An Address ON THE NATURE OF PREGNANCY AND ITS PRACTICAL BEARINGS.

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BY

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It is, perhaps, a somewhat remarkable fact that now, in the second decade of the twentieth century, there should still be so many regions in the domain of pregnancy which call for investigation and exploration. Nothing in the whole circuit of medicine is more certain than this or more capable of immediate proof. It is possible that some observers who have not carefully surveyed the entire field may be moved to enter a protest, saying that whilst they fully and readily recognize the limitations of our knowledge in respect of the diseases of gestation they are persuaded that the physiology of pregnancy is not a matter about which there is or can be much mystery. Surely the embryo simply lies in the maternal tissues, obtains from them its nourishment, grows, and in course of time is born and takes on an independent life. Further, are not textbooks of physiology silent regarding any special problems of pregnancy? Is that not sufficient evidence that there are no such special problems?

An answer to these questions is not hard to find; it comes as soon as the attempt is made to study and to explain any of the morbid states of pregnancy. Every one of the diseases of childbearing is made difficult of elucidation by the lack of a satisfactory explanation of the intimate nature of pregnancy and of the phenomena which are associated with the presence of a living embryo or fetus in the uterus. The pathological facts do not fit with any simple theory of gestation, and the silence of the physiological textbooks, it may be suspected, is not one of complete knowledge but rather of partial ignorance, or at least of that curious mental state which is able to look past problems without seeing them. It is only necessary to name one or two of the many problems of pregnancy to establish the correctness of this statement. What relation does the intractable vomiting of pregnancy bear to the so-called normal morning sickness of the expectant mother, and what is the cause and the mechanism of the production of the latter? Or, to instance another constant and apparently commonplace change in the physiology of the woman with child, What is the meaning of the pigmentary changes in her skin, and have they any bearing upon the activity or inactivity of the suprarenal glands at these times in her life? The whole subject of pregnancy, normal as well as pathological, literally abounds in problems as difficult as, or more difficult than, these; and some of them are not only unsolved, they have not even been submitted to the influence of solvents.

It may, therefore, be not unprofitable to take a general survey of the whole field of pregnancy; at least let us essay such a survey, without, of course, hoping to penetrate each nook and cranny with our gaze. There is, unfortunately, no belvedere from which a commanding view can be had, for each observer can only look at the cases which have come within his ken, and it is safe to say that no two instances of pregnancy, normal as well as morbid, are identical. Even if each one of us augments his own experience by that of others as revealed in books, in medical journals, and at professional gatherings, he is still regarding but a small part of what is to be learnt. The heart complications of pregnancy are cases in point. I have seen many such; no two have been quite similar either in symptomatology or in progress, and I feel sure that the next one will differ from all the others and will call for details of management such as none of the others received. So, too, with eclampsia; the differences between individual cases in this disease are more fundamental than can be expressed in terms of relative severity of symptoms; treatment, therefore, should, in all probability, be varied more than is the custom. A much rarer disease

is chorea gravidarum; few doctors see as many as half a dozen or a dozen cases; each one is a clinical study by itself. The need, then, for the close study of pregnancy in all its aspects is great.

PREGNANCY REGARDED AS PARASITISM.

A very common way of looking at utero-gestation is to think of the unborn infant making certain demands upon the mother, and of the latter supplying these. Thus, the embryo or the fetus requires shelter, protection, warmth, nourishment, and a way of escape for its effete products; and all these the mother is able to give by means of the uterus, which serves as a nest, and is rendered safe from external injury by the pelvic bones, and through the placenta, where the bloods of the two beings come into intimate relations without actually mixing together. It may not be put in so many words, but this is regarding the unborn infant as a parasite; and those who hold this opinion, whilst they do not refuse to the fetus some slight degree of individuality, really class him with the intestinal worms—those free guests which, in popular parlance, suck the blood of their host. He is thought of as living in, and drawing his supplies from, his mother; he always asking, and she always giving, with great advantage to himself, but with constant loss and danger to her until after his birth, when, indeed, she thinks no more of these things, but rejoices in the possession of a baby, and goes on still giving through her milk for his nourishment. This view, whether it be right or wrong in its outlook, has certainly directed the attention of the profession, as of the public, too exclusively to one aspect of pregnancy—to that side of it which reveals the mother sacrificing herself for her unborn child; and it is little wonder if some women in these days should rebel against the convention which requires them patiently to spend the greatest part of their married life in such self-immolation at the shrine of posterity and for the sake of a birth-rate which persists in falling. The influence of this view, too, is seen in the way in which the life of the unborn infant is spoken of both within and outside of the medical profession. An expectant mother is suffering, it may be, from some ailment; if it be a slight illness the comments are limited to remarks upon the unfortunate fact that her recovery will be retarded by the fact that she is carrying a child, whilst if it be a serious malady there is an open call for the termination of her gestation so that she may be relieved from its intolerable burden and set free to fight more strongly for her life. It is my opinion that one hears more of this sort of thing now than formerly; in consulting practice I seem to be familiar with such remarks as "Save my wife, doctor; never mind about the child that she is expecting"; "Cannot we end the pregnancy, and so lighten the heavy handicap she is under?" "She would have a better chance if the baby were brought away, would she not?" If the fetus be nothing but a parasite, and a prejudicial one, too, there would seem to be less moral obliquity in feticide; we might even venture to call it justifiable feticide.

THE PATHOLOGICAL THEORY OF PREGNANCY.

