The causation of sex : a new theory of sex based on clinical materials ; together with chapters on the sex of the unborn child, and on the determination of sex at will / by E. Rumley Dawson.

THE CAUSATION OF SEX

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A NEW THEORY OF SEX BASED ON CLINICAL MATERIALS

TOGETHER WITH CHAPTERS ON

THE FORECASTING OF THE SEX OF THE UNBORN CHILD, AND ON THE DETERMINATION OR PRODUCTION OF SEX AT WILL

BY

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"OMNE VIVUM AB OVO"

WITH TWENTY-ONE ILLUSTRATIONS

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To the Memory

OF

A MEDICAL MARTYR

THE LATE

IGNATIUS P. SEMMELWEISS

FORMERLY OBSTETRIC ASSISTANT TO THE VIENNA HOSPITAL

THIS BOOK IS DEDICATED

AS A RESULT OF PROPOUNDING AND ADVOCATING A THEORY OF THE CAUSATION OF BLOOD-POISONING DURING CHILDBIRTH, NOW UNIVERSALLY ADMITTED TO BE CORRECT, BUT NEW THEN AND THEREFORE DISBELIEVED, HE WAS DESPISED AND RIDICULED BY HIS COLLEAGUES AND TEACHERS, FINALLY DYING INSANE

A VICTIM

TO THE RELENTLESS PERSECUTION AND CONTEMPTUOUS OPPOSITION TO WHICH HE WAS SUBJECTED

"THERE IS NOTHING MORE THANKLESS THAN THE ATTEMPT TO INFLUENCE ANY FIELD OF PUBLIC OPINION."

PREFACE

I HAVE written this book, not as the outcome of a sudden inspiration or guess, but as the result of prolonged and careful study; hence I trust the reader will form his conclusions thereon only after careful perusal of it.

The problem of the Causation of Sex in Mankind has always been a fascinating one, and only recently it has been described as "on the borderland of the insoluble."

Some hitherto insoluble questions have been solved, for example, by Marconigrams, Radiograms, and Submarine Warships; others are being assailed, for both Arctic and Antarctic expeditions are attempting to solve the Polar question, while the conquest of the air by aërial machines and dirigible balloons will not apparently be long delayed.

Such examples, therefore, encourage the attempt to solve the question of the Causation of Sex, and supply a valid reason for the production of my book, the more especially as I claim to have discovered Nature's secret.

This theory is built up essentially on clinical material and facts, and thus differs from Schenk's theory, which recently startled the world. The latter looked like an

attempt to give a scientific flavour to the old nursery rhyme that—

> "Sugar and spice and all things nice,
> That is what girls are made of."

It was never seriously credited, however; for by the application to Schenk's theory, or rather hypothesis, of the one well-known clinical fact of the occasional simultaneous birth of both a boy and a girl, it was at once shown to be quite untenable.

In the chapter on the Determination of Sex I have given general rules only, as each individual case must be separately worked out, preferably by the person's own private medical attendant.

Of the illustrations, nine are new and original. The source of the remainder is given in the text: all have been redrawn, and some have been modified or simplified so as to render certain points clearer to the reader; while for the loan of Figs. 14 and 21, taken from Bland-Sutton and Giles' "Diseases of Women," I have to thank Mr. Bland-Sutton and his publishers, Messrs. Rebman, Ltd.

For many of the facts used I am indebted to others; the fitting of them into the mosaic of the theory I claim to be my own.

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INTRODUCTION

EARLY in the year 1887 my attention was first called to the fact that the great problem of the Causation of Sex in Mankind was still unsolved.

The inquiries which I then began to make soon showed me how much in the dark the medical profession is on the subject.

The whole question of the causation of sex in mankind had been hedged around, encumbered and obscured with observations *ad nauseam* on the eggs of the invertebrata; on worms and tadpoles; on sponges, and plants; on bees, and water-fleas; and lastly, on hens' eggs, to which nothing more dissimilar could be found than the human egg or ovum.

If ever it be true that "the proper study of mankind is man," it is in this study of the causation of sex, and therefore I have made it chiefly a clinical study.

Among the large number of theories which had been advanced, the great majority were quite untenable, and were propounded without any clinical evidence or facts to support them; several others I found had been suggested which were diametrically contradictory to a theory which some former writer had advocated. A few of these I mention in the text.

As a general practitioner of medicine, the daily round of work, the ever-present necessity of earning one's living, sadly interfered with, and was hardly conducive to, close study of and inquiry into such an engrossing subject, and so progress was slow; but we must remember, as Dr. Samuel Johnson said, "it is dangerous to quiet our uneasiness by the delusive

opiate of hasty persuasion" ; for the answers to most great questions have only been arrived at after much patience combined with persistence and sustained work.

It was not, therefore, till some thirteen years after first beginning the study of the Causation of Sex that I ventured, in December 1900, to bring the subject before the Obstetrical Society of London : it is remarkable, but it was the first time that the subject of the Causation of Sex in Mankind had ever been discussed by the Society ! Innovations, however, rankle with many, and, as was to be expected, but little knowledge of the subject was shown, and much of the criticism of the paper was irrelevant and inaccurate.

The reception of the paper did not discourage me, and the following eulogistic notice of it from the pen of the then President of the Obstetrical Society, Mr. Alban Doran, F.R.C.S., appeared in vol. xliii. 1901, pp. 49 and 50, of the Society's Transactions :

"A very remarkable monograph on 'The Essential Factor in the Causation of Sex : a New Theory of Sex,' was read in December by Mr. E. Rumley Dawson. This communication was prepared after long study of cases of removal of one ovary, and of families where one sex predominated or prevailed entirely. . . . The boldest theory in this singular monograph was the assertion that the sex of the child depends upon which ovary supplied the ovum fertilised. This paper was strongly criticised in a very active discussion by several obstetrical and gynæcological authorities ; but the author, who showed great dialectical ability both in his written monograph and in his reply to his critics at the meeting, stoutly maintained the scientific value of his views. This memorable discussion on a sex problem—a subject always of interest, though on the borderland of the insoluble —was further remarkable as being the last piece of work done by the Obstetrical Society in the nineteenth century."

Having thus led the way, I continued to note and observe, and the gradual collection of facts and cases stimulated me to further efforts, for I found new patients and new cases supplying almost daily fresh points or facts with which to build up and maintain my theory.

Each individual fact brought forward in support of my

theory may have no great force by itself, yet when we come to add together the separate facts, the number of points in favour of the theory form in the aggregate proof so convincing as to leave very little room for doubting its accuracy.

The present book, then, is the result of this further study; the original paper is incorporated with it, the whole has been rewritten, and the additions thereto more than equal the original observations.

I have throughout endeavoured to support and substantiate every statement, theory, or conclusion, either by extracts from well-known authorities or by clinical cases, and thus gradually to build up the theory on ascertained facts; but no one save those who have hunted up cases in medical literature can be aware of the great difficulty experienced in finding perhaps the very item or fact we are looking for. In this way scores of cases which might have been used are found to be useless owing to the remarkable manner in which authors have failed to note the sex of the child born, or from which side an ovary was removed, or in which half of a double uterus the child was contained. I have had most exasperating experiences in this way, and writing personally to the authors has been no more successful: thus, in one case, though the weight of the child is given, and a careful dissection was made of its heart, its *sex* was unaccountably omitted; in others we get the weight and length, but no sex; and, finally, a case is described of opening the mother's abdomen, removing a living child, elaborate measurements of its head are given, but though the ovaries were removed, they are not described, neither is the sex of the child given!

I have thus found my investigations repeatedly hampered by incomplete records, hence the number of cases is less than it might have been.

I have claimed, and repeat my claim, that my theory is a new one: in dissociating as I do the male parent from any influence in sex causation, my theory essentially differs from those old-world theories which some critics thought were similar. Further, I prove my theory practically and with clinical material; no attempt has previously been made to utilise the sexually differing families daily met with; and such subjects as extra-uterine pregnancy; pregnancy in

abnormal uteri ; multiple pregnancy ; the migration of the ovum ; and why more boys are born than girls ; are all used to prove the theory for the first time.

Confirmation of the correctness of the theory is practically shown by my being able not only to forecast the sex of the coming child, but also to determine the sex ; so that whether the writer's ideas of human fertilisation and heredity be accepted or not, it will neither negative the causation of sex, nor render inoperative the means for its determination.

I have endeavoured to give chapter and verse for most quotations and cases. I am well aware of faults in the book, but I must claim the reader's indulgence, for, apart from the claims of my daily work, which often rendered it impossible for several days and weeks together to either write or study, the mere collection of so many cases necessarily prevents the narrative running along in the smooth way one might wish ; but they were essential to prove the theory.

And again, in order to emphasise the different points I have had to utterly disregard repetition : emphasis requires repetition, and hence I fear the narrative suffers thereby.

The absorbing interest of the subject, however, will override the literary deficiencies, for that the subject of sex is of the greatest interest and importance is surely indisputable ; and all must agree with Havelock Ellis when he says that—

" Sex is the central problem of life."

CHAPTER I

THE ANATOMY OF THE FEMALE GENERATIVE ORGANS

A COMPLETE anatomical description of the whole of the female generative organs being beyond the scope or necessities of this book, only the following abbreviated account of the internal organs essential to reproduction will be given.

THE UTERUS or womb is roughly a pear-shaped muscular organ, containing a small cavity which is capable of much

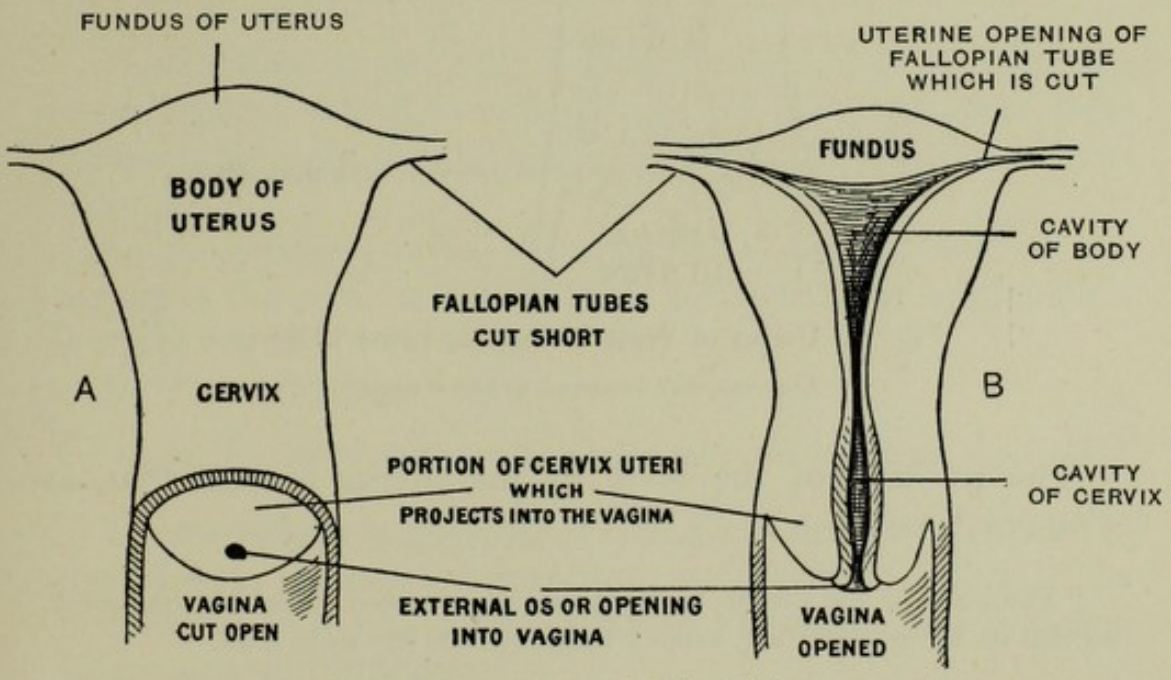

Fig. 1.—Front View of Virgin Uterus.
A. Unopened. B. Opened, by removal of anterior wall showing its cavity.

dilatation. It is situated within the bony pelvis, to the walls of which it is attached or slung by folds of peritoneum, known as the broad ligaments. These pass outwards, like outstretched wings, from the sides of the uterus, and so form suspensory ligaments for it.

The uterus is freely movable, and consists of a body, the upper larger portion, triangular in shape, and a cervix or narrowed cylindrical portion which projects downwards into the upper part of the vagina or external genital passage.

The uterus varies in size slightly in different women, and considerably whether it be in a virgin or multiparous state.

