

CAMPBELL (H. F.)

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in Sterility.

Some of the Requirements of Treatment.

BY

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AUGUSTA, GEORGIA.



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THE INFERTILITY OF WOMEN. THE NERVOUS SYSTEM IN STERILITY.

SOME OF THE REQUIREMENTS OF TREATMENT.

BY HENRY F. CAMPBELL, M.D.,
Augusta, Georgia.

STERILITY in the female is an opprobrium acknowledged by the gynecologist; it is also a calamity which is, perhaps, more often and more acutely felt and grievously lamented by the woman herself, than any other relating to her individual life. "Give me children or I die!" comes wailing down the centuries, and which one of us so fortunate as not to have been made conscious that this distressing cry of Rachel, albeit unuttered, is sadly re-echoed in at least one, and perhaps many of the yearning hearts whose desolation we have been powerless to relieve by the most earnest efforts of our art?

In regard to an abnormal functional condition constantly causing such distress, the amount of which cannot be estimated, any considerations, however remotely tending to its correction or relief, cannot be viewed with indifference by the profession.

It is not the object of the present brief paper to consider at large the causes of sterility either natural or acquired. The bare enumeration of them would occupy more space than would be required in the restricted province to which these remarks are necessarily limited.

The essential, if not the initial fact or occurrence upon which procreation depends, in man as well as in all mammals, and indeed infinitely lower down in the descending

scale, is the contact of germ-cells of the female with the sperm-cells of the male. For the accomplishment of this, and for the development, nutrition, and prosperous growth of the combined result of such a union, all adjustments mechanical, histological, and functional are made—all their physiological intents and purposes tend to the maturing and fulfilling of the contemplated object—the propagation of the race.

The briefest summary of our knowledge concerning the unproductiveness of women would comprise a classification of certain essential conditions of the female organs of generation, which have been found as the frequent concomitants of sterility. One of the first results of such a generalization is the division of these defects into the causes of natural and acquired sterility. While such a classification is necessarily loose and incomprehensive, neither division exclusively appropriating any one of the conditions, as in the one case, the cause of natural, and in the other, of acquired barrenness—for many of these conditions are often present in both classes of cases. For our present purpose, however, no greater exactness is requisite, and therefore in our preliminary remarks I will refer indifferently to the conditions of the organs which constitute most commonly the barriers to reproductiveness in the female.

SOME OF THE ORGANIC CONDITIONS USUALLY RECOGNIZED AS CAUSING STERILITY.

Besides the many and various conditions of the organs, either natural or acquired, which obstruct procreation, as defective or absent vulva or uterus; of absent or diseased ovaries or impervious Fallopian tubes; or conditions the result of previous inflammatory states, or inflammatory states still existing, there are certain others to which infertility in the female is more frequently attributed and which come more fully and pertinently within the field to which I have thought best to limit the present discussion. J. Marion Sims,¹ who has given per-

¹ Uterine Surgery.

haps more recent and fuller attention to this subject, and that which to us at present is the most available record of statistics on this matter, has tabulated these conditions, both morbid and teratological in their relations to sterility, and I cannot do better before entering upon the discussion, than to present some of his more striking, though familiar, results.

It may, perhaps, be hoped that any effort to study the nature and origin of obstructing conditions so frequently met, and withal so forlorn, cannot but be regarded with a certain degree of interest by this Society.

As an introduction to the statistical enumeration of the abnormalities recorded by Dr. Sims, I will quote his ideal, though not claiming to be strictly anatomical, of the normal uterus. "We are told by anatomists that the uterus is pear-shaped and flattened antero-posteriorly, that it is from two and a half to three inches long, an inch and a half wide, more or less, at its largest part, and about an inch thick; that it is divided into fundus, body, and cervix; that its cavity is from two and a quarter to two and a half inches long; the canal of the cervix being a little longer than that of the body; that the os tinæ is generally round in the nulliparous uterus, elliptical and transverse after childbearing; and that the cervix is rounded and embraced by the vagina, which is inserted higher behind than before, thus making the posterior intra-vaginal portion of the cervix a little longer than the anterior."

"But," he continues, "anatomists do not tell us how far the intra-vaginal portion of the cervix should project into the vagina, or what proportion it should bear to the supra-vaginal section, which, by the by, is an important matter to determine. He further assumes that a normal os tinæ whether round or transverse and elliptical, should be opened and filled with a slippery translucent mucus of slightly alkaline reaction; that the cervix should be rounded, truncated, and elastic to the touch; that the intra-vaginal portion should be about one-fifth, or not more than a fourth of its whole length—*i.e.*, from a quarter to the third of an inch anteriorly, and a fraction more

posteriorly; that the canal of the cervix should be straight or curved slightly forward; and that the axis of the whole organ should stand at about right angles with that of the vagina, being neither anteverted nor retroverted to any great degree. Any woman with such a state of the uterus will always conceive in three or four months after marriage, *if everything else is right.*"¹

DEFECTS AND PERVERSIONS OF THE UTERINE DEVELOPMENT.

Of two hundred and eighteen cases of sterility the neck of the uterus was straight, conical and elongated, in one hundred and sixteen, or more than half; it was flexed in seventy-one; of these nineteen were supra-vaginal curvatures complicated with some deviation of the fundus from a normal position. The flexure was associated with a conoid form in fifty-two cases, in some of which there were also malpositions of the body. The cervix was straight, conical, and indurated in four; straight, conical, indurated, and elongated in one hundred and nine; straight, conical, elongated, and not indurated in seven; granular and conical in three cases.

The author's record is one which, while it exhibits the vast preponderance of these *abnormities* and defects of development as offering hindrance to the accomplishment of reproduction, the real intent and purpose of the generative organs, also demonstrates, in a most discouraging way, the extreme paucity of good results following amputation and other surgical measures, heretofore depended principally upon and practised by modern and more remote practitioners; for it appears to us that Dr. Sims, though recognizing more fully than others, these defects of development, as beyond all comparison the cause of sterility, and advocating amputation, incision of the canal, and excision of one or other lip of the uterus, has reported but comparatively few successes in secur-

¹ Italics are mine.—H. F. C.

ing the establishment of the function in cases especially of natural sterility.