Some observers, however, go further, and say that pregnancy is not merely a period of giving without getting on the part of the mother; it is a nine months' disease from which she is suffering. She is not simply weak during these months, she is really ill; she is more than a valetudinarian, she is an actual patient; she has passed from physiology over into pathology. There is something, too, to be said in support of this view, which originated perhaps in the somewhat bitter gibe that a woman only escapes being unwell once a month by being ill for nine months, and therefore the matter must be looked into a little closely. Even a superficial survey shows that there is evidence in support of this startling statement. One has only to remind oneself of the morning sickness of pregnancy, of the various sympathetic phenomena—the neuralgias, dietetic idiosyncrasies, psychical changes—of the varicosities, the blood changes, etc., to see at once that, if this state is really physiological, it wears something very like the livery of pathology. But there is more than this. Modern science has been investigating the blood reactions of the pregnant condition with much care during these past months, and, whilst it is perfectly true that obstetrics may receive from such

researches the gift of a certain blood test for the early detection of gestation, there may also come from them the proof that the carrying of a child in the womb must be classed with the diseases which develop immunity reactions. Work such as that so ably summarized recently by Dr. Leith Murray¹ cannot be easily put on one side, and the evidence must be heard; but in the meantime the investigations are so complicated, the details are so technical, and the true conclusions are so difficult of extraction that final judgement must at least be suspended. Even if it be proved that in some respects pregnancy is an instance of reaction to an antigen, it does not necessarily follow that from all points of view it is to be grouped with diseases.

PREGNANCY AS HARMONIOUS SYMBIOSIS.

There is another and a very different view of the nature of pregnancy—that specially advanced and elaborated by Professor Bar. Remembering that it is a state in which two living beings are existing together in association the Parisian teacher has examined the alternative to parasitism—to wit, symbiosis or commensalism. More than this, he has found and has furnished a large body of scientific evidence in favour of the view. According to this theory of pregnancy, mother and unborn infant are mutually serviceable or helpful; the child in the womb is not a parasite and the mother a host at whose expense he lives; he is still to be regarded as her guest, a nine months' visitor, let us say, or, better yet, a paying guest, not a free guest, and still less a detrimental. He receives much from his mother—shelter, warmth, food, energy—but he does not receive without also giving; his presence in her womb so reacts upon her organs and tissues that they are stimulated, and, to take but one instance, the food she takes, not necessarily in increased quantity, is better utilized and is made more of than when she is non-pregnant. He demands nourishment from her, but he at the same time gives her the power of yielding that nourishment without weakening her own vitality or lessening her capital fund of albumin, carbohydrates, minerals, and the like. Professor Bar has arrived at this conclusion from careful researches on the metabolism of the maternal organism in pregnancy and from a great number of analyses of the urine and blood, etc., and it must be admitted that he presents a good case, so to say, for his great generalization that if there be a healthy fetus in a healthy mother (*fetus sanus in matre sana*), then pregnancy must be regarded as a perfect, a unique, and a very wonderful instance of homogeneous harmonious symbiosis.²

It is homogeneous, because the commensalism is between beings of the same species, for it must be borne in mind that symbiosis, as it is met with in nature—for example, between the lichen and the fungus or between the hermit crab and the anemone—is between creatures of very different kinds. In this case it is an association of two beings of the very same kind; both are human, indeed one may go further and say that they are nearer than two animals of the same species, for the child is bone of the bone and flesh of the flesh of the mother. There is, therefore, every justification for the use of the word "homogeneous." At the same time it must not be claimed that they are identical, for in the act of impregnation there has been introduced a new series of influences which come from the male parent and complicate the process of reproduction. The child *in utero* is an ovum of the mother, advancing through a wonderful procession of events towards a fully-developed human being; but he is more than this, he is truly an ovum of the mother, but with a dash of the father in him, and so he (or she) can never be simply a replica of the mother. Impregnation has, so to say, introduced the unknown quantity into the new being, and has brought qualities which are foreign to the maternal tissues into the embryo and fetus. Of course, there are also traces of earlier ancestors, too, but it is unnecessary to introduce any complications. There is, then, great similarity between the two associated beings, mother and unborn child, but there is not sameness or identity. The word "homogeneous" expresses this relationship very well.

But the symbiosis, says Bar, is also harmonious. That is to say, there is a congruity in the association of mother and unborn infant; they are so adapted and related to

each other as to produce an orderly and consistent result—to wit, a healthy child in a healthy mother. Harmonious, from its etymology, means jointed together or agreeing, and in this particular case we are to think of the action and reaction between mother and fetus as in full agreement; there is an interlocking of the two lives which is for the benefit of both. From this thesis one passes to the grand conclusion that for the healthy mother carrying one or even two healthy children, and supplied with sufficient nourishment, the time of pregnancy is not a period of sacrifice but may even be one of gain. At the same time Bar lays stress, and rightly, on the ease with which this harmony may be turned into discord, this profitable partnership converted into a prejudicial parasitism. Especially in the first half of pregnancy there is a danger of the harmony breaking into dissonance, but the risk extends into the second half; and truly there is no harmonious symbiosis in, say, a gestation complicated by hyperemesis, by chorea, or by eclampsia. This admission, however, need not weaken the general conclusion that pregnancy under normal circumstances is to be regarded as an advantageous symbiosis rather than as a state of detrimental parasitism; for the equilibrium in commensalism is a very delicate and unstable one, and on small provocation the symbiote may degenerate into a parasite, the paying guest may fall behind in his weekly contributions. If the one partner do more than his fair and fixed share or the other do less, symbiosis has at once broken down and parasitism taken its place.

So there are three theories of the nature of pregnancy for the profession to choose from. There is the view that the unborn infant lives upon his mother as parasite upon host; there is that according to which he constitutes a disease with which she is afflicted, which, after all, is simply the parasitic theory stated in a more subtle fashion, the fetus playing the part of the countless microbes of an infectious malady and setting all the maternal protective organs at work to offer resistance and develop an immunity; and there is the (to me) more welcome hypothesis that mother and unborn infant are not antagonistic in this great matter of reproduction, but are working together for the benefit of both, the mother putting forth energy and giving nourishment, but her child so acting upon her as to enable her to do so without exhaustion or loss. In the first theory there is no thought of anything but what the unborn infant is able to draw from the mother; but, in the second and third, consideration is given to what the fetus is able to effect upon the mother, either in the direction of developing immunity reactions in her or in that of activating her tissues and organs to greater vitality.