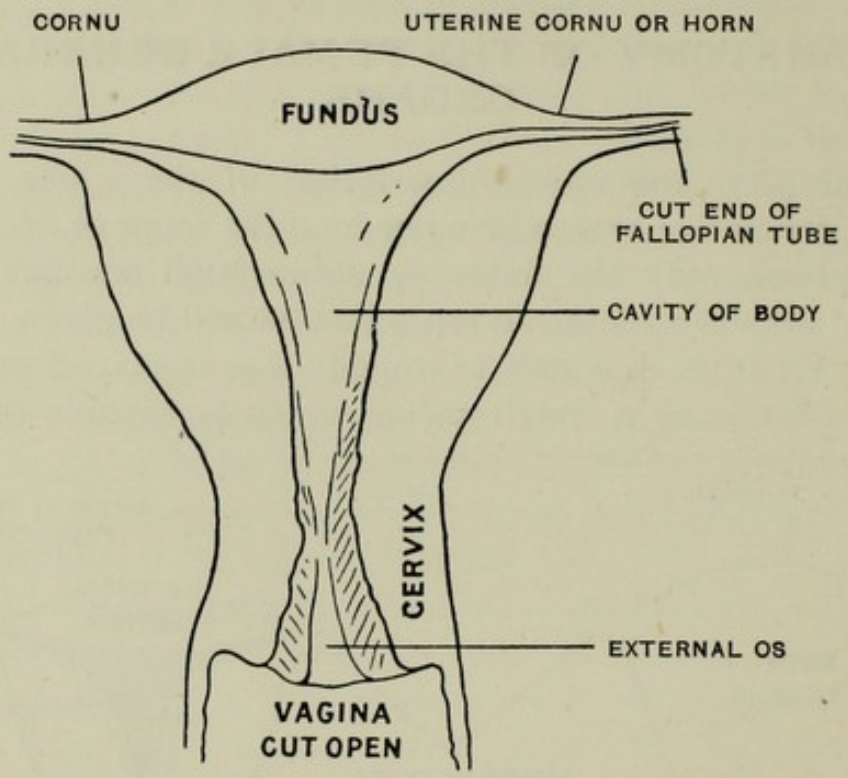

Fig. 2.—Uterus of Woman who has borne Children.

Anterior wall removed to show cavity.

The position of the body of the uterus is such that, as *Playfair*[1] says:

"The body of the uterus is very generally twisted somewhat obliquely, so that its anterior surface looks a little towards the right side."

This facing towards the right side by the anterior surface of the uterus leads to the left side of the uterus being carried to the front, so that when the woman is in the dorsal position, or lying flat on her back, the right ovary and the uterine opening of the right oviduct or Fallopian tube are lower in the pelvis than the left.

[1] Playfair, "The Science and Practice of Midwifery," 1898, p. 33.

Spiegelberg[1] says:

"The uterus is not only inclined forwards, but almost always towards the right side also, while the left side is rotated forwards, a position caused mainly by pressure of the rectum during development, and by the weight of the organ in the right lateral posture, which is the commoner."

Garrigues[2] says:

"The mother's rectum causes a partial rotation of the uterus, by which its left edge is carried a little more forward than its right edge."

Parvin[3] too admits that—

"A slight rotation occurs by which the left side is thrown toward the front, and the right side backward."

Dr. G. Moorhead reports a case where—

"There was lateral rotation of the uterus, so that the left ovary and tube came into relation with the anterior abdominal wall just external to the middle of Poupart's ligament on the left."

This rotation is generally believed to be due to the presence of the rectum, which stretches from the left sacro-iliac joint obliquely towards the right side to reach the mid-line of the sacrum.

As constipation is so universal with women, and as the rectum is the portion usually most distended, the explanation is doubtless the correct one.

Hart and Barbour[4] say:

"Rectal distension displaces the uterus forwards and to the right side."

The variations in position of the uterus due to distension of the bladder are more evanescent; the pressure comes to be directed on to the anterior surface of the uterus in a direction backwards and upwards.

Apart from the oblique twist of the uterus, the whole organ lies far more commonly to the right of the mid-line of the body than to the left.

[1] Spiegelberg, "A Text-book of Midwifery." New Sydenham Society Translation, 1887, p. 32.

[2] Garrigues, "Science and Art of Obstetrics," 1902, p. 83.

[3] Parvin, "The Science and Art of Obstetrics," 3rd ed. 1897, p. 71.

[4] Hart and Barbour, "Manual of Gynecology," 5th ed. 1897, p. 54.

Thus *Garrigues*[1] says :

"The fundus uteri lies a little nearer to the right side than to the left ;"

while *Cunningham*[2] writes :

"The uterus rarely lies exactly in the mesial plane of the body, but usually bends to one or other side, most frequently towards the right ;"

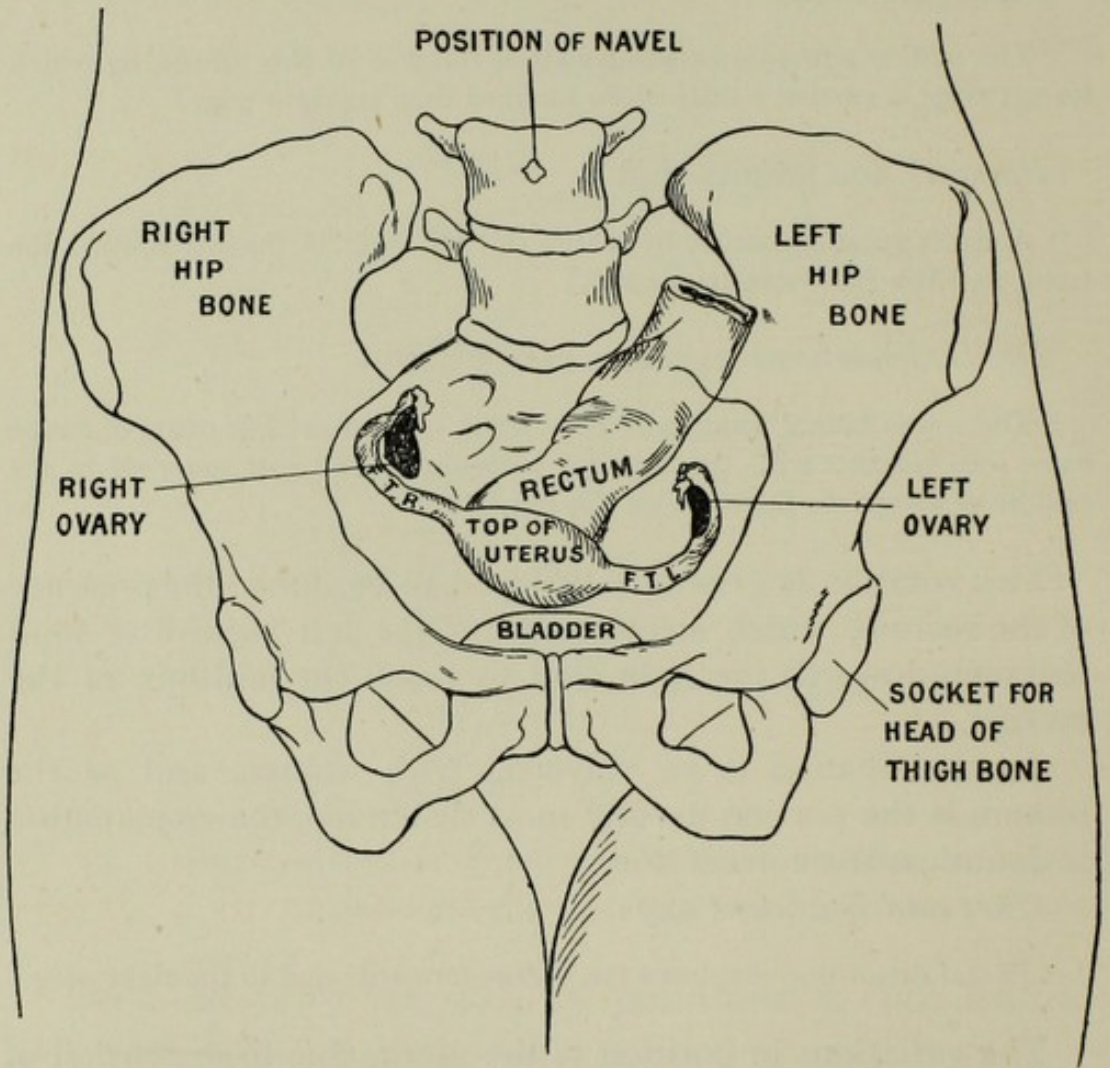

Fig. 3.—The Relation between the Pelvis and the Pelvic Organs and the Surface of the Body (modified from Norris and Dickinson).

It shows the uterus pushed by the rectum over towards the right side ; the right Fallopian tube, F.T.R., is thus carried backwards. The ovaries are shown more or less encircled by their respective tubes ; the right ovary is larger than the left.

and *Gerrish*[3] says :

"As a rule, the uterus does not occupy the median line of the body, but is somewhat deflected usually to the right. There is also present a certain

[1] Garrigues, "Diseases of Women," 3rd ed. 1900, p. 54.
[2] Cunningham, "Text-book of Anatomy," 1903, p. 1132.
[3] Gerrish, "Text-book of Anatomy," 2nd ed. 1903, p. 858.

amount of torsion, by means of which the left superior angle is carried a little farther forward than the right."

The cavity of the body of the uterus, when seen from the front, is triangular in shape, and, like the whole organ, varies in its measurements ; thus *Richet*[1] gives the following figures :

	Virgin Uterus.	Multiparous Uterus.
Vertical diameter of cavity .	1·80 in.	2·44 in.
Transverse diameter of cavity .	·60 in.	1·24 in.

The cavity of the cervix is spindle-shaped, with narrowed openings above into the body of the uterus, the internal os, and below into the top of the vagina, the external os, or mouth of the womb.

It should be borne in mind that, though usually described separately, the cavity of the cervix uteri and the cavity of the body are really continuous, and practically form a single cavity only, which should normally in the woman's erect posture, and when seen from the side, show a slight curve, whose concavity looks forwards and downwards.

The cavity of the body of the uterus is lined by mucous membrane, which undergoes monthly growth, and some superficial decay. The glands in this membrane, the uterine glands, secrete a thin secretion which serves to keep the uterine cavity moist.

The walls of the cavity of the uterus, even in a virgin, are not in complete apposition, being always separated by a certain quantity of this mucus, and thus the cavity is always dilatable.

In the event of a woman bearing a child the virgin shape and size of the cavity of the uterus is lost, and is never regained.

Into the cornu, or upper angles of the cavity of the body, the Fallopian tubes open ; by its lower opening, the internal os, the uterine cavity communicates *viâ* the cervix with the vagina or external genital passage.

In various abnormal uteri we find the cavity of the uterus consisting of two parts, and making with the cavity of the cervix a Y-shaped cavity ; in other cases the uterus and cervix are completely doubled.

[1] Richet, quoted by Hart and Barbour, *op. cit.*, p. 16.

The origin of these malformations is easily explained, as the normal uterus is originally formed by the fusion of two parallel tubes, the so-called Müller's ducts; hence if the septum between them, due to their coalescence, is not absorbed, the cavity comes to be divided more or less completely into two.

When the cavity is thus divided above, but coalesced below, and thus opens into a single vagina, as in the uterus bicornis

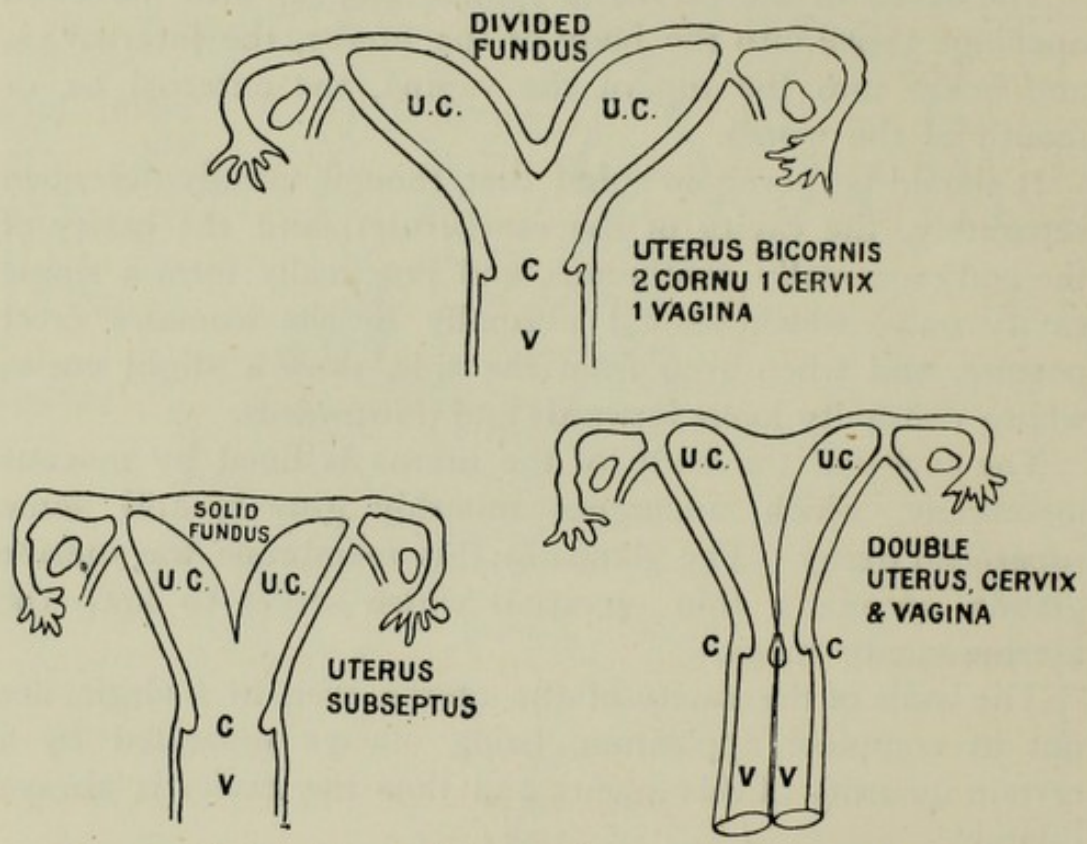

Fig. 4.—Various Abnormal Human Uteri. (Modified from Kehrer.)