Inspired with confidence by the perhaps somewhat questionable reports of Lisfranc, by those of Huguer, of Mackintosh, and of Sir James Y. Simpson, and most of all by the enthusiasm and appealing logic of our own Marion Sims, I had hoped at an earlier stage of my consideration of the question, that to remove the obvious mechanical barriers, as excessive length of cervix, or flexed cervix, or contracted cervical canal, or any other condition apparently competent to obstruct the contact of, or access of, sperm-cells to germ-cells, was to secure conception and to give progeny and happiness to desolate women, but longer experience and many disappointments have forced upon me the unwelcome conviction, and many present will agree with me, that to amputate the elongated or conical neck, or to excise an occluding lip, whether anterior or posterior, or to straighten the flexed cervix, or to correct anterior or posterior deviation, or again to enlarge the constricted canal, whether by bilateral incision or by sponge tents, bougies, or by rapid dilatation with forceps, did not any of them, always—indeed, very rarely—secure the object for which the treatment had often even most confidently been made. What one present, however long his experience, and however distinguished for brilliant success in other departments of gynecology, who will not acknowledge that in such cases of sterility, his experience has been mine, and further, that his disappointments, after the removal of all mechanical barriers have nearly approached to mine, both in their frequency and perplexing inscrutability?

And further, which one of us has not, at least sometimes, after such disappointing results, paused to consider, and been brought seriously to question the proposition that mechanical obstructions in the genital canal, though competent of themselves to prevent conception, may not be, even when they have existed, the only cause which has operated to produce the barrenness, but that some less obvious underlying influ-

ence, or some not sufficiently considered and duly accounted condition—congenital or acquired—which in a large proportion of these pathological or teratological abnormalities of the generative organs, have coincidentally operated to produce the sterile condition and to continue barrenness, even after the more obvious and more easily recognized mechanical obstructions have been cleared away? May we not suspect that possibly some such occult or unrecognized influence, which now continues the sterility, may have been the original cause of the abnormalities themselves?

Of course, in the brief space here allowed, in so obscure and extensive a field, little more can be done than to point out lines of investigation, which are most hopeful and likely to reach results leading, at least, logically to correct conclusions on the subject.

Though in the treatment of sterility by the ordinary and accepted methods, predicated on the ordinary and accepted etiology of the condition, my own results have, perhaps, been as satisfactory as those of most of my fellow-practitioners, it is not to report these successes, or to advocate the advantages of any one modification of such methods over the others that this paper is presented, but rather to enunciate for myself and for others, if you will allow, dissatisfaction with the paucity of good results at present obtained, and to ask that some new direction may be given to the study of the causes of sterility, which may possibly result in some happy modifications of our present methods of treatment.

Having brought the question, perhaps somewhat tediously, to the present point of consideration, and finding that the removal of mechanical barriers, and even the improvement of histological and structural conditions most lamentably fail in yielding the desired results, we may now ask, In what other line of investigation we may yet hope to solve the problem of infertility and to suggest methods for its correction?

THE ROLE OF THE NERVOUS SYSTEM IN ATROPHIC STERILITY.

From a long and patient consideration of many of my own cases, and also from a careful study of the reported experience of others, I am led to the following postulates :

First, as it is universally admitted that all the vital processes of the organism whether simple or complex, as sensation and motion, circulation, secretion, nutrition, and trophic development, depend for their due performance on the normal and perfect action of the nervous system, which in each one controls these activities ; so likewise must the reproductive organs of the female be dependent upon a proper innervation for their organic perfection, and for the proper performance of their functional activities.

Secondly, that defective or abnormal innervation is the prime cause of the defects of ovarian and uterine development which constitute the most frequent barriers to conception in cases of natural or atrophic sterility.

And thirdly, that the same deficient and abnormal innervation still continuing, perpetuates the sterility and renders normal uterine and ovarian action impossible, even after these obstructive barriers have been mechanically removed.

In the careful examination and study of the above three postulates, we may expect to find that imperfect development and defective activities of the nervous element of the reproductive organs constitute a most important factor in sterility.

MENSTRUATION WITHOUT OVARIES.

It will hardly be unfamiliar to the Fellows of this Society, to find me discussing nervous instrumentalities and their influential rôle in the economy of the uterine system.

At the Eighth Annual Meeting of this Society in Philadelphia, September, 1883, I read the synopsis of a paper, the title of which was "Menstruation after Extirpation of the

Ovaries." Though no record of this *résumé* is to be found in the proceedings as published in the volume of *Transactions* for that year, a pretty full rehearsal of both my own remarks and of the discussion which followed them, will be found recorded by the reporters of many of the journals of that year, and more particularly in the *Journal of Obstetrics and Diseases of Women and Children*, October, 1883, vol. xvi. page 1038; and also the *New York Medical Record*, vol. xxiv. No. 13, September 29, 1883. The object of this paper, as will be seen by referring to the above records, was to show that though the ovaries may be recognized as the ordinary medium through which menstruation is normally excited, we must still look to the nervous centres of the spinal cord and the ganglionic centres of the hypogastric plexus, and to the ganglia in the structure of the uterus itself, and to nerves distributed to it from the cord and from the plexus, as the real exciters and controllers of the function of menstruation; and further, that menstruation was found to return periodically with a true or *quasi nisus* and flow after removal of the ovaries. After the same manner and under the same centric influences as that, sensations are felt in the amputated limb, even for years after the removal of the part in which the sensation is experienced. In the latter case, it is the centric endowment manifesting sensation in the phantom of the lost limb, exhibiting itself often painfully, in toes, and instep, and ankle, and all other parts to the consciousness of the subject; while in the former, on account of the special endowments of the ganglionic element controlling the bloodvessels and nutritive activities of the uterus—the manifestation was one of congestion, change of tissue, and a continuance of the periodic blood-flow even though the ovaries, the ordinary medium for the transmission of their excitation, had been removed. The vaso-motor reflexes of the uterus as excited in the mammary gland and in the ovaries, and even in the parotid gland, were illustrated by cases fully presented at the time, in two of which menstruation was awakened in early childhood, and in another sterility

seemed to be overcome by awakening the uterine activities through the establishment of lactation in an infertile woman. I was much pleased to find that in the last volume of the *Transactions*, in a paper entitled the "Infantile Uterus," Dr. A.W. Johnson has adopted the same line of reasoning and attributed the continuance of menstruation after extirpation of the ovaries to certain influences acting through nervous filaments distributed to the uterus.