THE MATERNAL RESPONSE IN PREGNANCY.

Now a great deal depends upon the view that is taken of the nature of what I have called the maternal response in pregnancy—that is to say, of the reaction of the mother's organs and tissues to the action or stimulus of the new organism in the womb. The maternal response is part of the means by which the obstetrician diagnoses the existence of pregnancy, for it finds expression in some of the signs and symptoms of gestation. But the phenomena of this response may be divided into two kinds—those which are the mechanical or physical effects of the distension of the uterus acting upon that organ itself or upon the structures in its neighbourhood (abdominal wall, intestine, liver, bladder, etc.), and those which are the chemical or bio-chemical changes induced by the presence of the new life inside the womb. There is little difficulty in understanding the former, but the latter present problems of great complexity which are far from solution.

Let us take, for instance, the mammary changes of pregnancy. Some of these are mechanical, and are due to the stretching of the skin caused by the increase in the gland tissue; but others, such as the pigmentation of the areola, the appearance of Montgomery's follicles, and the secretion of milk (colostrum), are bio-chemical. It is common vaguely to call them sympathetic, but it would puzzle most of us to define what is meant by that term. It has been suggested that in the ovary, and precisely in the corpus luteum of that organ, a hormone or messenger substance is produced which is carried to the breasts and sets up certain changes in them resulting in the formation of colostrum. To my mind it is more

likely that some substance from the unborn infant passes over into the maternal blood and stimulates the activities of the milk-producing glands; but the most recent view at the present time is that the mother's pituitary gland supplies the hormone which excites the secretion of milk (Schäfer), although, even if this be so, it may still be something from the fetus, or from the fetal part of the placenta, which, passing over into the maternal tissues, sets up unwonted activity in her pituitary gland.

The maternal response shows itself in many other ways and in many other organs. I have said (in another address) that the expectant mother tingles to her very finger-tips with the new life which is in her, and microscopic examinations of the nails in pregnancy show that the statement is no figure of speech, but sober and demonstrable fact. In the skin also there are deposits of pigment, especially in certain parts of the body, the sebaceous and sudoriparous glands are more active, and the hair, particularly the down, in some cases at least, grows more quickly. Sometimes the maternal response is so excessive as to become pathological, as in the women who suffer in their pregnancies from pruritus and herpes. Morning sickness is, in pregnancy at least, a mysterious phenomenon; but it is probably due to some bio-chemical change set up by the presence of the embryo in the uterus. A like origin is probably to be sought for the vagaries of appetite in gestation, and for pica and longings. The nervous system thrills in its various parts; the sense organs are normally more sensitive in the pregnant woman, and they may become abnormally hyper-sensitive and lead to disease; mentally, too, the expectant mother is not quite her natural self, for she is either exalted with a sort of *joie de vivre* or depressed with *ennui* or occasionally with forebodings of disaster. Even the cranial bones, far distant as they are from the centre of new life in the womb, feel its influence and react strangely in the formation of little osteophytes or bony outcrops from the inner table of the skull. We know also that the so-called ductless glands and endocrinous organs are profoundly affected by pregnancy; even the ancients were acquainted with the enlargement of the thyroid, but it has recently been discovered that the suprarenals, the pituitary body, the parathyroids, the ovaries, and even the mucous membrane (decidual membranes) of the uterus, are all influenced by gestation, and functionate then in a manner which differs from that seen at other times of life. If they act too much or if they act too little, pathological states may arise, and some observers look to these ductless glands for the explanation, perchance also for the means of cure, of eclampsia and several other maladies of pregnancy which are dreaded greatly for their lethal effects. But it is well to bear in mind that the interrelations of the endocrinous organs in the non-pregnant state have yet to be elucidated, and it is therefore perhaps premature to speculate regarding their behaviour in pregnancy. Of course one wonders if the altered activities of the suprarenal glands have anything to do with the pigmentary changes in the woman carrying a child; but one has as yet no warrant to do more than wonder.

It is upon the chemical changes to be discovered in the urine in pregnancy that Professor Bar has founded his fascinating hypothesis of childbearing as a harmonious symbiosis, and certainly this part of the maternal response is exceedingly interesting. To take only one element in the urine, the nitrogen, it has been found that the output of this constituent of the urine (in the form of urea) is diminished in the second half of gestation when the mother is kept on a constant diet, and that the diminution is proportionate to the development of the unborn infant. Further, it has been discovered that on a mixed diet the faecal nitrogen, as it is called, is lessened in pregnancy, indicating that more of the albuminous food which the woman takes is being utilized for the building up of tissue. Taking these two facts in conjunction, it seems certain that the protein or albuminous constituents of the food, the tissue-builders in the woman's diet, are being more fully assimilated in pregnancy than at other times. Bar thinks that on this account the expectant mother is, in normal circumstances, a little better off, *quâ* her stores of nitrogen, at the end of each pregnancy than she was at the beginning; she has suffered no loss, but has actually made a small addition to her nitrogenous capital. Similar conclusions have been reached regarding other materials

which go to build up the child's body, which must be derived from the mother's metabolic activities and transmitted by the path of the placenta, and calcium, iron, phosphorus, and sulphur may be named.

It will, however, in all probability be found that upon the blood changes of pregnancy the true theory of the nature of childbearing must rest. By these blood changes I do not mean such simple and obvious alterations as can be seen in increase in white or diminution in red corpuscles, or even in quantitative variations in the iron, albumin, or salts of the circulating fluid. I refer rather to the more subtle states which underlie the development of antibodies in response to chorionic or placental antigens, the variations in surface tension as revealed by the stalagmometer (known as the meiostagmin test), the increased antitryptic power of the serum, and the appearance in the blood of ferments or enzymes capable of breaking up placental albumin into peptone and amino-acids. There is no denying the fact that the existence of these reactions in the blood of the pregnant woman, if it can be proved to the satisfaction of the bacteriologist and the clinician, does support the view that gestation has an effect upon the mother resembling that of an infectious fever and even of malignant disease.