U.C. Uterine Cornu and Cavity. C. Cervix of Uterus. V. Vagina.

or two-horned uterus, the human uterus closely resembles in form the uterus of the mammalia as a class.

The function of the uterus is to receive the ovum, especially when fertilised, to retain and support it during its growth and development into the fœtus, and then to expel it when able to maintain a separate external existence.

THE FALLOPIAN TUBES.—The Fallopian tubes or oviducts are two in number—a right and a left; they are curving muscular canals, arising one from each side of the fundus of the uterus at its cornu or upper angle. They run outwards

laterally from the uterus to the ovaries, and each ends by a fringed and funnel-shaped expanded opening, the abdominal ostium, close to and in immediate proximity to its respective right or left ovary. Each tube is lined internally by mucous membrane covered by special epithelium, which has a wave-like action towards the uterine cavity, due to cilia or fine hair-like processes which project into the lumen of the tube; their movement being always in one direction impels onwards to the uterus any ovum which may enter them.

A small quantity of thin albuminous fluid is secreted by the mucous membrane.

The inner or uterine third of each tube is straighter and thinner than the outer two-thirds, which, increasing gradually in size, curves sickle-like to encircle its corresponding ovary for more than half of its circumference.

The tubes are dilatable; the lumen varies in size, being least where they open into the uterine cavity, and greatest as they approach their expanded, outer, or abdominal opening, near to the ovary.

The average length of each tube is four inches, but they are rarely of equal size or length.

Thus *Hart*[1] says:

"The right Fallopian tube is usually larger than the left,"

while *Montgomery*[2] says:

"The Fallopian tubes vary in size and length, the right tube being the longer."

The tubes have a considerable range of mobility, and are easily displaced by tumour growth or inflammatory affections; the tubes are relatively very much larger, in comparison to the size of the human uterus, than are the Fallopian tubes in most of the mammalia—so much so that the mammalian Fallopian tube is generally overlooked, and the uterine cornu or branches are thought to be the tubes.

The function of the tubes, as their name oviduct implies, is to convey the ovum, fertilised or not, into the uterine cavity. They are practically the excretory ducts of the ovaries, but,

[1] Hart, "Atlas of Female Pelvic Anatomy," 1884, p. 12.
[2] Montgomery, "Practical Gynaecology," 1900, p. 132.

unlike most other excretory ducts, they are not part of the gland whose product they transmit, but are portions of the receiving organ.

The contractions of the muscular layers of the tubal wall help in the propulsion of the ovum, and its easy progress is assisted by the thin layer of albuminous fluid moistening the tubal lumen.

THE OVARIES. — The ovaries or genital glands are the essential organs of reproduction; they dominate the entire reproductive life of the woman.

They are two in number, a right and left, and lie on the right and left sides respectively of the uterus. Each ovary is a solid, oval, or almond-shaped organ, and is more or less encircled by the outer or abdominal end of its corresponding Fallopian tube.

The ovaries vary in size considerably in different women, and also at different times in the same woman, according to the condition of their functional activity. Thus each ovary enlarges slightly when about to discharge an ovum — as *Garrigues*[1] says:

"The ovaries, or at least one of them, swell regularly before each menstrual period, and decrease after menstruation;"

and enlarges markedly when, having discharged an ovum which becomes fertilised, a true corpus luteum of pregnancy is formed in the substance of the ovary.

The two ovaries are not of equal size, the right being larger than the left ovary. *H. Morris*[2] says:

"The right ovary is usually a little larger than the left."

An average ovary measures $1\frac{1}{4}$ in. long by $\frac{3}{4}$ in., and $\frac{3}{8}$ in. thick.

Each ovary is attached by its anterior border to the posterior surface of the broad ligament, and to the uterus by a muscular band of varying length, averaging one inch, the ovarian or utero-ovarian ligament; also by an enlarged tubal fringe to the open or abdominal fringed end of the Fallopian tube.

[1] Garrigues, "Diseases of Women," 1900, p. 596.
[2] Henry Morris, "A Treatise on Human Anatomy," 2nd ed. 1898, p. 1052.

The relative position of the ovaries in the body is much disturbed by pregnancy, as also by the growth in them or near them of any tumour.

At birth the ovaries are much longer than their width, so

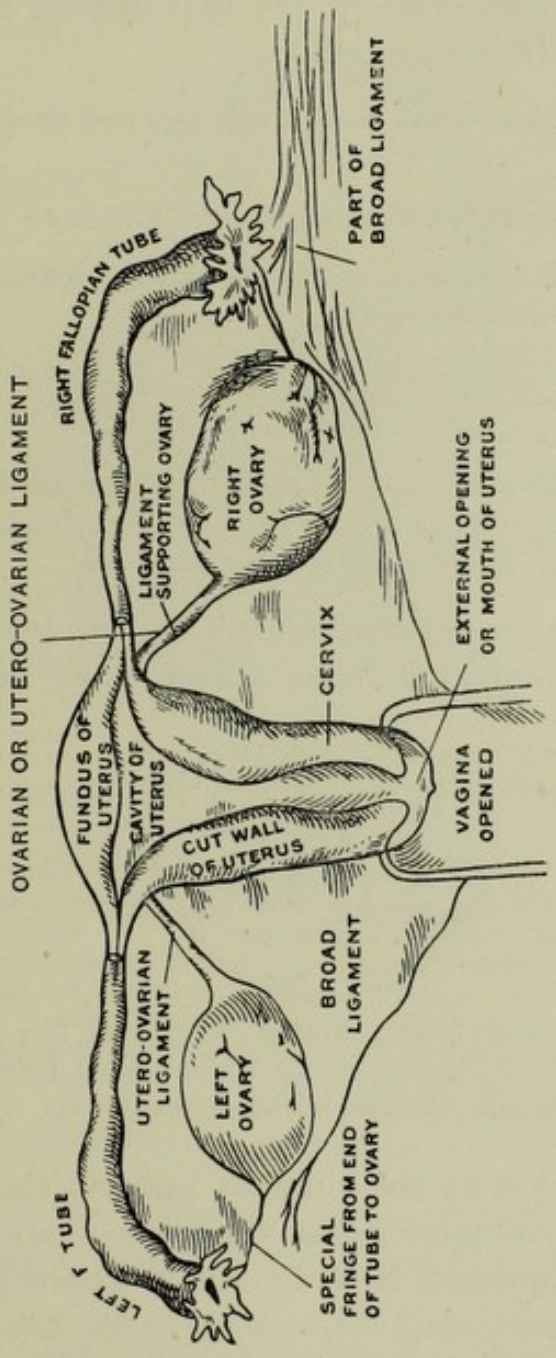

Fig. 5.—Posterior View of the Opened Uterus, with its Fallopian Tubes and Ovaries. (Diagrammatic.)

that they are described as cucumber-shaped, while the adult ovary more closely resembles a peach-stone.

The substance of each ovary consists of a groundwork or stroma of fibrous and muscular tissue, in which run numerous blood-vessels and nerves. It is seen to be occupied by a very

large number of small vesicles or cysts, called ovisacs or Graafian follicles, after their discoverer *Regnerus de Graaf.*

Each Graafian follicle or ovisac contains an ovum or egg, floating in a little clear albuminous fluid, the Liquor Folliculi.

Authorities differ in their estimates of the number of Graafian follicles contained in the two ovaries at the child's birth. Thus *W. Williams*[1] says:

"Each ovary at birth contains at least one hundred thousand primordial ova,"

while *Piersol*[2] puts them much lower. He says:

"The entire number contained within the two ovaries of the child being estimated at over seventy thousand."

All such figures, however, as *Dr. T. G. Stevens*[3] definitely states,

"must be viewed with some scepticism, because the enumeration of the Graafian follicles in an ovary cannot be a matter of any certainty, and there must be a large margin for errors of observation."

What, however, is certain is, that by far the larger proportion of the Graafian follicles atrophy and disappear, but

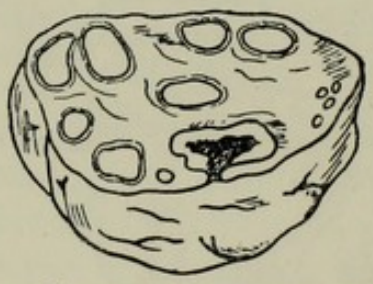

Fig. 6.—Section of an Ovary from a Woman on the First Day of Menstruation, showing Burst Follicle opening on the Surface, other Follicles in different Stages of Development. (Modified from Leopold.)

do not burst, so that by the time of puberty the number of Graafian follicles remaining in the two ovaries, and thus capable of development, is only about one-third of those present at birth.

The Graafian follicles are scattered throughout the superficial or greater part of the substance of both ovaries. The

[1] Whitridge Williams, "Obstetrics," 1903, p. 61.

[2] Piersol, in Norris & Dickinson's "Text-book of Obstetrics," p. 61.

[3] Stevens, "Trans. Obstet. Soc.," vol. xlv., 1903, p. 465. "The Fate of the Ovum and Graafian Follicle in Pre-menstrual Life."

deeper part of the ovary contains loose connective tissue and muscle fibres, and transmits the blood-vessels and nerves.

Every follicle contains an ovum, each ovum contains a germinal vesicle or nucleus, and this germinal nucleus contains a germinal spot or nucleolus.

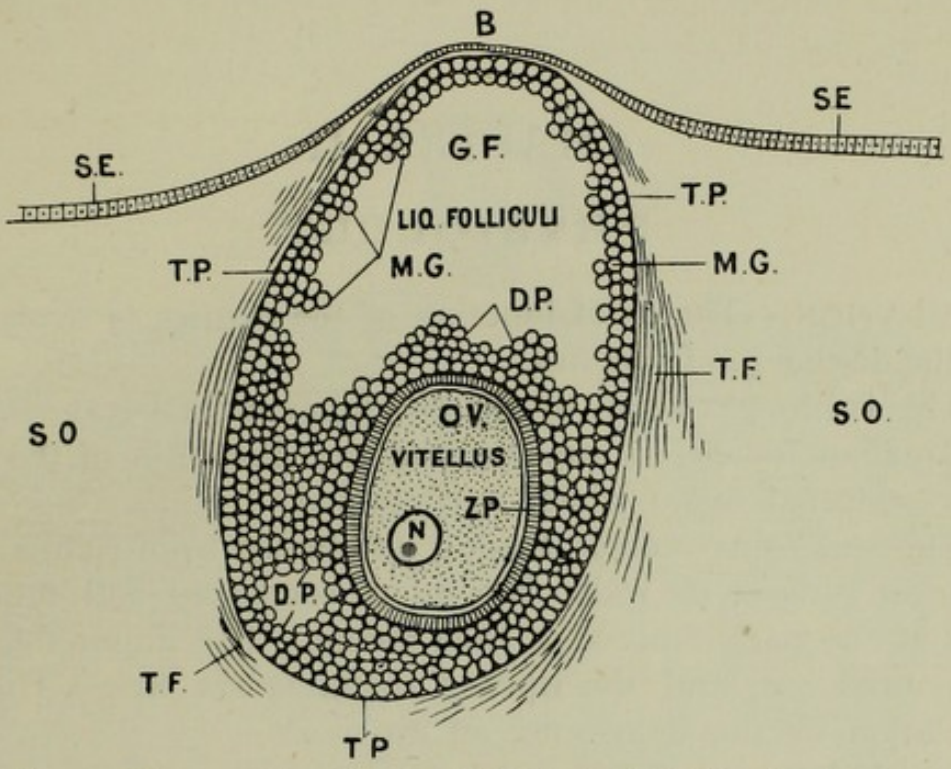

Fig. 7.—Diagram of a Graafian Follicle shortly before its Rupture. (Much magnified.)

S.E. Surface Epithelium of Ovary, showing at B thinning where the follicle is about to rupture and discharge the Ovum, OV. G.F. The Graafian Follicle, filled with the liquor folliculi, in which is OV., the Ovum, filled by the granular-looking vitellus or yolk; in this lies N., the Ovum Nucleus or germinal vesicle; this contains a nucleolus or germinal spot. S.O. The substance or Stroma of the Ovary. T.F. Condensed ovarian stroma, forming the external wall or Tunica Fibrosa of the follicle. T.P. The Tunica Propria or true wall of the follicle, lined internally by layers of cells, M.G., the Membrana Granulosa, which are heaped around the Ovum to form D.P., the discus proligerus. Z.P. The Zona Pellucida, the outer wall of the Ovum. OV. The Ovum; should be more circular than it is drawn.

Occasionally the Graafian follicle contains two ova instead of the more usual one. *Heisler*[1] says:

"As a rule each Graafian follicle or ovisac contains but one ovum, though sometimes two, and more rarely three are present."

Or the single ovum may contain a double nucleus—*i.e.* two germinal vesicles instead of the more frequent single one (see Fig. 8).

[1] Heisler, "Text-book of Embryology," 2nd ed. 1902, p. 27.

CHAPTER II

PHYSIOLOGY

OVULATION.—The chief function of the ovaries is ovulation or the discharge of ripe ova.