THE NERVOUS SYSTEM IN THE ANIMAL ECONOMY.

Reference to the foregoing discussion has been made more rather as an introduction to the study of the nervous system in its relations to our subject, than as an actual illustration of the principles we hope to evolve. Such illustrations and analogies are best and more forcibly presented when taken from organs, in which its controlling influence is more obvious and familiar.

The high controlling influence of the nervous system in all organic processes of the animal economy is universally admitted, and though it has been claimed that particular acts of nutrition and of secretion are completed with a certain degree of self-government in the organic cell, still many facts prove that even here it is questionable whether these instrumentalities are not also dependent for their normal and efficient action in the maintenance of the histological structure and for the part they take in secretory processes to the direct or remote influence of the nervous system.

All functional activities and organic processes whether simple or complex, are performed with regularity and exactness so long as the nervous centre originating, and the tubular cord conducting the required influence, remain normal and intact.

The ordinary phenomena of sensation and of motion; the more complex innervation of the organs of the senses, alike depend on the normality of their form and structure, and the

due performance of their functions upon the integrity of the apparatus controlling their nutrition and conducting their activities.

Experimental research, accidental injury, and the results observed under morbid processes, have rendered the eye, more perhaps than any other organ of the body, a valuable subject for illustration and comparison with the results of defective, aberrated, or perverted innervation, such as may be applied to the abnormalities of the reproductive system. Like the assemblage of organs set apart for propagation of the race, it is devoted to a special object: it is complex in its organization like this system, but answers our purpose more particularly on account of its complexity of both structure and function being controlled by a nervous apparatus, which like that of the reproductive system is composite and complete within itself.

Alter, by experiment, disease, or accident, any portion of the nervous apparatus of the eye, and the result is in exact accord with the functional intent of the nerve so injured.

Section or disease, whether centric or tubular, of the optic nerve, will produce amaurosis, while the structures and circulation and nutrition of the eye will remain intact, and the clearness and transparency of the cornea will be preserved.

Sever or paralyze the inner branch of the motor oculi, or the abducent or sixth pair, and you have divergent or convergent strabismus, which, let me remark here, may be regarded as analogues of some anteflexions and retroflexions¹ among the distortions of the uterus—paresis of the posterior muscular wall giving rise to the first, and of the anterior to the second. But it is when we come to consider the effect of experimental, morbid, or traumatic impressions made upon the ganglionic or vaso-motor supply of the eye upon its circulation, secretion, and nutrition, that we find the aptest and most plausible ground for stating that uterine and ovarian

¹ See Fredrick Eklund: Stockholm. Stem in uterine flexions.

nutrition and development, both organic and functional may fail when deprived of, or curtailed in their neuro-dynamic influence.

As far back as the days of Pourfour du Petit (1732) and of Dupuy, and later by Magendie, Alcock, and others, experimental research has been made on the effect of injuries on the sphenomaxillary or Meckel's ganglion on the circulation, secretion, and nutrition of the eye, and it was found that in accord with the amount of injury to the vaso-motor or nutrient ganglion the eye became congested and bloodshot, the cornea opaque and dry and necrosed, so that disintegration and destruction of the organ were the result of interfering with its nutritive supply by injury to the ganglionic centre.

Thus it will be seen that the eye with its endowments of special sense, common sensation, muscular control, and its admirable philosophical apparatus for reflection and refraction, was indispensably furnished with an apparatus in the form of ganglia placed conveniently near for the control of its circulation and nutrition, the disturbance of which, or failure in the energy of which, invariably interferes with its structural normality and compromises its functional intent. What we here recognize in regard to the nervous control of the nutrition of the eye, when compared with the same functional activities pertaining to the uterus and other organs of the reproductive system, is but a miniature likeness representing a colossal statue.

THE NERVOUS APPARATUS OF THE REPRODUCTIVE SYSTEM.

Before entering upon any discussion of the nervous system and its deficient or aberrant action as a factor in the infertility of women, it is desirable that we have before us some comprehensive outline of its anatomical arrangement, and to present the vast amount of nerve force and the kind of neuro-dynamic energy required for the fulfilment of the demands

made upon it in the performance of its most complex and entirely unique function, as found indispensable to the continuance of the race. Besides other anatomists and observers antedating them, Robert Lee, Frankhäuser, and Courty give us good anatomical descriptions of this portion² of the nervous system. From this last author I found it most convenient to quote: "The nerves of the uterus and ovaries, according to Frankhäuser, arise directly and indirectly from the cœliac through the intervention of the renal plexus, which through its inferior ganglion is distributed to the ovaries and spermatic ganglia. The aortic plexus by its upper part (superior mesenteric plexus) supplies these spermatic ganglia, which would be more correctly designated genital ganglia. These ganglia, four in number, receive two large branches from the great sympathetic, and give off a great number of nerves to the ovaries. Below the origin of the inferior mesenteric artery is the great uterine plexus (lumbo-aortic), which descends to one centimetre from the division of the aorta, and is formed of the principal branches of the genital ganglia with the addition of small branches proceeding from the four lumbar ganglia of the great sympathetic. On the promontory it is divided into hypogastric plexuses, which are joined by branches from the terminal ganglia of the sympathetic, and are situated behind the rectum, on the inner side of the pelvic vessels, and are distributed to the lateral borders of the cervix uteri. Each hypogastric plexus measures from seven to ten centimetres, and in its course supplies branches to the meso-rectum, to the mesentery of the sigmoid flexure, and to the ureter. There is a large cervical ganglion on each side of the neck, easily discovered in the newly born, even without preparation, but covered in adults by the pelvic fascia and superimposed nerves. It extends downward as far as the folds of Douglas, and measures in the empty uterus about two centimetres in length and one in breadth, and during pregnancy five centi-