PREGNANCY AS PHYSIOLOGY AT HIGH PRESSURE.

The opinion I have formed of pregnancy has more affinity with that of Professor Bar than with those which regard the changes of gestation as immunity reactions; but I question whether the theory of harmonious symbiosis does not go too far in maintaining the beneficent effect of the reproductive processes on the female, and does not fall short in its estimate of the ease with which the symbiosis is transformed into a state of prejudicial parasitism. I have looked upon pregnancy as physiology and not as pathology, as health and not as disease; but I have never forgotten that it is health under conditions of strain, that it is physiology working under high pressure, and that it therefore runs the risks which are inseparable from states of strain and high pressure of all sorts. If in the great majority of cases it remains a condition of health, yet in not a few pathology is almost reached, and in a small number the border line of disease is actually crossed. Pregnancy may perhaps be called the Marathon race of the reproductive life of a woman; and on that account it ought to excite our interest, hold our attention, and receive our constant care, for everyone knows that the runner in such a race is undergoing a tremendous strain and test of endurance.

If I am asked to define the nature of pregnancy more accurately I should be inclined to compare it to the process of digestion. When a meal of food is introduced into the stomach there is set in action a complicated biochemical machinery, the details of which are far from being completely worked out; but part of this reaction seems to be the development of chemical messengers (hormones) which pass to such organs as the glands of the stomach, the liver, the pancreas, and the intestines, and determine their activity, or, to use the technical term, "activate" them. In abnormal circumstances, however, the food may act as a poison on the individual, or the digestive organs may refuse to work, and indigestion will ensue, which is, of course, a disease. Similarly, it may be supposed that the unborn infant and its membranes and placenta send messenger substances to the mother's organs (as well as to its own), which excite in them activities which are not met with in them apart from pregnancy, activities which constitute the maternal response; but it may send under unusual circumstances poisons or toxins instead of hormones, or the maternal tissues may be incapable of responding, and then a morbid gestation will result.

CHILDBEARING AND LIFE INSURANCE.

It may, however, be asked, and the question is perfectly justifiable, whether the discussion of the nature of pregnancy is of any practical value, or is likely to lead to any tangible results. I say in reply, Certainly it is, and instances may be given. There is, to begin with, this eminently practical conclusion, that when a woman has stood the strain of three or four pregnancies and gone through them without a breakdown or failure of any sort she may be regarded as possessed of a thoroughly sound body in each and all its parts, for, as has been proved,

pregnancy is a severe and searching test of the structural integrity and functional fitness of every organ and tissue. I for one should have little hesitation in recommending such a woman for acceptance by any insurance office. I am ready to go a little further and to say that until a healthy woman has passed through the strain and stress of a pregnancy she has not developed her frame to its highest or brought out all the latent possibilities of her nature; this is true of the body, and it is equally true of the mind, for Herbert Spencer in his *Study of Sociology*, said "parenthood produces a mental exaltation not otherwise producible." It will be objected that to receive this gain and to advance to this wider and higher level in life the mother must run risks, must take her chance of the maladies of pregnancy and the dangers of the delivery, and must practise self-sacrifice and accept some loss of personal comfort. To this it can be replied that no great thing in life is ever to be achieved without taking risks, that there is no real gain without some suffering, and that grand ends justify high-spirited enterprises. It will be a bad day for this country when the passion of adventure cools down, whether that adventure be in the realm of childbearing, of parenthood, of business, of politics, of medicine, of sport, or of religion. "What we adventure in a cock-boat," said Sir Thomas Browne, "may return in a carrack unto us." Of course, if it can be shown that pregnancy is of the nature of a disease, far more if it can be classed among the deadly diseases, it will be necessary to revise our opinions; in the meantime that necessity is not upon us.

A BIOLOGICAL BLOOD TEST FOR PREGNANCY.

In the second place, this practical benefit flows from, or may flow from, the investigation of the bio-chemical reactions of pregnancy—namely, a biological or blood test of the gravid state. Scientific medicine has been for several years trembling on the brink, so to say, of the discovery of a certain bio-chemical test of pregnancy; which should be available in the early months when no other certain sign is to be had. Time after time hopes have been raised that from a precipitin reaction, or a diffusion reaction, or a complement-fixation reaction, the long-looked-for chemical test for gestation was forthcoming, but further research has generally first weakened and then dissipated the most confident expectations. Lately, however, Abderhalden, by means both of a polarimetric and of a dialytic reaction, seems to have put the biological test of pregnancy on a surer basis than it has ever occupied before. I have elsewhere³ summarized and criticised the recent literature on the Abderhalden test, and what I state here is the briefest sketch of what is really a very large and a very complicated problem in metabolism.

Greatly abbreviated and shorn of most of its technicalities the Abderhalden test and its *rationale* are as follow: It is known that if species-foreign foodstuffs (materials such as albumin from a different species) are introduced directly into the blood certain intimate changes occur in it, and ultimately the foreign foodstuffs are reduced and converted into materials (*Bau-steine*, or "free-stones," so to say) which can be used in the building up of the tissues. The general belief with regard to this action is that the foreign substances themselves cause ferments to appear in the blood which split them up. The same effect is produced when substances which are native to the body but foreign to the blood are introduced into the latter fluid; they, in technical language, "mobilize" the ferments which in their turn break them up. Abderhalden's test makes use of the action which albumin native to the body of the expectant mother but foreign to her blood stream has, or is believed to have, upon the chemistry of her blood. The foreign substance is thought to be an albumin or protein from the placenta, which makes its way through into the maternal circulation and produces its characteristic effect upon it—that is, causes ferments to appear in it which break up the placental albumin or protein and change it into peptone and amino-acids. On account of their action, the ferments are called proteolytic. If, therefore, these proteolytic ferments are present only in the blood of the pregnant woman, and if they or their products can be easily recognized by any chemical or physical test, then we shall be in possession of a blood test for pregnancy.