This is brought about by the development and maturing of a Graafian follicle, its rupture, and the discharge of the by-now-perfected ovum which it contained.

The enlarging follicle having gradually approached the ovarian surface, its walls becoming congested and thinned and at one part exposed, it then bursts. The liquor folliculi is poured out, and the ripened ovum is set free. This is ovulation or the dehiscence of an ovum.

Heisler[1] says :

"Ova are extruded from the ovary, one or more at a time, at regular, generally monthly, intervals, from puberty to the climacteric, usually during the menstrual period."

And with this latter statement *Halliburton* agrees.

In a young girl, before the ovaries have begun to ovulate, *i.e.* to fulfil their physiological function of providing ova, the surfaces of the ovaries are, as *Garrigues*[2] says—

"even, smooth, velvety, of pearl-grey colour. Later, each ovulation leaving a little puckered cicatrix, the surface shows irregular depressions."

It must be noted that the greater proportion of the Graafian follicles and their contained ova are microscopic, hence an infinitely small piece of an ovary may contain immature Graafian follicles which are capable of development and maturation. It is only as the growing follicles approach

[1] Heisler, *op. cit.*, pp. 33, 37.
[2] Garrigues, *op. cit.*, p. 71.

the free surface of the ovary, preparatory to bursting, that they become visible to the naked eye.

The Graafian follicle having ruptured and the ovum escaped, the rent in the substance of the ovary then begins to heal and the cavity of the old follicle or ovisac fills up,

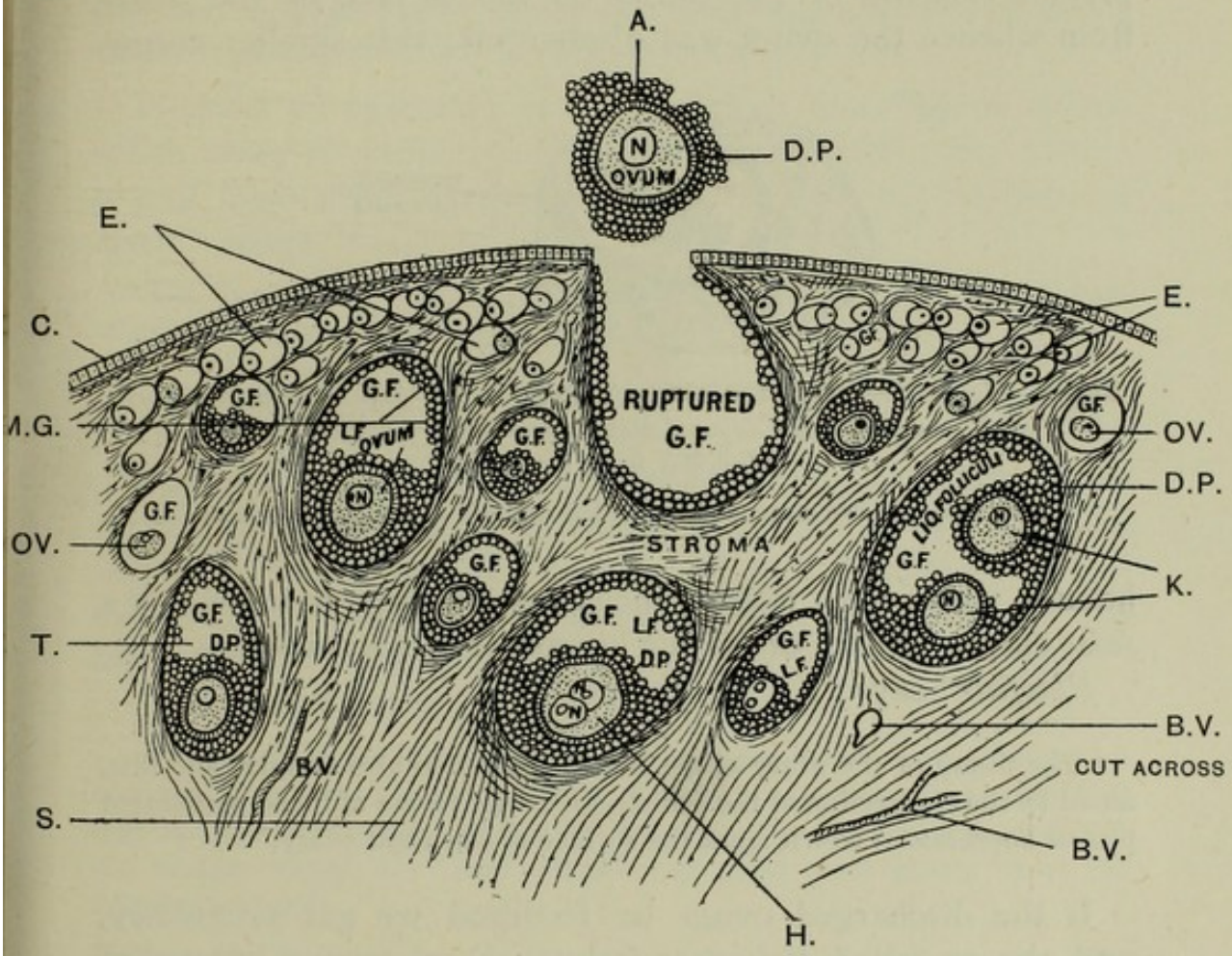

Fig. 8.—Composite Diagram of a Magnified Section of an Ovulating Ovary.

A. Ripe ovum just shed from the ruptured Graafian Follicle, with cells of the D.P. or Discus Proligerus still clinging to it. G.F. A Graafian Follicle. OV. An Ovum. N. The nucleus of an ovum. L F. The Liquor Folliculi or liquid contents of a follicle. S. The fibro-muscular stroma or groundwork of the Ovary. B.V. Blood-vessels. E. Small Graafian Follicles near the surface of the Ovary. C. Epithelium covering the free surface of the Ovary. T. Typical G.F. containing the normal single ovum with one nucleus. H. A G.F. containing one ovum which has two nuclei. K. Two distinct ova in a G.F.; each is surrounded by cells of the D.P. M.G. Cells lining the walls of the follicles, and known as the Membrana Granulosa.

being partly obliterated by the collapse and contraction of the sac wall, while the remainder of the cavity is filled with blood incidental to the rupture.

THE CORPUS LUTEUM.—Subsequent changes in the filled-up follicle convert it into a yellow-coloured body called

the corpus luteum. The after-history of the corpus luteum is entirely dependent on whether the ovum which was set free from the Graafian follicle becomes fertilised or not.

If *not* fertilised the site of the follicle is gradually obliterated, so that after about two months, only a depressed cicatrix, or pit, shows on the surface of the ovary from whence the ovum was discharged; this smaller corpus

Fig. 9.—Vertical Section of a Woman's Ovary a few days after a Menstrual Period, showing the Corpus Luteum, and some Graafian Follicles. (Modified from Leopold.)

Note their relative sizes, and the folded cell-wall of the corpus luteum.

luteum, which thus follows menstruation only, is known as a *false* corpus luteum or corpus luteum of menstruation.

Playfair[1] says:

"The tissue of the ovary at the site of laceration also shrinks, and this, aided by the contraction of the follicle, gives rise to one of those permanent pits or depressions which mark the surface of the adult ovary."

If the discharged ovum be fertilised we get pregnancy, and the so-called *true* corpus luteum or corpus luteum of pregnancy forms.

This true corpus luteum continues to grow for from three to four months, so that it comes to be a very much enlarged edition of the other or menstrual form of corpus luteum. At the end of pregnancy it is very evident on section of the ovary, while often it may be seen to be present even without opening the ovary. Its entire obliteration, and termination as a depressed scar on the ovarian surface, does not take place for two months after delivery. The differences between the corpus luteum after menstruation—*i.e.* when the ovum was not fertilised—and the corpus luteum when fertilisation

[1] Playfair, *op. cit.*, p. 67.

has occurred are differences of degree only, as *Piersol*[1] says:

"the stimulus of impregnation leading usually to excessive development."

This is also thus confirmed by *Whitridge Williams*[2]:

"Both the true and the false corpora lutea present exactly the same structure, the larger size of the so-called true corpus luteum being simply due to the increased vascular supply incident to pregnancy."

Without an operation or post-mortem, enabling us to see which ovary contains the corpus luteum, we are quite unable to say from which ovary the ovum was derived; so that, as *Hirst*[3] says:

"The true corpus luteum is of value as an indication of the ovary from which the impregnated ovum came."

We consequently see that a corpus luteum signifies a previous ovulation.

PUBERTY.—Puberty is the epoch in a female's life which marks the change from childhood to womanhood; it is the beginning of her fruitful period. It is a gradual development, and usually takes place from the fourteenth to the fifteenth year of a girl's age.

Spiegelberg[4] says:

"The ovaries and the ova contained in them are the first to arrive at maturity." "The arrival at puberty, however, is generally not coincident with the complete development of all the generative organs, and especially not of the uterus; the latter continues to grow considerably up to the twentieth year."

For the first twelve years of a girl's life the uterus usually retains its infantile condition, but at puberty it rapidly begins to increase in size. There are, too, certain external signs of the approach of womanhood, for the breasts become larger and menstruation begins.

As *Bland-Sutton*[5] says:

"In the female puberty is strikingly declared by the institution of menstruation," so that "the actual establishment of puberty is reckoned from the first menstruation."

[1] Piersol in Norris and Dickinson, "Text-book of Obstetrics," 1897, p. 61.
[2] W. Williams, "Obstetrics," 1903, p. 71.
[3] Hirst, "Text-book of Obstetrics," 2nd ed. 1900, p. 63.
[4] Spiegelberg, *op. cit.*, pp. 59 and 62.
[5] Bland-Sutton, "Diseases of Ovaries," 2nd ed. 1896, p. 5.

Further, he says[1]:

"With the onset of puberty the ovaries, previously small, enlarge and exhibit the periodic series of changes known as ovulation."

Hence we get the two processes, ovulation and menstruation, normally starting together at puberty; and being coincident at their beginning, they usually remain so during life. It is not, therefore, until the approach of puberty that the regular full development of the Graafian follicles and their contained ova begins to take place; a few partially develop and then abort, and a very minute proportion may even burst and discharge an ovum before puberty, proof being that girls sometimes get pregnant before they first menstruate; but, as *Piersol*[2] says:

"The advent of puberty marks the establishment of the full and regular development of the Graafian follicles and their contained ova, accompanied by the usual attendant phenomena of menstruation."

Herman[3] says:

"Graafian follicles ripen, though they have not yet been proved to burst, long before menstruation has appeared; and there is reason to think that they may degenerate without bursting before puberty";

and *W. Williams*,[4] while admitting their growth during childhood, says:

"They rarely rupture at this time, on account of their position in the depths of the ovary and the intervention of a thick layer of cortex between them and the surface."

T. G. Stevens[5] says:

"No rupture of the follicles takes place, and nothing in the least approaching the structure of a corpus luteum is formed in pre-menstrual life."

So that we see that rupture of the follicles and the formation of corpora lutea do not normally occur prior to the onset of menstruation.

MENSTRUATION.—Menstruation is the expulsion of the menses, a periodic discharge of a bloody fluid containing

[1] Bland-Sutton and Giles, "Diseases of Women," 4th ed. 1904, p. 17.
[2] Piersol, *op. cit.*, p. 71.
[3] Herman, "Diseases of Women," 2nd ed. 1903, p. 518.
[4] W. Williams, *op. cit.*, p. 66.
[5] *Loc. cit.*, p. 468.

mucus and débris derived from the superficial cells of the mucous membrane lining the cavity of the uterus. Normally it recurs every twenty-eight days throughout the reproductive period of a woman's life.

It begins at puberty and ceases at the "change of life" or menopause, and on an average it may be taken to extend from the fourteenth to the forty-fifth year of a woman's life.

Exceptions to this age-limit at both the beginning and the cessation are frequent, several cases of precocious menstruation, some in infants shortly after birth even, being recorded. These very early cases are open to the objections that bloody vaginal discharge is not necessarily menstruation, and that in most cases it does not recur and so is not periodic, as in the case recorded by *Dr. R. Jardine* in the "British Medical Journal," February 1901 ; and *Dr. Jellett* is doubtless correct when he says, in "Journal of Obstetrics and Gynæcology," vol. i. 1902, p. 700:

"Menstruation appeared to him to be a misnomer for the red discharge that occurred in newly born female children. It was an isolated hæmorrhage, not a menstrual flow."

Macnaughton-Jones,[1] however, quotes a case by *Mengus* of regular menstruation in a child 23 months old.

It is commoner to find cases of delayed menopause, some women continuing to menstruate beyond the age of sixty. *Dr. E. J. Tilt*[2] met with two cases at the 61st year out of 284 patients ; while *W. Williams*[3] quotes a case of a woman who had her 22nd child at the age of 63 years, "after which she still continued to menstruate."

It is usually said that menstruation is arrested during pregnancy and during lactation : this arrest is not absolutely certain, for menstruation may continue for the first two or three months of pregnancy. It very rarely, if ever, does so for longer in a *normal* uterus ; but for menstruation to take place during lactation is far more common.