¹ The Uterus, Ovaries, and Fallopian Tubes, by A. Courty, 3d edition, p. 37.

metres in length and two or three in breadth. The greater number of the uterine nerves arise from these two ganglia, the rest coming directly from the hypogastric plexus. The cervico-uterine ganglia receive their afferent branches not only from the hypogastric plexuses, but also from the second, third, and fourth sacral pairs. They supply branches, not only to the uterus, but also to the vagina, bladder, and rectum. Besides these principal ganglia, there are on each side two small ones for the urethra and bladder, the latter sending some branches to the anterior surface of the uterus. The nervous branches from the cervico-uterine ganglia enter the cervix horizontally; passing upward they pierce the inferior portion of the body obliquely, whilst above, along the borders of the uterus, they run almost vertically, uniting with each other in the thickness of the anterior and posterior walls; they also anastomose with the ovarian nerves. The ramifications of the uterine nerves may be traced as far as the mucous membrane in the neck, but this cannot be done in the case of the body. Frankhäuser has found motor fibres in the uterine plexus, but he has not been able to discover sensory fibres. It seems impossible to distinguish the filaments arising from the cerebro-spinal and ganglionic systems."

From a consideration of the above rehearsal of the anatomy of the reproductive nervous system, it will be recognized that there is a vast predominance of the ganglia and plexuses of the nutritive or vaso-motor system over the cerebro-spinal element, though it is well known, as carefully pointed out by Tyler Smith and others, that sensori-motor nerves play a prominent part in some of the important activities of the uterus.

Even were we not already familiar with the functional complexities peculiar to the reproductive organs, a simple examination of its nervous supply and a consideration of the *kind* of nerve force appropriated, we would easily predicate that the organs so furnished would be endowed with great fluctuations of vascularity, with vast powers of nutrition and of trophic development.

UTERINE AND OVARIAN DEVELOPMENT AND THEIR
FUTURE FUNCTIONAL ACTIVITIES DEPENDENT
UPON THE GANGLIONIC SYSTEM.

What, then, are some of the important processes confided to, and what are the demands made upon this complex, multiplied, and powerful apparatus of neuro-dynamic energy? The first and by far the most important demand made upon it beyond the ordinary processes of nutrition is at the age ordinarily of, from eleven to sixteen years of the female—when its energy is taxed for the development of the organs of reproduction. It will be acknowledged that this is by far the most important work of this complicated assemblage of ganglia and plexuses, which, in the words of Bichat, “is to preside over and superintend the thousand secret operations of a living being,” for now, the convoluted and anteflexed rudimentary uterus is to be developed into the ideal and well-proportioned organ of nidation heretofore described (Sims), and the granular nodules foreshadowing the ovaries are to be perfected into the true organs of ovulation to furnish fertilizable germ-cells during the future life of the woman. Any failure in full response to this demand, or any diversion or misdirection given to the nerve force ordained for the purpose, will end in failure of development; the ovaries cannot furnish proper Graafian vesicles; the Fallopian tubes may be imperforate and the uterus stunted and flexed, with conical, projecting, or dwarfed cervix, with constricted or imperforate canal—the whole condemning the future woman to barrenness for life; no ovulation, no menstruation, conception and gestation hardly to be hoped for.

NERVOUS CONTROL OF THE NORMAL FUNCTIONS OF THE
REPRODUCTIVE ORGANS.

The nervous system in the normally developed reproductive organs does not so immediately concern the objects of the

present paper. Under its government the periodical returns of ovulation and of menstruation are regularly and normally conducted, and to interruptions in this nervous supply, doubtless, many of the disturbances of these functions, and through them infertility itself, are often to be attributed.

But the most complex, and, we may say, the most gigantic exhibition of neuro-dynamic energy, is seen in gestation, in the development of the uterine structures from a weight of one ounce and a half to four or five pounds, its trophic power in the government of vascularity, in the development of tissues, cellular, muscular, fibrous, and mucous, to prepare it for nidation, for the nutriment and growth of the fœtus; its enormous muscular power, as exhibited in parturition, and lastly, its miraculous return to almost its original weight by involution, whereby it is restored to its original conditions, both organic and functional, find no parallel in the exercise of, and marvellous capability of, nerve-force anywhere throughout the entire animal economy.

ETIOLOGICAL CONSIDERATIONS.

If in the foregoing presentation it has been shown that the development of the reproductive organs of the female at puberty is dependent upon the nutrient and trophic energy exercised by the ganglionic system at this important period, and further, that any failure or diversion of this energy is calculated to result in the various forms of stunted development recognized everywhere as the most frequent concomitants, if not causes, of sterility, it becomes an object of very high importance to inquire into the influences and causes which seem more obviously calculated to produce such interruption of the requisite nerve force.

CONDITIONS OF LIFE.

It is an observation perhaps too trite and familiar to bear extended comment, that in wild or savage and uncivilized

states, women enjoy the same immunity from sexual diseases and disturbances in the functions of the reproductive organs, and from difficulties in their parturition, somewhat as do the lower animals.

It is known that the Indians of North America exact of their women nearly, or all, of the work necessary for the cultivation of the field, carrying wood, or other burthens, while the men are occupied in the hunting grounds, and in more worthy warlike pursuits. It is said they seldom suffer from sexual derangement, and even in advanced gestation keep up with the trail on long marches, and when taken in labor detain the march but little, or not at all. They seek some stream, if near, and without assistance are delivered, and return with the infant to take up the march with the band :

"So easily she yields her bosom's load,
You'd almost think she found it in the road."

