when, as is the case in most instances, the predominant stigmata are of thyroid origin, are sometimes surprising.

Another feature which the teachings of clinical experience have emphasized is that the younger the child the greater are the chances of restoring its psychic functions, if these have failed to develop. After the first few years of life, some improvement is obtained from organo-therapy, but this is far from being ideal. This indicates plainly that *the development of all infants should be closely watched by the family physician, particularly if the family history is tainted, the physical and mental growth being compared with that required by normal standards. Any departure from the latter should be the signal for a careful examination of the organs of special sense of the child, the manner in which it is fed, etc., and if its condition cannot be accounted for through these factors and removed, organo-therapy should be instituted.*

The thousands of purely functional defectives which the

country contains are, as we have seen, judging from personal cases, the children of parents in whom, in most instances, clearly defined stigmata cannot be discerned. This means that any infant may become a defective unless its development be closely watched by the attending physician. At the present time, the evil trend is discovered too late to save the child's mind. Were every infant closely watched from birth, and its development, physical and mental, compared with that of a normal child (standard tables being available in most works on pediatrics), timely treatment could be instituted and a large proportion of them redeemed. In addition to the use of organic products indicated by the stigmata discovered, the special senses should be cultivated, external impressions being all important factors in psychic development. It should be remembered also that disorders of the eyes, ears, nose, and nasopharynx may be the underlying cause of defective mental development in infants.

All this bears only, of course, upon the defectives clearly traceable to inherited taints, all types of idiocy up to and including the backward child of our schools being meant. As in insanity in general, two great classes of idiocy are recognized: the organic, in which traumatism, hemorrhage, gummata, etc., have caused more or less localized lesions of brain-tissue and compromised psychic functions; and the functional, in which no organic lesions are present to account for the mental defect. It is in this functional type that heredity finds its greatest field. Unfortunately, as is well known, a large proportion of idiots show, *post mortem*, lesions of the brain such as sclerosis, atrophy, softening, etc., which no longer are cultivable soils. Yet, distinct improvement is often obtainable even in such cases. This is because the degenerated areas are seldom bilateral and the corresponding areas on the opposite side of the brain can thus be made, through improved nutrition and oxidation, to compensate to a remarkable extent, sometimes, for the shortcomings of the functionless areas. Even these areas are sometimes subject to improvement, Cattani, Klebs and others having shown that regeneration occurs occasionally when the lesions are comparatively slight and of recent formation.

Organic lesions of the ductless glands of the infant may also complicate the situation. Both these and the brain lesions

may be caused by an accumulation of toxic wastes during the pregnancy—the same intermediate wastes which cause nephritis and puerperal convulsions. The intense vascular tension awakened gives rise to hemorrhagic foci in the brain and ductless glands, with resulting impairment of the organ of mind. This emphasizes anew the commanding importance of the advice of obstetricians to watch the kidneys closely during pregnancy. The most frequent sources of lesions of the ductless glands, however, are the diseases of childhood. It is only a few years since some textbooks of practice condemned precautions to avoid measles on the plea that the sooner it was over the better for the child! But we know today how pernicious was such advice. Not a small proportion of the cases of idiocy we meet date from some children's disease during which hemorrhage into the ductless glands compromised their functional integrity sufficiently to arrest cerebral development.

Here again, however, pessimism as to results is not warranted if the child is seen early enough. A characteristic feature of the ductless glands is their tendency to hypertrophy when the normal glandular tissue left after local lesions is sufficient to carry on their functions. Thus, one-eleventh of the adrenals suffices to insure this and one-fifth of the thyroid, also, provided the parathyroids are unharmed. If, however, what remains of the ductless glands of the child is not sufficient to sustain adequately general nutrition and brain development, organotherapy will serve to compensate for the glandular deficiency. We recognize these cases by the fact that they soon recede, after distinct improvement, as soon as the remedy is stopped and resume progress when the treatment is restored. But perseverance will elicit the fact that smaller doses will meet the needs of the cases after a time—evidence to the effect that the ductless glands themselves are increasingly meeting the demands of the organism. If the little patient is young enough, the time may come when no treatment will be required.