Remfry[4] states that among 900 suckling women, in 57 per cent. only was menstruation entirely absent, and that 43 per

[1] Macnaughton-Jones, "Diseases of Women," 1900, p. 30.
[2] Tilt, "Diseases of Women," 1853, p. 44.
[3] W. Williams, *op. cit.*, p. 74.
[4] Remfry, "Trans. Obstet. Soc.," vol. xxxviii. 1896, p. 26.

cent. of suckling women menstruate more or less, 26 per cent. of these menstruating with absolute regularity.

Menstruation is the outward periodic sign that the lining or mucous membrane of the uterine cavity had been prepared to receive and give anchorage to a fertilised ovum. Hence *Geddes* and *Thomson*[1] say that "menstruation is comparable to an abortion prior to a new ovulation"; but as a fertilised ovum was not forthcoming, its degeneration and discharge accompanied by some bleeding follow.

Menstruation is therefore, as *Dr. John Power* in 1821 wrote of it, a "disappointed pregnancy"; or, as *Dr. Robert Cory*[2] calls it, "only the abortion of an unimpregnated ovum or egg"; while *Dr. Peter Horrocks*[3] terms it a "miniature parturition."

Some few authorities, as *Heape* and *F. H. Marshall*, are disposed to call menstruation a preparation *for* pregnancy, not an undoing of the preparations: which is correct is immaterial to this theory of sex causation, but certainly, if this is so, pregnancy in a non-menstruating woman, *i.e.* in a woman whose uterus was *not prepared for* pregnancy, would be very difficult to explain.

The process of building up a fresh nidus of swollen mucous membrane, to prepare for an oösperm or fertilised ovum, recurs after each discharge of the preceding unused one; the degeneration and discharge of some of the hypertrophied mucous membrane is the result of disappointment in the absence of an oösperm. This constitutes menstruation; and the process is made evident to the woman by a varying amount of constitutional disturbance, and clinically by variations in temperature, pulse, blood pressure, etc.

These, then, are the phenomena of menstruation, and have nothing whatever to do with its causation.

The actual cause of menstruation is unknown: it has been ascribed to nerve influence, and is thought to be probably controlled by an undiscovered nerve centre in the brain; and a sympathetic nerve ganglion in the ovary has even been described. Menstruation occurs only in women and a few

[1] Geddes and Thomson, "The Evolution of Sex," 1901, p. 265.
[2] Dr. R. Cory, "Lancet," November 7th, 1891.
[3] Horrocks, "Trans. Obstet. Soc.," vol. xl. 1898, p. 173.

(especially captive) monkeys ; and has therefore been attributed to their erect postures.

It may roughly be said that, normally, previous to the onset of menstruation and after its cessation (the menopause), women are incapable of bearing offspring or becoming pregnant. This rule, however, like most others, meets with a few unimportant exceptions. Thus *Dr. Addinsell*[1] relates a case of pregnancy in a girl of 13 prior to any appearance of menstruation ; while of the rarer condition of pregnancy after the menopause, the following is a case from my own private practice : Early in March 1904 I attended Miss E. C., aged 50. She had passed " the change," and had seen nothing for just two years, when, deeming herself safe from the possibility of pregnancy, she ran the risk, and was duly delivered by me of a living male illegitimate child, nearly three years after having ceased to menstruate.

A somewhat similar case is recorded by *Dr. R. Hann*[2] in a woman of 49 years, who gave birth to her thirteenth child—a boy—three years after the menopause ; but in this case menstruation returned after weaning this child.

All authorities agree that, prior to puberty, the ovaries of a girl present smooth surfaces ; then, as *Bland-Sutton*[3] says, " from puberty to the menopause the smoothness of the surface is marred by scars, caused by the rupture of mature follicles "—that is, by ovulation. So that prior to puberty, " strikingly declared by the institution of menstruation " (*Bland-Sutton*), ovulation has not occurred to scar the smooth surface of the ovaries.

The two processes, ovulation and menstruation, evidently both depend upon a common cause, probably a periodical congestion induced and controlled by a nerve impulse ; having the same cause, they usually occur about the same time—*i.e.* they are nearly if not quite synchronous.

Heisler[4] says " the two processes (ovulation and menstruation) usually occur at the same time " ; so that *Temesvary*[5]

[1] " Lancet," March 25, 1905, p. 791.

[2] R. G. Hann, " Journal of Obstetrics and Gynæcology," September 1902, p. 290.

[3] Bland-Sutton, " Diseases of Ovaries," 1896, p. 26.

[4] Heisler, " Text-book of Embryology," 3rd ed. 1907, p. 38.

[5] Temesvary, " Journal of Obstetrics and Gynæcology of the British Empire," vol. iii. 1903, p. 512.

calls menstruation "the outer sign of ovulation." *Heisler*[1] also says "the ovum is usually discharged from the ovary during the menstrual period."

That ovulation can occur without menstruation is evident from those rare cases where young girls become pregnant before menstruation has begun.

This is chiefly due to the fact that the ovaries and their contained ova are fully developed earlier than the uterus (see remarks of Spiegelberg *ante*), so that a mature ovum may be formed some time before the uterus has developed sufficiently to menstruate. The fertilisation of the ovum and its consequent attachment to the wall of the immature uterus cause the rapid and complete development of the uterus, so that the pregnancy continues and the child is born before its mother has even menstruated; but the pregnancy will have caused the full development of that uterus.

Ovulation must occur without menstruation in those cases where women get pregnant during lactation, when menstruation is often absent.

There are many reasons for believing that usually ovulation continues with its habitual regularity throughout the lactation period, the process of lactation replacing that of menstruation; but for pregnancy to occur before the reappearance of the menses is not usual, *Remfry*[2] giving only 6 per cent. as the number of non-menstruating women who conceive during lactation, while 60 per cent. of women get pregnant who menstruate during lactation.

The obvious criticism of both the above cases of ovulation without menstruation is that, though both occasionally occur, yet both are uncommon and more or less exceptional; in both cases fertilisation does not usually occur till after the appearance or reappearance of menstruation.

That ovulation may occur and menstruation be absent is most evident from cases where, though the ovaries are present, the uterus is either entirely absent or so rudimentary as to be functionless. Ovulation in this case cannot be accompanied by its usual phenomenon of menstruation; but we must not argue from congenital abnormalities.

That ovulation usually occurs only at or about the time of

[1] Heisler, *op. cit.*, p. 41. [2] Remfry, *loc. cit.*

a menstrual period, the previously mentioned exceptions notwithstanding, is evident from the following facts.

After the discharge of an ovum a corpus luteum is formed; a corpus luteum, therefore, as we have already seen, signifies a previous ovulation. The only ultimate trace of a corpus luteum is a scar or cicatrix on the surface of the ovary.

If, therefore, ovulation occurred oftener than at or about the time of a menstrual period, the signs of the previous ovulations, viz. scars of corpora lutea, would be increased in number, and would not correspond to the number of menstrual periods experienced, as they practically invariably do.

If ova were habitually discharged independently of menstruation—say one or two ova every week, and by each ovary—then at the end of a lunar month of four weeks we ought to find post-mortem from eight to sixteen corpora lutea in the two ovaries for each month or menstrual period, which is absurd.

W. Williams[1] says:

"We must conclude that ovulation and menstruation usually occur about the same time, but that one not infrequently antedates the other by a few days."

The fact should be pointed out that, *if a girl have menstruated only three times in her life, only three ovulation scars will be found in her two ovaries.* If ovulation usually occurred, say weekly, that girl, having seen three monthly or menstrual periods, should have exhibited in her two ovaries not three cicatrices only, but from twelve to twenty-four at least, that is, one each week from each ovary; so that these *scars* or *signs of ovulation equal the number of menstrual periods experienced.*

Strassman, quoted by *Macnaughton-Jones*,[2] says:

"Anatomical examinations on the number of corpora lutea, contrasted with the number of known menstruations, establish the connection between ovulation and menstruation;" and "Each menstruation is the expression of an ovulation."

Whether the two processes strictly agree as to time is

[1] Williams, *op. cit.*, p. 77.

[2] Macnaughton-Jones, "Diseases of Women," 8th ed. 1900, p. 34.

immaterial; in fact, ovulation probably usually precedes menstruation by a day or two. Ovulation is certainly a painless and spontaneous process, which we are quite unable to induce, though sexual excitement probably helps to do so.

Ovulation is **the** function of the ovaries, the period of functional activity of the ovaries is coincident with the woman's menstrual life; so that both ovulation and menstruation occur only during the period of a woman's potential fertility.

That menstruation and ovulation are dependent on a common cause is evident from the facts that—

What stops ovulation also stops menstruation: in the complete congenital absence of the ovaries, though the uterus be present, menstruation does not occur.

When the ovaries atrophy in old age, menstruation stops.

When, as is normal prior to puberty, the ovaries are not active and ovulating, menstruation does not occur, so that when ovulation begins menstruation also usually begins.

Alban Doran[1] has pointed out that among the Esquimaux, during the Arctic winter, breeding is arrested, and is accompanied by cessation of menstruation during that time also; so that the *cold which stops ovulation also stops menstruation.*

Because instances have occurred where menstruation (?) has recently happened, and no trace of the ripening of an ovum has apparently been found, it has been alleged that menstruation can occur without ovulation. This statement must be accepted with great reserve. All hæmorrhages in women are not menstruation, and we require to exclude several conditions and morbid growths as causes, before deciding that the hæmorrhage was a true menstrual period. We should not forget that the hæmorrhage from bleeding piles *has* been taken for menstruation!

Then, too, failure to find what is deemed a recently ruptured Graafian follicle is no proof that ovulation did not occur, and it is probable that in young women a corpus luteum of menstruation often disappears more rapidly than we usually expect, and thus resembles a corpus luteum of a former ovulation, and so is not ascribed to the recent menstruation.

[1] Alban Doran, "Trans. Obstet. Soc.," vol. xl. 1898, p. 166.

W. Williams[1] says:

"In young women, in whom the circulation is active, the degenerated lutein cells are rapidly absorbed, so that in a short time the corpus luteum becomes replaced by newly formed connective tissue which corresponds closely in appearance to the surrounding ovarian stroma."

Some cases may be explained thus. *Leopold*,[2] quoted by Heisler, says:

"If rupture (of a Graafian follicle and extrusion of the ovum) occurs during the intermenstrual period instead of at the time of menstruation, hæmorrhage will be small or entirely wanting, the resulting corpus luteum being called then *atypical*, to distinguish it from the *typical* body formed in the ordinary manner."

Again, hæmorrhage, after the menopause or change of life, often erroneously taken for menstruation, is necessarily unaccompanied by the formation of a corpus luteum in either ovary.

We are forced, then, to agree with *Horrocks*[3] when he says:

"There are no facts which proved that menstruation could take place without ovulation."

As a matter of fact, menstruation cannot occur if all ovarian tissue is absent; it is absolutely dependent on the presence of some ovarian tissue.

[1] Williams, *op. cit.*, p. 68.
[2] Heisler, *op. cit.*, p. 33.
[3] Horrocks, "Trans. Obstet. Soc.," vol. xl. 1898, p. 173.

CHAPTER III

THE FORMATION OF OVA

In the human embryo the surface of each ovary is covered by a thick layer of oblong or columnar cells—the germinal epithelium. From this germinal epithelium all the ova are eventually developed.

Downgrowths of the covering cells or germinal epithelium take place into the substance of the ovary, and from these cells thus carried into the stroma of the gland the Graafian follicles are formed, one or more cells being specially enlarged to form the contained ovum or ova.

These ingrowths of the germinal epithelium take place during intra-uterine life, so that at birth the child's ovaries already contain, though in an immature form, the full number of ova that the adult ovaries contain. The formation of new ova ceases with the birth of the child.

It will thus be seen that all the ova shed during a woman's life are highly matured cells, whose development has been slowly taking place prior even to the woman's own birth.

The ova are not the result of hurried growth, but of careful and very deliberate preparation extending over many years.

No new Graafian follicles are formed after birth, but as the two ovaries together are estimated at puberty to contain some 70,000 Graafian follicles it is evident that only a very few ever reach maturity. The majority of the follicles never ripen, or, if they do, they do not burst—they atrophy and disappear.

Halliburton[1] says :

"Some of the Graafian follicles never burst, they attain a certain degree of maturity, then atrophy and disappear."

[1] Halliburton, "Handbook of Physiology," 5th ed. 1903, p. 801.

The human ovum or sexual cell is a spherical particle of viscous protoplasm of a complicated chemical composition, varying from $\frac{1}{120}$ to $\frac{1}{150}$ in. in diameter; it is a single living cell, capable of further growth and great development if fertilised.

It soon dies after its discharge from the Graafian follicle if not fertilised, its life being counted by days only—thus differing considerably from the **male** sexual cell, or spermatozoon, which can live for weeks even, in the Fallopian tube of a woman.

Though our microscopes are not perfect enough to enable us to detect any differences between them, *each ovum has, I maintain, its own definite and unalterable sex*, being either **male** or **female**, according to the ovary from which it is derived.

And in the same way, the ovum of one woman is indistinguishable by microscope or any apparatus from the ovum of another woman, yet we know there *must* be vast differences between them; similarly the ovum of a negress is indistinguishable by our present appliances from the ovum of a blonde, yet we know full well that if fertilised the one produces a black child, while the other gives rise to a white one.

The difference must be there, but we cannot detect it.

And in animals, just as surely as a cat's ovum, indistinguishable by microscope or other apparatus from that of a bitch, will give rise to a cat and not a dog, so a **male** human ovum, though we cannot yet by any of our present means distinguish it from a **female** one, will as surely give rise to a **boy** and not a **girl**, and *vice versa* the **female** ovum gives rise to a **girl** and not a **boy**.