This may be regarded as an attractive romance adjusted to the popular belief in whatever is marvellous; but even the popular traditions of the common people have each a modicum of truth in them, which is, at least, significant of, though not to be accounted as a demonstration of the facts in question.¹

LIFE ON THE SOUTHERN PLANTATIONS.

My own observation of the effect upon female health of an open air and active physical life comprehended that which may be considered the best ordered and most humane period of American slavery, viz. : that which covered the period of about twenty years preceding the war between the States. Regular and not undue work was required of the women; they were protected by sufficient clothing, and their food was abundant and nutritious, care for their moral and religious

¹ Interesting information on the subject of parturition among savage nations—which is only incidentally related to our theme—may be found in the valuable work of George J. Engelmann, M.D., of St. Louis: *Labor among Primitive Peoples.* J. H. Chambers & Co., 1883, St. Louis.

conditions was not forgotten, churches were provided on each plantation, and marriages were encouraged among them. Physicians were employed to attend them, and in every way an enlightened view of both the interest and the duty of the masters secured to them whatever was necessary for their physical health, comfort, and well-being.

From my own personal observation, and from frequent interchange of experience with medical men engaged in attendance upon patients of this class, the almost entire immunity from sexual diseases among the women, freedom from menstrual disturbances and other uterine derangements, has been with me a carefully recorded history pertaining to the earlier days of my professional life.

In a private infirmary for the treatment of negroes, both men and women, established in 1850, by my brother, the late Dr. Robert Campbell and myself, during the eleven years to 1861, of its active operation, we received for treatment a considerable number of women from plantations in Georgia and other Southern States, who were the subjects of sexual diseases, but it is remarkable (by notes found upon the record book of the hospital) that seldom was a field-hand or out-door laborer the subject of these diseases, or of accidents supervening upon labor. Our patients came usually from the class more favored, as the housemaids, the seamstresses, or the nurses, whose lives and mode of in-door occupation differed but little from those of the mistress and daughters of the household. Such domestics, it can be remembered, were selected from the females of the plantation in early childhood, taken into the household, carefully raised, often petted, and seldom allowed to leave the house, or to associate with, or lead the life of the other children of the plantation.

CHILDBEARING ON THE PLANTATIONS.

The fertility, prosperous pregnancy, and natural and easy parturition everywhere observed in women subjected to

active life and out-door toil were exemplified in my observation of the women on the Southern plantations. Their work in the field, either with the hoe or with the plough, was generally continued to within a few days, and often up to the very day or hour of labor, without compulsion on the part of the owner or remonstrance from herself. Except in difficult cases, and they were extremely rare, a physician was never present at the labor. Each large plantation had its midwife or "granny," to whose care all cases of labor were confided, and who was often sent for to be present at the labor of women on neighboring plantations, and not infrequently officiated at the birth of children in the master's family, when from motives of primitive modesty she was preferred to a male accoucheur. The amount of obstetric knowledge and skill possessed by these grannies was *nil*, which was fully sufficient for all the duty required of them, and the duty was always best performed when they did *nothing*. Unlike the custom which seemed prevalent among the Indians, where no time was given the woman as a recognized period for rest after labor, by established custom the negro women on the plantation were allowed a full month for what was called her "confinement," and though she was generally up in a few days, attending to the wants of her children and other duties of her cabin, the full month of privilege was claimed, and she scarcely ever returned to work in the field for even the lightest duty, till after the time had expired.

The number of children in these families was quite remarkable; some of them numbering twelve, thirteen, and even eighteen and twenty children conceived and born under the circumstances herein related.

In what striking contrast do we find this vigorous fertility in lower and unintellectual grades of humanity when we consider them in comparison with the women of the higher classes, the educated, cultivated, and refined. Each marriage is a lottery in which the birth of even the first child is too often an unexpected prize.

Though the rationale of the process through which such perfection of organic development and of functional activity have been attained in the rude nomadic life of the Indian woman, and the less exposed and more systematized, but not less laborious living of the negro women of the southern plantations—cannot perhaps be satisfactorily elucidated, still it is impossible to evade the conclusion, first, that such modes of living are intimately and etiologically connected with this organic and functional perfection of these women; and secondly, that any mode of life which would contravene, or in any way deprive the woman of the beneficial influence so secured, should be expected to arrest or stunt the development and aberrate the functional activities of the reproductive organs. At the present we will be content to suggest that the influence in either case, whether favorable or adverse, is profoundly operative through the trophic or developmental function of the ganglionic system.

THE HIGHER GRADES OF SOCIAL LIFE, EDUCATION, DRESS, AND SOCIETY.

Much that is valuable has been written, but now become too familiar, perhaps, to be heeded, on the adverse influence of many of the customs of society upon the present and future health, especially of adolescent females subjected to them. To these customs or habits, or, as they may be called, "innocent vices," it is scarcely pertinent to do more than to refer in a general way, that while they may serve to embellish and beautify, and perhaps make attractive in a certain way the subjects of their influence, they are most of them calculated to arrest sexual development and to degrade, if not nullify, the fertility of the future woman.

MODERN SYSTEM OF FEMALE EDUCATION.

The most unfortunate requirement by which female education is conditioned, as related to the interest we are discussing,

is the particular period of life during which it is necessarily most actively conducted. From the age of eleven or twelve to that of fifteen or sixteen years is ordinarily the time appropriated to the higher branches of education. The child exchanges her elementary school and simpler studies for the seminary or the female college where, in the curriculum, we may find algebra, geometry, physics, political economy, intellectual and moral philosophy, logic, rhetoric, often Greek and Latin, and one or more of the modern languages, besides music, and drawing, and painting. It will not be claimed that any one girl is expected to undertake this formidable array of difficult, and many of them, abstruse studies. They are, however, set before her, as most desirable attainments, and each one, or several, or all of them are within her reach, and the sure reward of untiring and devoted study. Her ambition is excited, a spirit of emulation is engendered, diplomas, medals, and honorable prizes add their quickening influences to stimulate her flagging energies, and thus they hold on their career, brilliant and profound to the end of the exciting and all-absorbing course.