Abderhalden claims that these conditions are fulfilled and that we now have such a test. Placental albumin is

very carefully prepared (a laborious and prolonged operation) and placed in a dialyser, and the blood serum of a woman believed or supposed to be pregnant is added to it. If now the ferments characteristic of pregnancy are present in the blood, they will change the albumin into peptone and amino-acids, and these will pass through the membrane of the dialyser into the distilled water in the container outside the dialyser. The rest of the test is simple, and consists in the detection of these substances in the water in the container. Formerly the biuret reaction was used, but fortunately a polysyllabic chemical substance, called "triketohydrindenhydrate"—or, shortly, *ninhydrin*—has been discovered, which gives an easily recognizable colour reaction with peptone and alpha-amino-acids. All that remains to be done, therefore, is to add ninhydrin to the dialysate and to note whether or not the colour change takes place; if it does, the reaction is positive and indicates pregnancy; if it does not, the reaction is negative, and the woman whose blood is being tested is not pregnant. But there is one thing about which uncertainty exists—namely, the possibility that the blood of non-pregnant patients sometimes gives a positive reaction. So far as experience has gone, the blood of some patients suffering from diseases of the generative organs and general maladies, including cancer, has given the positive reaction with ninhydrin; further, in some undoubtedly pregnant women the blood test has been negative. There is, however, one very significant fact to be taken notice of: As care in making the test has been increased and as the attention to every detail in the technique has been made more and more rigorous, so there has been a steady diminution in the number of negative results with pregnancy cases and of positive results with non-pregnant ones. This is very evident in such a series of sets of observations as those made by Jellinghaus and Losee,⁴ and the fact points to the establishment of the reliability of the test.

THE ETIOLOGY OF THE MALADIES OF PREGNANCY.

In the third place, the study of the nature of pregnancy is beginning to throw a flicker of light into that very dark region known as the causation of the diseases of pregnancy; and it may confidently be expected to illuminate it still more as investigations are carried forward with expedition and with increasing enthusiasm. It is unnecessary to do more than name such diseases as eclampsia, intractable vomiting of pregnancy, pernicious jaundice of the gravid, chorea gravidarum, pyelitis in pregnancy, insanity of gestation, tubal pregnancy, and the hæmorrhages which may attack the expectant mother, not to name the diseases and deformities to be found in the unborn infant, to convince the least thoughtful amongst us that there is a real need for research here if anywhere in the whole range of medicine. Each one of these names will bring up a spectre out of the past of professional experience to every man or woman who has done much obstetric practice, and to those who have had charge of maternity hospitals the ghosts will come, not in ones or twos, but in battalions. It has, I think, been fully admitted now that the plea I made at the Liverpool meeting of the British Medical Association in 1912 was a necessary one; it was that before we can hope to understand the etiology and pathogenesis of eclampsia we must have a more complete and correct knowledge of the physiology of normal pregnancy and especially of the relation of the ductless glands to that state. I suppose hardly any one believes that the parathyroids by their defective action are the cause of eclampsia, and yet experimental and therapeutic results can be so grouped and so presented as to make a very good case for the theory. Thus, it has been stated that these mysterious little fragments of parenchyma which we call the parathyroids are more active during pregnancy; that their experimental removal in that state is followed by more severe symptoms than in the non-pregnant condition; that, in some cases of eclampsia, *post-mortem* examination has shown a diminution in the number of parathyroids or signs of their defective action; that some women suffering from diseases of the thyroid gland (whose effects could hardly be separated from those due to parathyroid maladies) have developed eclampsia or tetany in pregnancy; and that some of the good results which have occurred after the giving of thyroid extract in eclampsia have been

due to the presence in it of parathyroid tissue. Of course, there are many weak links in this chain of reasoning; but its fundamental defect is that we do not know almost anything with certainty regarding the action of the parathyroids in normal pregnancy. So, too, with regard to the pituitary gland; much investigation is needed before its action in pregnancy can be fully understood, and until this knowledge is our possession the use of pituitrin in obstetrics must remain empiric. At the present time there is a marked tendency for therapeutics to outstrip pharmacology, not always with the best ultimate results to the patient; and this is particularly true in respect of the use of the organic extracts in women, non-pregnant, pregnant, parturient, and puerperal. A closer scrutiny of all the phenomena of normal pregnancy, and more extended experimentation regarding the physiology of this time in a woman's life, are needed if a right understanding of the essential characters of the pathology of gestation is to be arrived at. It is absurd to suppose that we shall discover the nature of hyperemesis if we do not know the cause and mode of production of morning sickness; and the intimate pathogenesis of the convulsions of eclampsia is likely to baffle us till we have more accurate information regarding the state of the reflexes in normal pregnancy.

THE PLACE OF PREGNANCY AND ITS DISEASES IN THE MEDICAL CURRICULUM.

Naturally enough, these considerations lead on to the fourth practical bearing which the subject of normal pregnancy has at the present time. If it be granted that normal pregnancy is incompletely understood, and that morbid pregnancy is so deadly in some at least of its manifestations, it follows that radical changes are called for in the manner in which these subjects are presented to the medical student. When I was an undergraduate, some thirty-two years ago, there was no hint given in the lectures on midwifery which I attended that the phenomena of pregnancy were in any sense difficult of explanation, or, indeed, peculiar; further, in connexion with one course of instruction attended by me then, I was told that room for the pathology of pregnancy could not be found in the ordinary lectures, and that it would be dealt with as a sort of appendix course to be held during the succeeding session, with the result that whilst I benefited much from the ordinary lectures I forgot all about, and never attended, the special ones. Even at the present time there is a tendency to teach the subject of pregnancy as if there was nothing hard to understand in its physiology, and to give but small space to the diseases of gestation. A far stronger emphasis should be laid upon the intimate nature of pregnancy, and it ought to be included in courses of instruction, theoretical and practical, upon physiology; the diseases, too, of gestation, whether they be due to the pregnancy, be aggravated by it, or be simply accidental complications of it, should be dealt with much more in detail, and not pushed into a few lectures or demonstrations at the end of the session. This is simply one of many lessons regarding preventive medicine which are being slowly learnt at the present day; it is not wise to wait for the onset of labour pains before trying to remedy a morbid state which has existed during the whole or a part of the pregnancy. It is a sufficiently difficult matter many a time to save the life of a woman in a difficult labour; it is sometimes converted into an impossibility if the confinement be complicated by a disease of gestation which has previously received no treatment, which perchance has not even been recognized. In obstetric teaching, therefore, let abundant time be allowed for the consideration of pregnancy, normal and morbid.