In structure an ovum is a typical cell, or circular mass of protoplasm with a very fine and delicate cell wall or limiting membrane, called the Vitelline membrane. External to this, but separated from it by a little fluid (the Perivitelline fluid), is a second protective cell wall, the Zona pellucidà or Zona striata.

The perivitelline fluid, therefore, occupies the perivitelline space between the true and the secondary cell walls.

The zona pellucida or zona radiata exhibits hundreds of fine lines or striæ—hence also zona striata—radiating outwards; these fine hair-like lines are really pores or canals,

so that this cell wall is a porous one. Through these canals the ovum is nourished, and through these "avenues of entrance" the moving spermatozoa enter the ovum and so reach the nucleus; they are really multiple "ways in" for the spermatozoa.

In this respect the human ovum differs from those of the invertebrata, which have only one such opening or "way in" for the spermatozoa, called the micropyle; but, as we shall presently see, only one spermatozoon is required to enter the

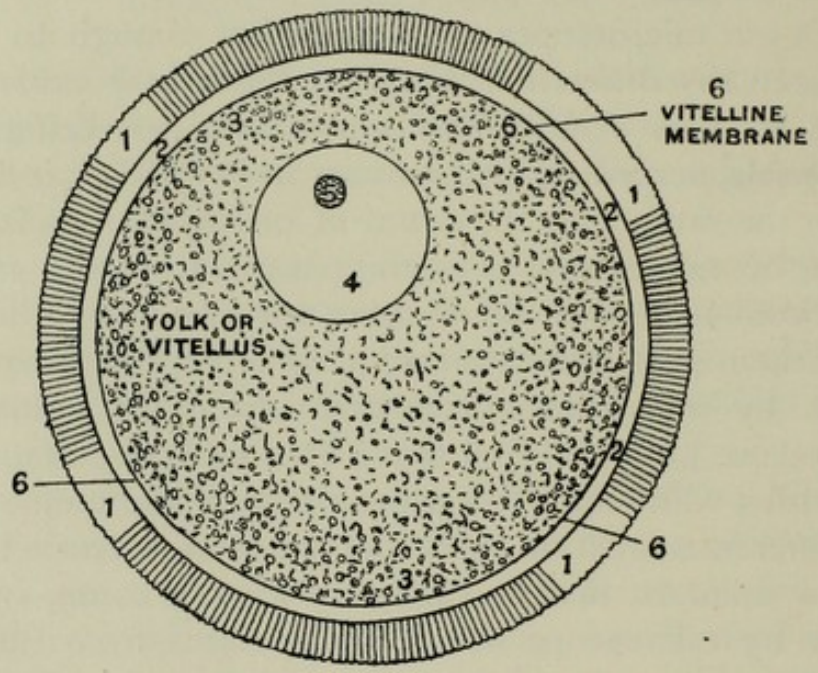

Fig. 10.—Diagram of a Human Ovum. (Much magnified.)

Though this diagram represents the ovum as quite flat, it must be remembered it is a sphere, and more nearly resembles a miniature orange than a vertical section of an orange as the figure would appear to indicate. Compare Fig. 12.

1. Zona Pellucida, the thick cell-wall, showing radiating lines, which are pores or entrances for the spermatozoa. 2. Perivitelline space, containing the Perivitelline fluid. 3. The ovum, filled by the Yolk, or protoplasm loaded with food granules. 4. The nucleus or Germinal vesicle. 5. The nucleolus or Germinal spot. 6. Vitelline membrane or delicate ovum wall.

ovum of the invertebrata in order to fertilise it, so that "the supply is equal to the demand."

The contents, yolk, or vitellus of the cell is protoplasm, and situated eccentrically therein lies the spherical nucleus, $\frac{1}{100}$ in. in diameter, called the germinal vesicle, and this contains a nucleolus known as the germinal spot. *The nucleus or germinal vesicle is the most important part of the whole ovum;* it is usually single, but there may be two nuclei. It is junction

with the nucleus of the ovum by the head or nucleus of the spermatozoon that constitutes fertilisation. We know nothing of the use or function of the nucleolus.

To the protoplasmic vitellus or germ yolk of the ovum is added material called deutoplasm or food yolk, designed for the nutrition of the ovum during the first few days of its development after fertilisation.

The germ yolk is always in great excess compared to the food yolk in a human ovum.

All ova in which the protoplasm, or germ yolk, and the deutoplasm, or food yolk, are uniformly distributed, as in those of the mammalia, including man, are known as Alecithal ova.

The eggs of birds, reptiles, and bony fishes are known as Telolecithal ova ; for the preponderating food yolk is accumulated at one part of the ovum, and the protoplasmic germ disk at, usually, the opposite pole.

NOTE.—Some of the statements as to the very minute structure of cells and their nuclei must be accepted with some reserve, for in the staining and preparation of the cells we cannot be quite sure that we have not ourselves caused the appearances so described, so that the facts may be really artificial ones, or *artifacts*, as they often are called. Hence I shall not detail them, as they do not now concern us.

CHAPTER IV

THE FORMATION OF THE SPERMATOZOA

THE spermatozoa are the essential fertilising constituents of the semen; they float in an albuminous fluid, the liquor seminis.

Each spermatozoon consists of a head $\frac{1}{6000}$ in. long, and a long slender tail from $\frac{1}{400}$ to $\frac{1}{500}$ in. long; a middle portion or body, thicker than the tail, is also described. They therefore slightly resemble miniature tadpoles.

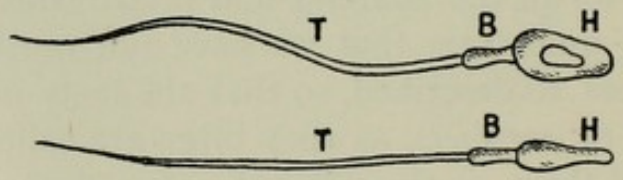

Fig. 11.—Human Spermatozoa. (Highly magnified.)

H. The head, showing a nucleus. B. The body or middle piece. T. Long tail, the source of the motility of the spermatozoon.

The spermatozoa are derived from the spermatoblasts or cells, which form the most internal lining of the seminiferous tubes or seminal canals of the testes. The nucleus of the cell forms the head of the spermatozoon.

The long tail projects into the lumen of the seminal tube, and when fully developed the spermatozoon is set free, and is probably carried to the vesiculæ seminales or receptacles for the storage of the semen.

No spermatozoa are formed till after puberty, usually about the fifteenth or sixteenth year; any seminal fluid in younger boys usually containing no spermatozoa.

Under certain conditions in man the formation of spermatozoa is very rapid, but in no case is their preparation such a long and careful process as is that of an ovum.

It has already been pointed out that the ova are all formed before the child's birth even, the spermatozoa not till puberty, hence the ovum is a far more slowly matured and specialised cell than the spermatozoon. In size, too, the ovum is much more important, the nucleus or essential portion of the ovum being $\frac{1}{100}$ in. in diameter; while the head of the spermatozoon, containing the nucleus or essential portion, is only $\frac{1}{8000}$ in. long; in fact, the spermatozoa are the smallest cells in the body.

The spermatozoon and ovum agree in that each is a small mass of protoplasm containing a nucleus; the former represents a portion of the father's body, the latter a portion of the mother's body.

The long tail of the spermatozoon is essential to its motility or power of progression, and for the most part disappears after the spermatozoon has entered the ovum, that is, when no longer required.

CHAPTER V

FERTILISATION

FERTILISATION is the incorporation of the essential portion of the **male** fertilising fluid, or semen, with the ovum or egg provided by the **female.**

The ovum before, and after, fertilisation are two vastly different things: the unfertilised cell becomes an oösperm or fertilised cell, which differs from the original ovum not only in its chemical composition, but also in its power of life and growth. A portion of the **male** parent's body has by means of the spermatozoon joined the ovum or part of the mother's body, and the germ of a new being begins to grow.

The youngest fertilised human ovum or oösperm ever found and described is the one by Hubert Peters, in 1897, in the uterus of a woman who committed suicide three days after missing her menstrual period; therefore it was at first claimed, on not very conclusive grounds, to be of only three days' development: but we do not know when the fruitful coitus took place—it may have been a day or two or even a week or more previous to the day her period was expected to begin, hence five to twelve days would then represent its age. Though considered to be only three days old by Peters, the ovum, *W. Williams*[1] says, "certainly presents a tolerably advanced stage of development"; while *Heisler*[2] says:

"No observations have been made upon embryos of an age less than four or five days, and but few, indeed, upon those younger than sixteen or eighteen days."

Graf Spee has described two very early fertilised human ova, but both were slightly older than that of Peters. *Leopold*

[1] Whitridge Williams's "Obstetrics," p. 88.

[2] Heisler, "Text-book of Embryology," 2nd ed. 1902.

described one of seven days' development; while *Reichert's* ovum was about twelve days old.

The youngest I have personally met with was certainly less than fourteen days old.

If, therefore, five to twelve days is the youngest oösperm ever seen, it follows that the *actual fertilisation of the human ovum has never been observed*, hence the minute processes and early phenomena incidental to the fertilisation of the human ovum *are unknown*, as *Dr. J. W. Ballantyne*[1] says:

"No biologist and no embryologist has ever seen the human ovum entered by the human spermatozoon."

Indeed, *very few men have even seen a free human ovum*, that is, one discharged naturally from its Graafian follicle, and most observations have been made on ova *artificially* removed from the follicles either after death or while operating under chloroform, etc.

We are equally ignorant with regard to most animals, for, as *Dr. Eden*[2] says:

"The beginnings of development have not yet been made out with precision in *any* of the mammalia."

The actual contact of the spermatozoon with the nucleus of the ovum not having been observed, it is impossible to say how many human spermatozoa are required to fertilise the human ovum.

From analogy it has been believed and dogmatically taught that only one spermatozoon was necessary: this may be so, but it is also open to doubt. One spermatozoon only *may* be sufficient, but it is also quite possible that very often, if not usually, many spermatozoa do so.

Fertilisation of the frog's egg and also of the transparent ova of several of the invertebrates, *e.g.* thread-worms and sea-urchins, has been actually watched. In them only one spermatozoon has been seen to enter the ovum, through the only opening, called the micropyle, in the tunic or wall of the ovum; hence it has been assumed that only one likewise enters the human ovum. Though the entrance of but one spermatozoon is usual, according to among others Van Beneden,

[1] Ballantyne, "Manual of Antenatal Pathology," p. 608.
[2] Eden in Playfair's "Midwifery," 1898, p. 88.

he has actually, though on but few occasions, seen two spermatozoa enter one ovum, while watching the fertilisation of the eggs of the ascaris.

Comparative embryology is at best a doubtful guide, and that it is dangerous to argue from analogy is evident from the fact that there are marked differences in the ova of the mammalia, including the human ovum, and the ova of the fishes, birds, or reptiles, the ova of the latter being meroblastic and telolecithal, while the human ovum is holoblastic and alecithal.

A *meroblastic* ovum means that a portion only of the ovum when fertilised divides or segments, and it contains more food yolk than germ yolk, as it has to develop independently of the mother; while in the *holoblastic* ovum the whole substance divides and subdivides, it contains much more germ yolk than food yolk, because the mammalian embryo very early derives its food supply from the mother while in utero.

It is possible that this initial fundamental difference in the

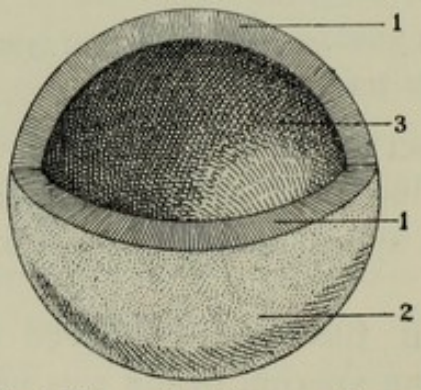

Fig. 12.—Magnified View of a Human Ovum removed from a Graafian Follicle. (Diagrammatic.)

The spherical ovum has been cut vertically and horizontally, to show that the cell-wall is universally perforated by the porous canals for the entrance of the spermatozoa. The outer surface of the ovum, 2, shows the minute puncta or orifices of the canals, which are shown in 1 as radiating lines; 3 shows the interior of the ovum from which the nucleus and the liquid yolk have escaped.

ova is sufficient to require the different number of spermatozoa, more being required when the whole ovum segments as does the human ovum.

There is no micropyle, or specialised "way in," provided in the cell wall of the human ovum for the entrance of the spermatozoa; on the other hand there are multiple, even hundreds, of openings in the human ovum wall, so it is only

reasonable to suppose that hundreds of spermatozoa *do* enter the ovum by them and so reach the protoplasm or yolk of the ovum, whence it is possible that several also enter the nucleus of the ovum.

That the striæ in the zona pellucida are for the passage of the spermatozoa is stated by *Gerrish*,[1] who says :

"The zona pellucida is marked by numerous radiating striæ. The striæ are supposed to be minute canals, through which nutrition reaches the ovum while it is still in the Graafian follicle, and through which the spermatozoa may afterwards pass in the process of fecundation."

Cunningham[2] too says "they allow the spermatozoa to reach the ovicell."