Our female seminaries and colleges are undoubtedly most successful in producing women of the highest intellectual type, in producing women fitted for the companions and counsellors of the most brilliant and profound men;—successful in producing women who are ornaments of our social system, and women who, with kindlier and gentler intuitions than those of men, reinforced by superior intellectual culture, will, in time, influence for good our national counsels; but as opposed to all these desirable results, let us examine into some of the probable disadvantages attending the modern system of female education. May it not have perverted their destiny and lessened their chances of maternity? I have just said that the most unfortunate requirement of female education is the time at which it is most actively to be conducted. It will be remembered that this term from eleven to sixteen years is the period of sexual development and of the perfecting of the

organs of reproduction ; not only are the organs themselves to be developed and perfected, but the nervous apparatus, the producer of the nervous energy which is to develop these organs, and which is to supply the force to originate and to preside over their functional activities during the entire child-bearing life of the future woman, is itself expected to undergo such evolution and development as will fit it to be the neurodynamic machine for carrying on all the complex and recondite operations and changes that can alone be accomplished by the exercise of the nerve force it is to furnish.

WHEN TROPHIC NERVOUS INFLUENCE IS INTERRUPTED
OR DIVERTED AT PUBERTY, DEVELOPMENT MUST
BE ARRESTED AND FUNCTIONAL ACTIVITY
PREVENTED.

In the ovaries and uterus of the infant and the child, ovulation and menstruation and fecundity are but potential endowments, which under favorable influences at a certain period of the life of the individual are to become real. Until the period of pubescence, the attributes of the hypogastric plexus are but those required to preside over the ordinary nutrition of the organs they supply ; the inherent endowment peculiar to them, by which they are to develop the generative organs and conduct their complex activities during the life of the woman, is but potential, and only to become real, it appears to me, under favorable conditions and proper influences at that particular period of the girl's life known as the age of puberty. Should they fail or be interrupted in their own development, *from any cause whatever*, the organs they are to develop fail also ; the functions they are to conduct and preside over never come into activity. Ovulation will be sparse and feeble, menstruation scant and irregular, or may never appear, while fecundity, conception, and nidation are never to be expected. Such is the *rationale* and this the realization of natural, or, what I ever prefer to call it, atrophic sterility.

THE YEARS OF PUBESCENCE PASSED WITHOUT AND WITH INTELLECTUAL LABOR COMPARED.

But few words are necessary to develop the significance of this portion of our etiological discussion. It has been seen that in the rearing of women under the wild, or savage, or half-civilized conditions of Indian life, and also under the more systematized, active, and laborious out-door life of women on the southern plantations, in both of which modes of life the years of pubescence or sexual development were passed in bodily activity and without mental strain; the reproductive organs are naturally and promptly developed, their functions normally performed, gestation prosperous, parturition easy, and offspring numerous. May we not legitimately conclude that conditions so entirely opposite and adverse as those in which the adolescent female of the better class must pass the period naturally allotted to sexual development, may be considered a potent factor in the arrest of ovarian and uterine development, by diverting the vital forces from the sexual organs, at the very time that their exercise is most needed, and concentrating these energies in the brain for the development and culture of the mental faculties. Without statistical record, demonstration will be impossible, but when such record shall have been made, the infantile uterus and atrophic sterility will be found, I think, more frequently among those women who have been subjected to severe and laborious intellectual labor during the period of pubescence, than in those of any other class. Unless active out-door exercise and diversion become recognized and important elements in the institutions for female education, the pupils will be liable to feeble sexual development, the alumni irregular and disturbed in their uterine and ovarian functions, and the prize girl will fulfil the destiny of a childless woman, while the ever-chided and irrepressible Tom-boy, will be like the famous character of the nursery rhyme, who had "so many children she didn't know what to do."

THE PERNICIOUS INFLUENCE OF FEMALE ATTIRE ON
THE ORGANS OF REPRODUCTION.

Much that is overstrained and exaggerated, and yet much that is true and worthy of attention has been recorded in works of physiology and hygiene on the effect of female attire in contracting the thorax and obstructing normal respiration, in interfering with the digestive and nutritive processes, laying the foundation of tuberculosis and other forms of wasting disease. There is no doubt in regard to the influence of such compression upon the organs of the pelvis and the close impaction of these organs, especially in the earlier periods of life. Those who may have escaped permanent atrophy of the sexual organs from such causes as above described, and in whom the development was but *delayed*, are often irreclaimably condemned to sterility by this unnatural impaction of the pelvic organs. The uterus, an organ naturally enjoying freedom of motion and mobility in every direction with no interference with the conditions of either its blood supply or with its innervation, is borne down and compressed in the lower plane of the pelvis by the superincumbent mass of viscera, its original ante-curvature converted into anteflexion, the cervical canal constricted, and the entire organ stunted and displaced. In the philosophy of dress, Moore, the poet, seems to have known well how to contrast the good with the bad.

Lesbia wears a robe of gold,
But all so close the nymph hath laced it,
Not a charm of Beauty's mould
Presumes to stay where nature placed it!
Oh! my Nora's gown for me,
That floats as wild as mountain breezes,
Leaving every beauty free
To sink or swell, as Nature pleases!

.

Nature's dress
Is loveliness—
The dress *you* wear, my Nora Creina.

ACQUIRED STERILITY.