PREGNANCY CASES IN HOSPITAL AND PRIVATE PRACTICE.

It is an easy transition to the fifth practical matter, namely, the paying of more attention to normal pregnancies in private and hospital practice. Theoretically, the medical practitioner is responsible for the health and welfare of his pregnant patient from the hour when he is engaged to attend her at her confinement; but in actual practice how seldom is the attention more than nominal, the supervision more than occasional, the control more than haphazard, and the interest more than evanescent. At his first interview with an expectant

mother, especially if she be a primipara, the medical man should, in addition to making a careful examination and arriving at a diagnosis, give the woman the probable date of her delivery, ascertain that she has engaged or is about to engage a suitable nurse, tell her the simple rules of health in pregnancy, and give her some hints as to possible danger signals whose appearance ought to bring her back again to him to once. But, further, he should arrange for a second interview, preferably at the patient's own home, and there and then he should inspect the proposed lying-in room and supervise the preparations which have been made for the accouchement, or see that they are put in train. Some obstetricians who are thorough in their methods will supply all their pregnant patients with printed or typed cards containing the rules for health in the expectant state, the lists of requisites to be provided before the labour, and an enumeration of the abnormal signs or symptoms which should cause the women to communicate with their doctor. The plan is a good one so long as it does not become stereotyped or perfunctory; but in most cases the spoken word is sufficient, and it has the advantage of being made applicable to the special wants of each case. Then, in addition to making a monthly analysis of the urine, the medical attendant should pay an occasional visit to his patient; in this way he will be able to detect those early, slight, insidious, but not insignificant deviations from the normal of health, which are being slowly recognized as the precursors of some of the most dangerous maladies of gestation. Even if he is not able to do her the service of detecting and averting those terrible catastrophes (eclampsia, hyperemesis, etc.), he may cure her of some of the common troubles of pregnancy (such as constipation, piles, and heartburn), and lessen for her some of the irksomeness and weariness of the long months of gestation. It has been said to me that patients will object to such attentions as unnecessary, and as adding to the ultimate bill; I have not found this to be the case, but quite otherwise. If, however, there seem to be any risk of this, the simplest plan is to make no charge for the visits which are unasked for, or at which you were unable to make any helpful suggestion, and to believe that by making the pregnancy healthy you will in many cases lessen not only your own future anxiety at the labour but also the amount of attendance you will require to give in the puerperium. It may be taken as an axiom that the anxiety caused by, and the increased number of visits needed for, one single case of eclampsia will far more than outweigh the extra attention you would have paid to some dozens of cases of normal pregnancy. If by such special visits and such more than conventional attention you are able to ward off one case of convulsions, you will not grudge the additional time and labour spent. No, indeed. You will also have that great possession—a good conscience.

PRE-MATERNITY WARDS AND ANTE-NATAL PATHOLOGY.

The hospital aspect of this enhanced importance of pregnancy in obstetrics is seen in the desire for the provision of pregnancy or pre-maternity wards. I have written and spoken so much upon this matter already that I need not give much space to it here. The necessity of accommodation for pregnant patients in maternity hospitals is now admitted, and in many places provision of some sort or another is made for it. The advantages are very real, and are enjoyed by all concerned—by the women themselves, who find a hospital for the maladies of pregnancy, and in some cases a home in which to rest during the last weeks of their expectancy; by the managers of the hospital, who are able to appeal still more powerfully to the public for charitable aid because they are in a position to show that a greater amount of relief is being given to suffering womankind; and by members of the medical staff, who are not only furnished with clinical material for teaching purposes, but are also enabled to deal with maladies at a more manageable and less hopeless stage of their development. In some cases, perhaps, the mortality of the hospital has been increased, for grave cases which would not previously have been admitted, because not in labour, have found an asylum in the pregnancy wards; but this increase is not likely to be permanent, for the more familiar expectant mothers become with the idea of hospital treatment for the diseases of gestation, the more readily the less serious cases will apply for admission.

In the long run, too, the treatment which such cases are able to receive before labour supervenes will lessen the dangers associated with the confinement when it happens. Further, the admission of homeless women who are not suffering from any disease may be contemplated, if for no other reason than that they will furnish the medical staff with a means of familiarizing themselves with the phenomena of pregnancy when under scientific observation. It has sometimes been said that these wards have been for unmarried women and their illegitimate pregnancies; but the terms of admission have, in the instance with which I have had to do, made no reference to marriage at all. The pre-maternity is open to all women suffering from the diseases or the strain of gestation, and, as a matter of fact, about 75 per cent. of the patients (about 150) treated in the pre-maternity ward of the Edinburgh Royal Maternity Hospital during the autumn quarters of the past five years have been married.