Heisler[3] also confirms this, and points out that these canals

"*correspond in function to the micropyle*, a small aperture found in the less easily penetrable egg envelopes of many invertebrates, and of some fishes."

In the invertebrata, therefore, the supply is equal to the

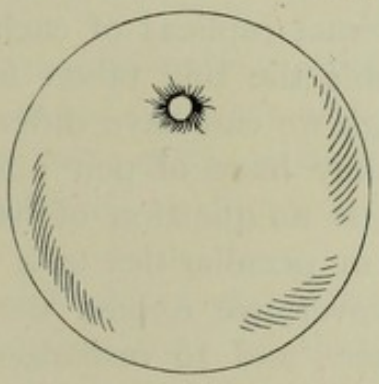

Fig. 13.—Magnified View of the Ovum of an Invertebrate.
The spherical ovum presents one large opening, the micropyle, "the only way," for the spermatozoon.

demand—viz. one micropyle for one spermatozoon. Hence, in those cases where there is only the single micropyle or special "way in" provided in the ovum wall, we should expect that one spermatozoon enters thereby only, because only one spermatozoon is needed. Certainly the provision in the human ovum of multiple avenues of entrance looks as though multiple spermatozoa *are* required to enter thereby, in order to fertilise the human ovum ; or does the supply

[1] Gerrish, "Text-book of Anatomy," 2nd ed. 1903, p. 852.
[2] Cunningham, *op. cit.*, p. 12.
[3] Heisler, *op. cit.*, p. 23.

far exceed the demand—hundreds of ways in for only one spermatozoon!

It is certainly evident, as stated by *Dr. J. W. Ballantyne*,[1] that "what took place in the chick did not necessarily occur in the human embryo"; and even more truly what takes place in the ova of worms and sea-urchins need not occur in the human oösperm. Indeed, *Dr. J. Teacher*[2] says that "each ovum seems to be a law unto itself."

It is not at all difficult to credit that only one spermatozoon is really required to fertilise each ovum of the invertebrata, etc.; for all that is necessary in them is the starting of the process of growth by the junction of the **male** and **female** nuclei. There is no question of the young differing in their appearance or resemblance to either of their "parents"; there is no question of heredity here. If we take among the fish the ordinary herring or cod, we can quite imagine that only one spermatozoon *is* required for each of those scores of thousands of ova we see in the roe, and we know that all the young will be exact replicas of each other, even as the 143 pen nibs resemble the one taken from a gross box of pen nibs; and though we can have different sizes and kinds of fish, as we also may have of pen nibs, it is exact reproduction only—there is no question of heredity or exhibiting ancestral tendencies or peculiarities to a varying degree. In the mammalia, however, we expect the young to differ in their appearances, etc., and to resemble in varying degree one parent more than the other, even as the pups of a bitch vary, though there has been but one father; because a varying number of spermatozoa carry a varying amount of paternal characteristics to each different ovum.

It is because of the astonishing differences, not only facial, in the many children of the same man and woman, that we can be sure that the different number of paternal and maternal features and characteristics inherited by the respective children, must be due to a varying quantity of the paternal body or germ plasm, carried to each ovum fertilised, by the varying number of spermatozoa.

[1] Ballantyne, "Journal of Obstetrics and Gynæcology," 1902, vol. i., p. 698.

[2] Dr. J. Teacher, "Journal of Obstetrics and Gynæcology," July 1903, vol. iv. p. 25.

If there were always a fixed and unalterable number of spermatozoa, never more than the one or solitary spermatozoon (as in the invertebrata), to carry the paternal plasma to each ovum, there would be no differences in the amount of germ plasm so carried, and thus no variations as regards paternal characteristics in the different children of the same man and woman would appear.

But in mankind we have not absolute reproduction or identical repetition: we have multiplication with modifications, differences, or variations; and, as we shall subsequently see, these differences are due to the relative quantities of **male** and **female** germ plasm present in the yolk of the ovum just fertilised.

Nature would hardly be so prolific in her supply of human spermatozoa to the single ovum if one only were necessary; for certainly the *enormous* number of spermatozoa provided each time, and *their very frequent renewal*, and their long life in the Fallopian tubes, point rather to the necessity of multiple spermatozoa.

Nature may well require only a single spermatozoon in those cases where sexual congress and fertilisation are an annual, or at most a half-yearly occurrence, and the ova to be fertilised are numbered by hundreds or even hundreds of thousands.

A further reason for objecting to the description of the fertilisation of the human ovum as absolutely analogous to the fertilisation of the eggs of starfish, sea-urchins, and thread-worms, is derived from the fact that even the human placenta, or "after-birth," cannot be studied from animals, as it greatly differs from that of all placental animals; further, the placenta differs greatly in different classes of animals, and also in different species of the same order of animals; and, by the way, all the *herbivorous* mammalia actually eat the placenta after giving birth to their young!

Marchand[1] says:

"It is clear that conditions found in animals cannot be directly employed in settling this question (details of origin of cells of placenta), owing to the great differences between the human placenta and that of lower animals";

[1] F. Marchand, "Journal of Obstetrics and Gynæcology," July 1903, vol. iv. p. 75.

and *Dr. J. Teacher*[1] cautions us that we can derive but little assistance from the animal kingdom when we study the attachment of the human ovum—that is, the origin and growth of the human placenta.

It seems most unreasonable, therefore, when human placentation cannot be studied from placental mammals, that fertilisation in woman, a vertebrate placental mammal, should not only be studied, but declared identical with fertilisation in the invertebrata!

The essential act in fertilisation, then, is the union of the **male** nucleus of the single spermatozoon with the **female** nucleus of an ovum.

Segmentation of the combined nucleus then rapidly occurs, for the development of a new individual has begun.

It is usual to claim that, besides together forming the new individual, the two fused nuclei have between them conveyed to it its hereditary tendencies, etc.—*i.e.* the characteristics which are transmitted from the parents to the children! inheriting the paternal peculiarities through the single nucleus of the single spermatozoon, and the maternal from the single nucleus of the ovum.

Now, if the quantity of the germ plasma, or material for conveying the hereditary tendencies, is thus always in amount definite and uniform, because arising from the single nuclei only, it seems quite unreasonable that there should be the great differences which we know do occur in the various children of the same parents.

If, therefore, only the **male** and **female** nuclei are essential to fertilisation and the production of hereditary peculiarities, the remainder of the spermatozoon—consisting of the protoplasm of the head other than the nucleus, the middle piece, as well as a portion at least of the long tail, together with the yolk of the ovum, consisting of the germ yolk or plasm of the mother (as well as the food yolk)—is to be looked upon either as functionless or nutritive only.

We shall, I think, be more correct if we look upon the whole spermatozoon, head, middle piece, and (?)tail, as bearers of **male** heredity, and the formative or germ yolk of the ovum,

[1] Dr. J. Teacher, "Journal of Obstetrics and Gynæcology," July 1903, vol. iv. p. 25.

as well as the nucleus, as bearing the **female** hereditary features. Consequently the number of spermatozoa which enter the yolk of the ovum and are dissolved in it, varying with each fertilisation, causes us to obtain the varying proportion of paternal or maternal characteristics seen in the children of the same parents irrespective of their sex. Many spermatozoa entering the ovum lead to a father-like child, whether **boy** or **girl**; a few only entering leave the yolk still maternally superior or prepotent, so that the child, whether a **boy** or **girl**, takes after the mother.

Those who credit that fertilisation in a woman's ovum is absolutely identical with fertilisation in sea-urchins and starfish, will find it difficult to explain the experiments of *Boveri* and of *Delage*. They have both succeeded in fertilising the sea-urchin's ovum, as well as that of the starfish and some other invertebrates, after having completely removed the nucleus from the ovum! This should certainly make us hesitate to believe that the details are identical when the human ovum is fertilised with what has been actually watched in the invertebrata.

Recalling here that fertilisation takes place *inside* the human body, while in sea-urchins, starfish, many fish, and some amphibians it takes place *outside* the body, it will be seen that *Dr. J. W. Ballantyne's*[1] warning that "it is not safe to conclude that what occurs in the lower animals will occur in the human subject," is fully justified, and so I claim that there is scarcely evidence enough to warrant the absolute statement that only one spermatozoon *is* required for the fertilisation of the single human ovum nucleus.

Polyspermy, or the entrance of multiple spermatozoa into the ovum nucleus, has been blamed for the production of human deformities on no reliable evidence; for who sees the fertilisation of the ovum when a monstrosity is produced? It has also been blamed for the production of twins and plural births on equally inaccurate data, for we know that usually when these occur, multiple ova as evidenced by multiple corpora lutea, have been produced.

I maintain that multiple—a varying number, sometimes many hundreds—of spermatozoa enter the *ovum* through

[1] Ballantyne, "Manual of Antenatal Pathology," 1904, p. 24.

the striæ in the zona pellucida; but as we cannot prove the contrary, I shall follow the usual course and describe the fertilisation of the *ovum nucleus* as due to a single spermatozoon from among the many which enter the vitellus of the ovum.

If, therefore, one spermatozoon only is required, and one only normally does fertilise the human ovum nucleus, it is abundantly evident that which spermatozoon actually does so out of the many hundreds of thousands of spermatozoa provided must be a matter of chance; and, as nature leaves nothing to chance, it is illogical to assume that this chance microscopical single spermatozoon, besides fertilising the ovum nucleus, also, according to some, settles the sex of the coming child, and likewise imparts to the oösperm the form and face, talents and tendencies, coloration of hair, skin, and eyes, movements and mannerisms, and even diseases of the father. That seems surely too much to ask of one spermatozoon!

NORMAL SITE OF FERTILISATION.—There is every reason to believe that fertilisation usually takes place in the Fallopian tube, and not in the uterus; if the uterus were the proper site for fertilisation, then tubal pregnancies could not occur so frequently.

The discovery in utero of an early fertilised ovum is no proof that that ovum was not already fertilised when it first reached the uterus; on the other hand, tubal pregnancies are so numerous that they must be looked upon as cases of abnormal arrest of a normally fertilised ovum in its progress along the tube, and not as cases of abnormal fertilisation in an abnormal site.

We are forced, then, to the conclusion that the actual site where fertilisation normally takes place is the Fallopian tube; probably it occasionally occurs in the body of the uterus, as it undoubtedly also does, on very rare occasions, in the recently ruptured Graafian follicle on the surface of the ovary; hence the site of fertilisation is not identical in all cases.

Garrigues[1] says:

"The Fallopian tubes are the canals through which the ova pass from the ovaries to the uterus, and in which probably, in most cases,

[1] Garrigues, "Diseases of Women," 3rd ed. 1900, p. 68.

impregnation takes places by the union of an ovum and one *or more* spermatozoids."

So usual is it for spermatozoa to be found waiting for the ovum in the Fallopian tubes of women in whom sexual congress regularly occurs, that the Fallopian tubes are now regarded as receptacles for the semen.

Most often, then, the fertilisation of the ovum and its conversion into an oösperm take place in the Fallopian tubes, both in women and the mammalia; it then safely makes the journey down the Fallopian tube to the uterus, which is, in fact, the incubator or nest for the fertilised egg.

On its arrival there, it finds a bed, or nidus, in the shape of a thick vascular mucous membrane, into which the ovum sinks, and thus secures a safe resting-place.

The site where it anchors or embeds itself is usually either the anterior or posterior wall of the uterus, but may be at any part of the uterine wall, even low down near the cervix, as in cases of placenta prævia. To whatever part it attaches itself, the now living and growing ovum practically eats or bores its way into the substance of the congested mucous membrane, and the result of the activity displayed by the growth and the fixation of the oösperm is that the mucous membrane does not degenerate and wither, but maintains its integrity and position, and thus menstruation is arrested: the woman is pregnant.

If the ovum set free be not fertilised, menstruation occurs—that is, hæmorrhage occurs from the congested superficial vessels, and portions of the epithelial lining of the congested uterine mucous membrane degenerate and are shed.

The site of attachment of the oösperm, the future placental site, is usually in the corresponding half of the uterus to the Fallopian tube it has just travelled down. *Garrigues*[1] says: "The fertilised ovum is, as a rule, arrested near the internal opening of one of the Fallopian tubes"—*i.e.* it is more to one or other side of the mid-line of the anterior or posterior uterine wall; it may be quite on the lateral wall; or it is in the corresponding cornu, or uterine

[1] Garrigues, "Obstetrics," 1902, p. 29.

horn, if the uterus be a double one. In the uniparous mammalia, too, the site of attachment (placental site) is usually in the corresponding horn to the ovary from which the ovum was derived, but not invariably so.

The site *may*, however, be more to the opposite side of the uterus, or even in the opposite cornu or horn if the uterus is double ; or again, it may be low down near the cervical orifice. We know not what determines its precise spot of anchorage ; it can undoubtedly travel to *any part* of the uterine wall.

This occurrence of implantations of the oösperm in the horn of the uterus of the opposite side to the ovary from which the ovum was derived, has long been known ; it occurs both in women and in mammals.

It may be due either to the ovum passing through the uterus from one side to the other, or else to its not entering the Fallopian tube on its own side, but passing along the surfaces of the intestines to the other side of the uterus, where it thus enters the opposite Fallopian tube. This is known as the migration of the ovum, internal and external respectively. I reserve the full discussion of the matter to Chapter XIII.