It had been my intention to present as a part of the general discussion of the infertility of women, certain considerations growing out of my own experience on the subject of what has been generally recognized under the name of acquired sterility; but the length of the paper, and we may say the entire divergence of the considerations relating to atrophic or natural sterility from those that would be required in that more varied and less obstinate class of cases, would seem incongruous, to appear under the same general head. While the treatment required may sometimes be the same in the one class as in the other, in their etiological relations they are as widely different as can possibly be imagined. Except in cases of super-involution, atrophic sterility has but one, and its constant cause and origin, viz.: arrest or failure of development at the age of puberty, on account of interrupted or deficient innervation, while to state the causes and conditions giving rise to acquired sterility, would be to enumerate and to trace to their origin almost all the morbid conditions, both structural and functional, of the entire generative system, and its treatment would be simply a recountal of measures and procedures everywhere practised for correction of those various affections.

CONSIDERATIONS OF TREATMENT OF ATROPHIC STERILITY.

In the foregoing discussion of the infertility of women, I have presented atrophic sterility resulting from whatever conditions of the uterus, whether from conical, pointed, stunted, flexed, contracted, or imperforate cervix, or from inadequate body of the uterus itself, or again, from unproductive ovaries, or from imperforate Fallopian tubes, the result of conditions, originating from and being continued by inadequate activity of the ganglionic nervous supply to the generative organs. Such conditions having such an etiology, will at once be admitted, as experience has realized, as not encouraging to

favorable results of treatment. Surgical and mechanical means, as amputation of the elongated cervix, discission, dilatation with tents, bougies, or the forceps in these atrophic forms of sterility, while they should be retained as important and perhaps indispensable parts of the management, cannot alone secure, as their frequent failures have realized, conception and pregnancy in an organ both structurally and functionally incompetent for nidation and gestation, by its undeveloped and paretic condition. The mere fertilization of the germ in a cavity so unfitted for engraftment and nidation, cannot be expected to supply all the requirements that have to be met in the well-developed and normally acting uterus. What then are the additional indications of treatment, and what the measures by which they are to be met?

The first, most important, and perhaps the only rational indication for treatment, however difficult of attainment, is to secure the full development of the uterus and other reproductive organs, which has been so long retarded. *Secondly*, as subsidiary, but indispensable to the carrying out of the major indication, is that which points to the awakening of the neurodynamic energies of the ganglionic plexuses upon which such development, as well as their functional activities, depends. Such are the two primary and fundamental indications inseparably related to each other, which the foregoing examination of the subject has led us to believe should be added to the present mechanical methods, and which should never be lost sight of, as beacon guides in the management of atrophic, or, in this relation, which I will call atonic, sterility. It may be naturally, and I may say reasonably, perhaps more doubtfully asked, especially by those who have thought most profoundly on the subject of the atrophic utero-ovarian system, by what means do you propose to accomplish so forlorn an object as that of initiating and perfecting organic and functional development in a uterus and ovaries which have lost their opportunity of development at puberty, and that have remained infantile and inactive perhaps for years?

Though this paper has been presented, as stated in the beginning, more as an illustration of the present unsatisfactory results of the surgical and mechanical methods now depended upon in the treatment of atrophic sterility, and to suggest new methods of study, hoping to evoke more efficient methods of treatment, rather than to report successes in my own experience, I can, however, point to a limited number of facts and results relating to the subject, which add a hopeful encouragement to efforts at treatment, such as indicated by these studies.

SUPERINVOLUTION.

Atrophic conditions of the uterus do not always occur as the result of arrested development at puberty; for instance, the progressive atrophy of advanced age and superinvolution from causes connected with prolonged or difficult parturition. It is said, also, sometimes to occur after the operation of trachelorrhaphy—in this case the progressive atrophy is most probably due to injury of the two cervical ganglia, placed laterally on either side of the cervix, and upon which the uterus depends largely for the conduct of its nutrition;¹ these being injured or destroyed, either at the time of the laceration, or during the paring and suturing of the operation for repair. Superinvolution of the uterus is sometimes caused by over-distention of the organ during pregnancy, by amniotic dropsy as illustrated in a case presented by myself, during the discussions of this condition before this Society in 1883, the woman bearing children regularly up to time of the occurrence, but remained infertile ever afterward, on account of the superinvolution supervening upon the dropsical distention.²

The opportunity for treatment in the case referred to above was not afforded, and probably the injury done to the nervous and muscular structures of the organ, by the extreme disten-

¹ Robert Lee.

² See Transactions, 1883, vol. viii. page 80.

tion, was such as to preclude the hope of restoration to fertility by any method of therapeutic effort. But the atony and atrophy which constitute superinvolution, do not always supervene upon injuries of gestation or of parturition, so serious as not to be amenable to restorative treatment, and sometimes of the most simple and even not very energetic kind : Dr. Joseph Eve Allen, formerly assistant to the chair of Obstetrics and Diseases of Women and Children, in the medical department of the University of Georgia, kindly furnishes the notes of three cases of superinvolution after severe labor. In each one of these cases, the atrophy of both neck and body of the uterus was marked, though previously regular and natural in menstruation and each one, the mother of children previous to the injury, became regular, the uterus recovered its normal size and condition, and childbearing was resumed, after protracted amenorrhœa and infertility—one for over three years.

The treatment in these cases consisted in the frequent application of bougies and probing of the uterus, combined with tonic remedies as iron, quinine, and strychnine, and nutritious food and regular exercise in the open air.

NULLIPAROUS STERILITY, INDEPENDENT OF ATROPHIC CONDITIONS.

There is a class of nulliparous women which I must not omit to refer to in this connection. They cannot be said to be cases of acquired sterility, nor, again, can they be placed with those who represent the class of atrophic cases—married for years ; they have borne no children nor have they ever conceived. Often ovulation is sparse and menstruation scant, irregular, and painful, or sometimes entirely absent. On examination the uterus appears to be of normal proportions and often free from inflammatory conditions or structural change ; yet from the period of puberty or perhaps shortly after, the uterine

disturbances and irregularities have continued to exist. Emotional or hysterical excitement in greater or less degree is frequently manifested. There is often pain in one or other of the ovarian regions; either before or after the menstrual nisis or flow, as the case may be.