As a necessary corollary of the pre-maternity ward comes, or ought to come, the pathological department of the hospital. It is a remarkable fact that not a few maternity hospitals have no pathologist on the medical staff, not to speak of the possession of a pathological department. I am happy to say that the Edinburgh Royal Maternity Hospital has now Professor Lorrain Smith as its honorary, and Dr. James Miller as its acting, pathologist; but these appointments have been made comparatively recently. Not only is a pathologist necessary for the performance of *post-mortem* examinations upon the mothers and newborn infants who may die, but he is needed also for the great mass of pathological material, consisting of dead-born children, of infants who have died in the birth, of monstrosities, of abortion sacs (normal and morbid), and of placentas of all sorts. There may not be enough work for a pathologist to do if it be restricted to necropsies upon women dying in labour, for, fortunately, not many maternity hospitals have more than a few of these fatalities in a year; but, if he will undertake the investigation of the morbid states of the products of conception as well, his post will supply him with all the occupation he is likely to ask for. It is a somewhat strange thing that I have been writing now for more than twenty-five years upon the subject of ante-natal pathology, basing my inquiries largely upon the material made available to me through our Maternity Hospital, and yet that material in other hospitals is so often treated as if it had no interest and called for no investigation. It may be that I have laid too strong an emphasis on ante-natal pathology, but I am encouraged to find Dr. Amand Routh⁵ making an appeal to the profession to call for the appointment of pathologists in all maternity hospitals to carry out researches upon this very kind of material. But more than a pathologist is needed. There ought also to be a man well trained in physiological and pathological chemistry to study the problems of pregnancy and the puerperium; he should be furnished with the necessary equipment, and he should be familiar with all the modern methods of clinical research. He should, for instance, be able to carry through the Abderhalden biological test for pregnancy, the meiostagnin test, and all the finer investigations on blood, urine, liquor amnii, etc. I am taking it for granted that he is appointed to a hospital which has a pre-maternity ward or wards. It is only by the presence of a pathologist and a bio-chemical researcher on the medical staff of maternity hospitals that an understanding of much that is obscure and well-nigh mysterious in ante-natal pathology and in the physiology and pathology of pregnancy can be arrived at in the near future, and with any degree of accuracy.

PRE-MATERNITY NURSES.

Recently I have carried the pre-maternity principle into the out-patient department of the hospital in Edinburgh, for last autumn a commencement was made of the practice of sending a specially well informed nurse to women who were pregnant, to give them advice regarding their health and the preparations necessary for confinement, to warn them regarding the danger signals of pregnancy (haemorrhage, excessive vomiting, extreme constipation, persistent headache, etc.), and to report upon the actual existence of any of these signals. In certain cases the nurse tested the urine, and was able to report

concerning threatened eclampsia. I have noticed also, of late years, an increasing tendency among the women to come to the hospital for advice and treatment during pregnancy; and doubtless, as information spreads among the patients and the medical men of the town, both the indoor and the outdoor pre-maternity work of the hospital will increase in amount. There can be no hesitation in saying that in this way suffering will be diminished and the number of hopeless cases of complicated labour sent to the hospital greatly lessened. There is all the difference in the world between the prognosis in, say, a case of placenta praevia diagnosed early and put under treatment and one which is brought into the maternity hospital for management after great haemorrhage has occurred on several occasions.

PREGNANCY AND LEGISLATION.

There is a sixth practical bearing which the examination into the nature of normal pregnancy and the etiology of abnormal gestation has or may have upon the future of our profession; I refer to legislation. At the present time the unborn infant is only obliquely recognized by the law, and his mother is but poorly protected from others and possibly from herself during the period of her expectancy; it is not even known how many pregnancies come to an end in their later months in this country, and early miscarriages are quite disregarded. The management of pregnant patients must be fully provided for in any amendments of the Midwives Act for England and in the proposed bill for Scotland; a part of the maternity benefit under the National Insurance Act should be made available for the making of preparations for the arrival of the infant before his birth; stringent regulations should be framed preventing the employment of pregnant women in trades which are dangerous to themselves or their unborn children; such diseases as syphilis, which are so terribly destructive to fetal and embryonic life, should be brought more fully under supervision and control; the notification or registration of stillbirths, with or without the cause of the abortion or premature labour, should be made compulsory by law; and possibly some encouragement (financial or other) should be given to the parents of large and healthy families. The notification of pregnancy is too much to look for, but under the aegis of the National Insurance Act some attempt might be made to lead expectant mothers to give notice of the term of their confinement and of the name of doctor or midwife engaged; the attraction might consist in a payment to account or a more liberal allowance later. The recognition of the value and sacredness of the life before birth ought to be much more evidently shown in the means taken to put down criminal abortions and to punish the abortion-mongers. Even therapeutic feticide or medical induction of abortion must be kept within bounds and scrutinized closely. One must not forget the tremendous fact that in every hundred abortions a hundred lives at least are lost, and that about half the premature babies who come alive into the world pass out of it again in a few hours, days, or months. The law must take more cognizance of these things. The old Latin proverb, *de minimis non curat lex*, does not apply here, for these are not the least things; they are more correctly described as amongst the greatest things.

PREGNANCY AND EUGENICS.

How great they are or may become is rendered dazzlingly clear when we consider them in the light of the woman's movement and of the balancing of the issues of peace or war, not to speak of that fascinating subject of eugenics which is proving so attractive to so many of the well-born scientists, savants, and illuminati of these days. To take the last-named subject first, one cannot but feel some regret that the eugenists with their large stores of enthusiasm and energy should by the restriction of their investigations to heredity have shut themselves out from the study of pregnancy and of the environmental causes which act upon the infant while still in the womb, and should by their acceptance of Weismannism have excluded the germ plasm from the moulding and modifying effects of its surroundings in the human body, making it theoretically as inviolable as the atom once was thought to be.

PREGNANCY AND FEMINISM.