Of the organic agents indicated in these cases, my preference has been so far for the desiccated gland in powder form. Experience has shown that, where simplicity prevails in the use of these agents, the patients tend better to persist in their use. Again, powdered glands of a different kind can be conveniently

combined and given to adults in capsules or mixed with the milk given to infants, unless they are breast-fed, when the gland is administered to the mother, her milk, we have seen, transferring the remedy to the suckling. In some instances, the unpleasant taste given to the milk causes the child to refuse it. Then a fluid preparation may be given when such is available.

In cases of maternal hypothyroidism, 1 grain of desiccated thyroid gland may be given three times a day, during meals. Mental defectives require somewhat larger doses. For infants the dose must, of course, vary with the age of the little patient; $\frac{1}{12}$ grain is a suitable dose for an infant 1 month old; this may be increased by the same quantity for each month; a 2-month-old infant being given $\frac{1}{6}$ grain, etc. As a rule, a year-old baby stands 1 grain daily without trouble. Adrenal gland may be given to adults in whom adrenal stigmata are present, in 2-grain doses, gradually increased to 5 grains unless constipation follow its use. Pituitary gland powder, 2 grains three times daily, is more efficacious. For the infants of such subjects pituitrin—a liquid extract of the infundibular portion of the pituitary—in drop doses in the milk to begin with, and increased as required, is more effective than any preparation of the adrenals. Thymus gland may be given in from 5- to 15-grain doses to the mother and 1-grain doses to the infant, gradually increased to the point of tolerance. This organic product is not always reliable and it is sometimes necessary to use the "neck sweetbread" of butchers instead. The compound syrup of hypophosphites is helpful when given with thymus gland. Often, a combination of these agents will doubtless hasten improvement. All cases in which organotherapy is resorted to must be watched closely to obviate untoward effects. The dosage must be adjusted to each case, susceptibilities to organic agents, and notably thyroid, varying considerably.

DEVELOPMENT OF THE SENSES.—Reference has been made to the importance of the senses, most of which are developed at birth, in the psychic development of the infant. When any of them show distinct evidence of lagging behind, measures, some of which are submitted, should be taken to favor their development.

Hearing.—Even in the infant, the auditory apparatus and the word-hearing center which constitute the main cerebral

mechanism of language are highly receptive. We have, therefore, in the apparently meaningless terms of endearment and praise, the prattle of other children, the cradle songs, and other forms of music, especially instrumental music, frequently repeated simple words, particularly if connected with some craving which the child's instinct will inspire, such as that for food, including the breast or bottle, etc., as many sources of stimulation which co-operate efficiently with the organotherapeutic measures adopted. With patience and perseverance and much repetition—virtues extolled in this class of cases by the late Edouard Séguin—unexpected results are sometimes attained.

Vision.—A careful examination by an ophthalmologist having shown that no organic disease of the visual apparatus exists to account for the apparent blindness, or defective vision, and appropriate medication having been instituted, resort should be had to out-of-door life, and to various glittering objects to excite the retina and through it the visual apparatus,—first, as the vision is weakened by bandages over the eyes or the dark rooms, so can it be stimulated by daylight. The baby coach is of great aid in this connection, its hood serving to shade the eyes, without interfering with the entrance of the surrounding bright light through the retina. The retinal muscles and those of accommodation and motion are also stimulated out-of-doors through the many factors, distance, variegated coloring, moving objects, etc., which a nursery does not supply. A glittering call-bell, several bright teaspoons tied together in such a way as to cause them to jingle when shaken, a shining baby rattle, etc., will enlist the help of the sense of hearing, and afford the mother a clue to the progress made as regards directed vision. The distressing vagueness so characteristic of these little patients when they attempt to see anything will at first breed discouragement in the attendant, but patience, aided by appropriate treatment—direct or transmaternal—and the steady development of attention and interest ultimately afford reward for patient efforts.