These cases are evidently of neurotic character and origin, and the morbid manifestations are the result of perverted functional activity, rather than such as result from defective organic development. This class of cases is far more amenable to measures of treatment than the atrophic cases to which this discussion has been principally devoted, and from it—were we making such a report—most of our successes, in the relief of sterility in nulliparous women, would have to be derived.

A good proportion of these patients coming often from paludal regions of Georgia and South Carolina, present complications of malarial and other toxæmic conditions which require attention in addition to the local treatment found necessary to restore healthy functional activities of the reproductive organs. For some time past I have found electrization, both local and general, a valuable adjunct to the treatment of these cases.

ATROPHY OF THE UTERUS DATING FROM PUBERTY.

Mrs. C. G., aged twenty-two years, married two years, without children; menstruation irregular, scant and painful. On examination the uterus was found small and undeveloped, with a minute os and contracted canal; a bent uterine probe was with difficulty passed into the cavity, which measured less than two inches from os to fundus. Under careful palpation, the body felt no larger than an ordinary horse-chestnut, flattened and triangular. The mother of the patient told me confidentially that her daughter was very desirous of having offspring and that in her opinion, if she could have one child,

her health would be fully established. To the conditional portion of her remark I fully assented; but told her candidly, that while her general health might be improved by local and constitutional treatment, I did not hope that she would ever conceive or bear a child, as the womb was undeveloped and, indeed, was what is called an infantile uterus. As the patient was pale and anæmic, and had recently lived in a malarial region of the State, I put her upon the following tonic treatment :

R—Vallet's mass	℥ iij.
Quinine	℥ ij.
Arsenious acid	grs. iij.
Solid extract of ergot	℥ j.
Strychnine	gr. j.

Mix and divide into sixty pills.

Sig.—Take one pill three times a day, before meals.

The local treatment consisted in moderate dilatation of the cervical canal with bougies, for the purpose of introducing a uterine electrode.

This was one of the periods, 1872, in which I had returned to the application of electricity as a therapeutic agent. In the then crude and undeveloped condition of the science, pertaining to its therapeutic action, galvanism had acquired some credit for promoting the menstrual flow, and with this view and entirely empirically, I made application of this agent to many cases. In the case of Mrs. G. an instrument known as the galvano-faradic battery, was used twice a week, one sponge electrode being applied sometimes to the lumbar region and sometimes to the pubis, and the other within the uterine canal. These applications and the tonic treatment were continued during three inter-menstrual periods. These menstruations were much more profuse, and attended with little or no pain and in the fourth interval it was considered prudent to withhold the use of the electrode, as menstruation had not appeared. The patient was soon found to have conceived, and was delivered of a healthy child at full term. She has since borne

four children. In my examination afterward to determine the fact of pregnancy, I found the uterus much improved in size and general development, but do not know whether the development had begun previous to conception or not. Indeed, I did not connect such increase at the time, with the effect of treatment in any other way than in the establishment of menstruation and the general improvement of the health of the patient. In the following case furnished by Dr. John S. Coleman, of Augusta, Ga., better opportunity for observation of the effect of the electricity in the development of the uterus was allowed previous to conception: Mrs. X. M. A., Jewess, aged about twenty, married one or two years, was in apparently good general health, except a strong inclination to obesity. She had menstruated irregularly and scantily or not at all. On examination the uterus was found to be infantile and undeveloped. Applications of electricity were made by uterine and sponge electrodes from a galvanic-faradic battery twice a week for several months. The uterus increased in size, the canal became less constricted, menstruation became more abundant, and the function seemed fully restored. This patient became pregnant some months after treatment, and has borne children regularly since that time, 1873.

In the foregoing cases, both those of superinvolution, and those of aborted development at puberty, the recovery of uterine normality of structure and function in the acquired atrophy, and the awakening of development and functional activity in the arrested development of the others, seemed to be occasioned by the stimulating influence of the local treatment, combined with the tonic. M. Courty is quoted as attributing to sponge tents, an influence promoting, in cases of subinvolution, the process of involution, by which, the organ is reduced to its normal proportions; it is highly probable, that in the cases furnished by Dr. Allen, the frequent probing and dilatation with bougies, under the action of the tonics, awakened through the large cervical ganglia, a process of *evolution*, which restored the growth and functional activities of the

superinvolted uterus. The mechanical stimulation of these powerful nerve centres by the bougies, and the sponge tents, is doubtless a potent factor in awakening trophic action in the tissues of the uterus, every part of which is supplied by filaments sent from these ganglia.

In a considerable number of the cases of sterility in women who have borne children, and in whom neither dilatation nor straightening is required, I apply the uterine *stem* and allow it to remain during the night with the distinct object of awakening the functional activities of the uterus by the prolonged mechanical stimulation through those intrinsic nerve centres located in the cervix. The beneficial result of this device has been marked in several such cases. My own soft-rubber spring stem pessary is the form most used by me for this purpose. In a woman sterile after ten years of marriage, now advanced in pregnancy, the stem used as a stimulator after dilatation appears to have been influential in promoting the present fortunate result. I must add here, that in one delicate and nervous woman reflex nausea and vomiting without any local pain were occasioned after three or four hours' presence of the stem. This promptly ceased after the withdrawal of the irritant.

ELECTRICITY IN UTERINE ATONY AND ATROPHY DATING FROM PUBERTY.

It will not be overlooked that the use of electricity in the two cases above reported, the application of which appeared to be so quickly responded to, by awakened activity, both organic and functional, was after a method far inferior to the more advanced, systematized, and thoroughly controlled methods governing the application of this powerful and widely available therapeutic agent, as applied by myself and others at the present day. If with instruments comparatively primitive, by empirical application, we have found electricity

competent to secure what seemed to be such satisfactory results, how much more may we hope to accomplish by the systematic and enlightened therapeutics of this agent as perfected by Remak, Apostoli, Tripier, Mundé, and Engelmann, when guided by the definite principles in regard to the nervous instrumentalities concerned in atrophic sterility, such as we have earnestly endeavored to establish by the foregoing investigation?