On the surface of the Woman's Movement floats the great vessel known as the *Vote*, and there are lots of little ships around it with sails trimmed to carry them into Franchise Harbour and Equal Representation Bay; but these things are only on the surface. There is underneath them a deep ground swell of discontent—in many cases well founded—of dissatisfaction with the life of woman-kind under certain circumstances, and of actual rebellion against the imposed self-sacrifice of the mother's lot. The agitation for the vote is a comparatively small matter; but this underlying changed outlook and mental attitude of so many women is no small matter either relatively or absolutely. Childbearing is self sacrifice, and does entail if not suffering at least irksomeness, weariness, strain, inquietude, and a certain separation from other more intellectual, perhaps more agreeable and more attractive, duties, not to name pleasures. In some cases it brings also danger, and it always means, sooner or later, the pains of labour. Of course there are, and ever have been, compensations for those whose hearts are motherly, and the women who bore us doubtless soon remembered no more the anguish for joy that a man was born into the world, but the compensations come after the suffering and are hidden from view at first, and it is not every woman who has the mother's heart. Now, if we obstetricians, who have by anaesthetics taken the sting out of labour and its pain, can by hygiene, supervision, and treatment remove some at least of the irksomeness from the nine months of pregnancy and the whole of the danger, we shall have done much to solve a part, and a not inconsiderable part, of the women's question. If we can assure her that pregnancy is ordinarily simply a period of strain and that the strain is a bracing and not a weakening and unnerving one, we shall put courage into her and alter her mental attitude towards childbearing; but if we have to say to her that gestation is to be regarded as a disease with an immunity reaction but no immunity from danger and attenuation of strength and health, how can it come to us as a surprise that the birth-rate falls still lower? I am not saying that the fall in the birth-rate is due to this or to any single cause, but I hold that the true nature of pregnancy is a factor which must be taken into account in all our thinking upon the subject.

PREGNANCY AND HIGH POLITICS.

Finally, the birth-rate of a country enters into the sphere of high politics, and behind the birth-rate there are, of course, necessarily the pregnancies of the women of that country. Napoleon said that the great need of his exhausted country was more mothers, and the same may be said of France now; but it may be said in another sense and for another object. France now requires more mothers and more pregnancies and a higher birth-rate, not that she may have more soldiers to wage wars of conquest and aggrandisement, but that she may not fall in numerical strength below the level of her rivals. Unless the birth-rate of France rises or that of her neighbour falls more quickly than it is doing, the French people will feel the loss of national strength so acutely that fear will enter in, and where fear enters there too often and too soon follows war. The nation with a high birth- and survival-rate and a limited territory must find room by colonization; where two races are living side by side in a country, the one with the higher birth-rate (the survival-rates being equal and migration inconsiderable) will inevitably rule, although the event may be delayed; the people who will not propagate must die. No wonder a far-seeing statesman said lately, in answer to his own question, What is the greatest thing in the world? "A baby!" In the ultimate issue of things babies are of greater import than battalions, and they are the true dreadnoughts of a nation; if they be well-nourished before they are born, if they are brought into the world with care, and if they are handled afterwards with tenderness and educated with knowledge and foresight, but without fads, they will not only stand to arms if need be for the defence of their land in their manhood, and be apt for the replenishing of her millions in their womanhood, but will also help to maintain her high rank among the nations in science, in literature, in commerce, and in all else that is worthy. Shakespeare was once a baby, and not an extraordinary but a very ordinary one;

Isaac Newton was less than an ordinary one, he was a premature one, no better than a fetus; Hobbes the long-lived philosopher, and George III the long-lived king, were both untimely births; and yet the history of the world would be the less interesting for their absence. Babies, indeed, are to be looked for, and even fetuses are not to be despised; and behind each are the nine or seven months of a pregnancy.

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A Lecture

ON

ANTE-NATAL HYGIENE:

ITS INFLUENCE UPON INFANTILE MORTALITY.*

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In this lecture I am dealing with ante-natal hygiene in its broadest sense, and my main object is to try to get that vital subject better understood and taken up more scientifically, both by medical practitioners, by municipalities, and by legislation, and last, but not least, by the mothers themselves. I am hoping that soon we shall have many definite signs of progress, and amongst them I would mention:

1. Compulsory registration and notification of stillbirths, and, if possible, notification of abortions.
2. Arrangements by which every poor woman shall have medical supervision during pregnancy.
3. The provision of pre-maternity wards in every locality, with facilities for conveyance thereto of any pregnant woman found to require hospital treatment.
4. The provision in every general or lying-in hospital in our larger towns and in university clinics of ante-natal research laboratories, and so far as may be practicable of pathological laboratories in every county and county borough under the supervision of the medical officer of health, where abortions and stillborn children and other products of conception can be systematically and scientifically examined by microscopical and bacteriological methods, so that we may gradually arrive at a more certain knowledge of ante-natal pathology.
5. The adoption of some means by which poor pregnant women can be financially assisted during the later months of pregnancy. This might be done by an extension of the maternity benefit for insured persons under the National Insurance Act, by which every pregnant woman may from the sixth or seventh month of pregnancy receive 5s. a week after voluntary notification of her pregnancy to the medical officer of health or her panel doctor.

Though I do not intend here to discuss ante-natal hygiene from the maternal standpoint, it is inevitable that that part of the general subject must be included, as many cases of fetal disease and death are maternal. All those interested in infant welfare are endeavouring still further to reduce the rate of infantile mortality, which in 1912 reached the relatively low figure of an annual mortality in England and Wales of 95 per 1,000 births in infants under 1 year of age. This is a gratifying rate when compared with those of 154, 149, 142, 153, and 127 in the previous five decades.†

Can this infantile death-rate of 95 per 1,000 births in 1912 be still further reduced? I believe it can. The London rate in 1912 was only 90 during the first year of life, and Hornsey, with a rate of 66.8, Bromley 68.1, Guildford 69.6, Hampstead 71.4, and Reigate with 71.9,

* Given on behalf of the National Association for the Prevention of Infant Mortality on January 13th, 1914.

† In 1911 there were 114,600 deaths from all causes under 1 year of age—130 per 1,000 births; but this increase of 35 per 1,000 births was due to deaths from diarrhoea, the result of hot weather and diminished milk supply in the labour strikes of the summer months.