Smell and Taste.—One of the leading features in the recognition of mental deficiency early in a child's life is that where organic lesions do not exist; the nervous system, which normally would be in process of rapid development, responds with greater

activity than later to the influence of remedies, especially organic preparations which actually nourish the nerve-cell and sustain its metabolism. The olfactory and gustatory apparatus thus develop more rapidly than in the older child, in whom the morbid process is more firmly established and therefore more resistant.

Important in this connection is the fact that where any or all the special senses show any marked degree of deficiency, the thymic nucleins should be supplemented by a preparation of phosphorus. Of special value in this connection is the official syrup of hypophosphites, which also contains a small dose of strychnine, $\frac{1}{12}$ -grain to the drachm of syrup.

Cutaneous Sensibility.—The usual means to develop touch—smooth and rough surfaces, buttoning, warm and cold surfaces, etc., used for older children—are useless for infants. These require measures which excite the entire surface. In some mental defectives the temperature sense is so obtunded that a hot object, which normally causes rapid withdrawal of the hand in contact with it, fails even to attract their attention. And yet these same children, who will appear dull, sleepy and torpid in cold weather, will, during warm weather or under the influence of a mild febrile process, become unusually bright and active. Why is this? It is due, from my viewpoint, to a physical phenomenon the far-reaching importance of which I have long urged, viz., that *while ferments carry on metabolism in all tissues, the temperature to which these ferments are subjected in the tissue-cells governs the rate of metabolism in those cells.* Hence, warmth applied to the surface enhances metabolism and, therefore, the vital activities of the entire organism. We therefore have, in hot baths twice daily, or, in heliotherapy, exposing the nude body to solar heat during prolonged periods, as is now successfully done in the treatment of osseous and glandular tuberculosis, potent aids in the treatment of these cases. Indeed, by supplying the infant the glandular substances which carry on its vital functions and simultaneously heat to raise the activity of these functions to their highest potential, we antagonize precisely the slowness of metabolism in all tissues—including the cerebrospinal system—to which the hereditary forms of idiocy and mental backness are due.

CHAPTER VII.

THE ADRENAL SECRETION AND FUNCTIONAL ACTIVITY.

IN the preceding six editions I described (1) the process through which the adrenal secretion (converted in the lungs into adrenoxidase, the oxidizing constituent of the hemoglobin) carried on, from my viewpoint, its functions in various organs, and (2) the manner in which the nervous system governed its distribution. Briefly, I submitted the view that in the skeletal muscles and the lachrymal, salivary, sweat and mammary glands as examples of other organs, the adrenoxidase was the physico-chemical agent through which cellular metabolism was sustained by oxidation, and that there were two phases to this process: the *passive*, during which the organ was inactive owing to the reduced quantity of adrenoxidase supplied to the tissue-cells by the artificial blood; and the *active*, during which a more or less great increase of adrenoxidase reached these cells in a correspondingly greater volume of arterial blood, initiated and sustained functional activity in that same organ.

As to the manner in which the distribution of adrenoxidase was carried on, I submitted the evidence which had led to the conclusion that two kinds of nerves took part in the process: 1, motor or secreto-motor fibers supplied by one of the cranial nerves (the pneumogastric, facial, etc.), the terminals of which caused the arterioles to the organs to dilate and to admit an excess of the oxidizing substance of the blood, adrenoxidase, into their cellular elements, thus initiating active function, *e.g.*, contraction, secretion, etc; 2, constrictor fibers, supplied by the sympathetic, which caused the previously dilated arterioles to contract, when this active function was to cease, thus diminishing the supply of adrenoxidase to the organ. This subject being considered at length in the second volume with explanatory illustrations, the reader is referred to that volume, pages 1115 and 1185.