It is to be recalled that fertilisation of the ovum is more correctly fertilisation of the ovum nucleus. An account of the minute details after fertilisation, as studied in starfish and sea-urchins, by which the single male nucleus and female nucleus approach and coalesce, and how the oösperm thus formed divides or segments, to form the primary embryonic structures, is not necessary to the task of solving the cause of sex.

CHAPTER VI

THE THEORY AND ITS EXPLANATION

THERE being, as we have seen, two ovaries, a **right** and a **left**, it follows that the ova produced are either **right** or **left** ova, also that as the **right** ovary is larger than the **left**, more **right-sided** ova are usually produced.

If, as must and does sometimes occur, the two ovaries each happen to have equally matured a Graafian follicle, we get a simultaneous, or nearly so, rupture of the follicles and discharge of the contained ova; that is, we get two ova to be possibly fertilised—for, of course, this does not necessarily always occur.

Should fertilisation of both occur, we get two fœtuses, or twins, owing their origin to the fertilisation of ova from different ovaries, the sexes differing, as we shall see later. This is not, however, the only mode of origin of twins, though it is the commonest; but I will refer to the subject of twins further on.

Much more frequently only one ovary matures a follicle, and a single ovum only is produced: if, now, as the result of the unilateral ovulation, the single ovum be fertilised, we get what is normal in mankind, viz. a single birth; if double or bilateral ovulation were the rule, and there were always two ova shed, surely both would usually be fertilised, and twins would become the rule and single pregnancies the exception, for it would not be expected that if two ova were *always* provided, one only would be fertilised and the other left.

This brings me now to the dominant influence of the supplying ovary over the sex of the resulting fœtus. The

supplying ovary is in reality the ESSENTIAL FACTOR IN THE CAUSATION OF SEX.

This, then, is my theory, that the sex of the fœtus is *not* due to the male parent, but depends on which ovary supplied the ovum which was fertilised, and so became that fœtus.

I find that a **male** fœtus is due to the fertilisation of an ovum that came from the **right** ovary, and a **female** fœtus is due to the fertilisation of an ovum that came from the **left** ovary.

I will explain the theory more in detail.

FIRST, then, my theory maintains that the **male** parent or father has *no* influence in the causation of sex, which rests entirely with the **female** or woman. She has in her two ovaries the already definitely sexed ova ready only for the fertilising action of the male semen, so that though man or the male fertilises the ripened ovum, he does not (to coin a word) sexify it or cause its sex.

No theory which I can discover has hitherto entirely dissociated the **male** parent, as I do; hence it is entitled to be called a new theory.

Every theory in which the father is credited with being even partly responsible for sex causation differs materially from mine.

In this category come a great many of the old and mythical theories. These in differing methods and ways ascribed to the two testicles, if not the chief, at least a great part in the *sexifying* of the ovum.

I do not propose to enter fully into these theories, none of which were based on clinical facts or cases, but will only shortly mention their chief points.

One maintained that sex was entirely due to the **male**—that the spermatozoa not only fertilised, but also gave the sex to the ovum.

Hippocrates thought that the future sex was determined by the relative prevalence of the **male** or **female** semen, either as to the quantity of it, or else the relative strength of it.

Leeuwenhoek went so far as to suppose he could see a difference of sex in the spermatozoa upon which depended the sex of the future fœtus.

Another theory maintained that fertilisation could only take place by the junction of the spermatozoa and ova of the same side of the body, so that a **left-sided** ovum could not be fertilised by a **right-sided** spermatozoon, and *vice versa*.

This theory received the support of *Hencke*, who in 1786 wrote a book based on this assumption, also claiming that **males** were derived from the union of **right** spermatozoa with **right** ova only, and **girls** from the union of **left** spermatozoa only with **left** ova only. This theory differs therefore widely from mine, in spite of several critics, because I say the spermatozoa do not influence sex at all.

I fully discuss the question of the paternal influence on the sex of the future child in Chapter VII.

SECONDLY, my theory maintains that **male** ova are restricted to and come only from the **right** ovary, and **female** ova only from the **left** ovary.

It matters not from which testicle the spermatozoon is derived which fertilises the ovum, the essential point being that sex is due to the ova always having their definite and unalterable sex prior even to ovulation.

It follows that directly an ovum is fertilised, a **boy** or a **girl** has begun to be developed, and no external or other influence brought to bear on the mother can alter the sex of the future child.

To inquire why the ovary of the **right** side should have been chosen for the production of **boys** rather than the other side seems as fruitless and as useless as to inquire why the liver should have been placed to the **right** and the spleen to the **left** of the body.

Galen said it was due to the **right** side being warmer than the **left**, but how this can rank as cause and effect I know not.

It is, however, reasonable to suppose that the association of the **left** ovary with the production of the **female** sex is due to the fact that the weaker sex should result from the weaker side of the body.

That the **left** side of the body is the weaker of the two is manifestly true, for as *Herman*[1] says :

"The **left** side is weaker than the **right**, not only in muscular strength, but in power of resistance to painful impressions. This is illustrated by

[1] Herman, *ob. cit.*, p. 71.

the fact that in cancer, which has no preference for the **left** side rather than the **right**, pain is more common on the **left** side. So it is in displacements of the uterus, although the changes in this condition have no unilateral character; and in the pain down the thigh from hæmorrhoids."

So that the weaker sex are derived from the ovary of the **left** or weaker side, while the larger and stronger **males** come from the larger **right** ovary. *Dr. T. G. Moorhead*[1] has shown that a child even at birth begins its "existence with a marked right-sided bias."

Taking it for granted, then, that only one ovum is produced at a time, the question comes, from which ovary does it arise? There can be but little doubt that it is provided more or less alternately by first one ovary and then the other; for although there are two ovaries, and both are normally active, they do *not work synchronously*: one ovary only discharges an ovum at a time, so that double or bilateral ovulation is not normal. *Négrier*[2] says:

"The ovaries perform alternately, for I find in one ovary a recently ruptured follicle, and in the opposite ovary one coming forward."

Further, he says that:

"In women, having double uterus and vagina, the menses have come from each side alternately."

A case published recently by *Jurinka* proves this, as also does a case of *Engel's*.

That unilateral ovulation is the rule is proved post mortem by cases where only a few and definite number of menstrual periods have occurred. We are then able to see and count the cicatricial pits or scars, the remains of the corpora lutea, and find them in the *two ovaries together to equal the number of periods passed.* We do not find that each ovary has pits or scars equal in number to the number of menstrual periods; but that if, for example, as in one of the following cases, only three periods had been experienced during life, each ovary has not three pits or scars, but the two ovaries have three scars between them.

[1] Dr. T. G. Moorhead in "Transactions of Royal Academy of Medicine, Ireland," 1902.

[2] Négrier, "Anatomical and Physiological Researches on the Human Ovary." Paris, 1840.

The following cases support and prove this:

Mr. Girdwood[1] exhibits a preparation taken from a young unmarried female who he knew had menstruated about thirty-six times.

"The ovaries presented several indentations or small cicatrices about the size of mustard seeds. From thirty-two to thirty-four of these marks could be detected—about eighteen in one, and sixteen in the other ovary."

"A young woman died under my care. She had menstruated three times. The surfaces of one ovary presented two cicatrices; that of the other, one."

"Jane C——, aged eighteen, died of consumption. She had menstruated only six times. We could readily detect five depressions or cicatrices—three on one, two on the other ovary; of a sixth we were doubtful."

I.e. there were not six ovulation scars in each ovary, but six in the two ovaries together.

"Miss G—— had been regular for two years previous to her sudden death. In her I found post mortem about twenty-two of the usual marks on the ovaries."

That is to say, there was definite proof of twenty-two ovulations by the two ovaries *together*, not by *each* ovary, as there would have been had ovulation been bilateral every month.

"Emma Bull died yesterday. Two years ago she menstruated, this being the first and only time she had ever had that secretion. I opened the body. The ovaries were plump and rather larger than usual, soft to the touch, and glistening. There was no mark or scar whatever on the right ovary; but on the left there existed a reddish part about the size of a mustard seed, which had quite the appearance of an ulceration skinned over."

That is, one menstruation, one ovulation scar in one ovary only.

In the following cases, examination of the ovaries *during* menstruation reveals only one ovary as having just ruptured a Graafian follicle—that is, one ovary only has ovulated.

Dr. R. Lee[2]—

"examined the body of a young woman who died *during* menstruation from inflammation of the median basilic vein. The left ovary was larger

[1] Braithwaite's "Retrospect of Medicine and Surgery," vol. vii. 1843, pp. 261-3.

[2] R. Lee, "Braithwaite's Retrospect," vol. i. 1840, p. 397.

than the right, and at one point a small circular opening was observed in the peritoneal coat, which led to a cavity of no great depth in the ovary. The right ovary was in the ordinary state."

"A woman under twenty years of age died suddenly from acute inflammation of the lungs *while* menstruating. A red, soft, elevated portion of the right ovary was observed, and at one part the peritoneal coat to a small extent had been removed. Under the opening was an enlarged Graafian vesicle filled with transparent fluid. The left ovary presented a natural appearance."

J. Bland-Sutton[1] says:

"The evening before the operation the patient *commenced to menstruate.* When the cyst was drawn up from the pelvis a small rounded aperture was noted in the peritoneal covering, from which a few drops of blood issued. Examination of the parts showed this to be a recently ruptured follicle."

That is, one ovary only, though in this case partially occupied by a tumour, had ruptured a Graafian follicle, coincidently with the onset of menstruation.

Dr. John Phillips[2] describes a case of a woman dying *during* menstruation from purpura hæmorrhagica:

"In the right ovary, at the site of the corpus luteum, there was a hæmorrhagic infarct the size of a marble."

In this case, therefore, menstruation had been accompanied by unilateral ovulation and the formation of a *single* corpus luteum, not one in each ovary.

Garrigues[3] says:

"The fact is, we, as a rule, find only one fully developed or ruptured follicle corresponding to a menstruation."

We are therefore justified in saying that the number of pits, scars, or cicatrices in the two ovaries being nearly equal, and *together* equalling the known number of menstrual periods experienced, not only proves unilateral ovulation, but also necessarily implies that such ovulation must be practically alternate from the two ovaries.

In animals, too, in whom single pregnancy is customary, only one ovary ovulates at a time. This is borne out by the

[1] Bland-Sutton, "Diseases of Ovaries," 1891, p. 46.
[2] J. Phillips, "Trans. Obstet. Soc.," vol. xxxiii. 1891, p. 395.
[3] Garrigues, "Obstetrics," 1902, p. 17.

observations of *Heape*[1] on monkeys. These animals are monotocous—*i.e.* have but one at a birth—and he found the ruptured Graafian follicle *on one side only*. They had "a more or less prominent discharged follicle in one or other of their ovaries"—that is, *not* one in each ovary—so that ovulation had been unilateral and not bilateral.

Of course, in the polytocous animals—such as pigs, foxes, dogs, cats, rats, and rabbits, etc., where multiple births are the rule—each ovary ovulates, and yields several ova. It is only when the ovaries have provided ova that the **female** animal permits insemination; hence both ovaries in the polytocous animals act at the same time.

I have found as many as eight corpora lutea in one ovary of a rabbit, and six more in the opposite one, fourteen in all; while five corpora lutea in each of a sow's ovaries is not a very unusual number.

Every theory of the causation of sex hitherto brought forward, other than the association, in some way or other, of the **right** side with the production of the **male** sex and the **left** for the **female** sex, has been met and answered by a diametrically opposite or contradictory theory; thus—

Canestrini maintained that sex was due to the number of spermatozoa which entered the ovum. The greater the number of spermatozoa the more **male** children are produced; a few lead to **girls** being born.

Dr. J. Ross ("Lancet," 1884, p. 48) held just the opposite; he says: "A few spermatozoa lead to **male** offspring."

Geddes and *Thomson* ascribed the production of **males** to a katabolic habit of body, and of **females** to an anabolic habit.

Dr. Andrew Wilson, F.R.S.E. ("Lancet," 1891, p. 713), says exactly the opposite: an anabolic habit of body produces **males**, a katabolic habit of body produces **females**.

The theory that sex is dependent on the relative ages of the parents led to—

Hofacker and *Sadler* maintaining that the older parent produced its own sexed offspring.

[1] Heape, "Trans. Obstet. Soc.," vol. xl. 1898, p. 167.

This was directly contradicted from a larger number of cases by—

Berner and *Stieda*, who held that the younger parent produced its own sexed offspring.

Girou promulgated the comparative vigour theory—that the *stronger* parent produced its *own sexed* children, so that if a woman were the stronger a **girl** was born.

Vilson and many others say just the opposite—viz., that the *weaker* parent produces its *own sexed* children, or the stronger parent breeds the opposite sexed child to itself, and thus a stronger woman should breed **boys.**

Mayerhofer advanced the view that it was the fresh and unexhausted state of the father which led to **male** offspring, so that when a bull or ram was fresh and newly turned among the cows or ewes he bred more **males** or his own sex.

Dr. P. Tuckey ("British Medical Journal," January 19, 1901) says just the opposite—that when a bull or ram is newly turned out among the herds of cows or ewes, the offspring of the **females** served early were mostly **females**; the later ones were **males**: that is, when the father was fresh and not exhausted he bred the opposite sex.

The theory that infrequent sexual intercourse leads to **female** children has been met by the opposite one—that this is responsible for the production of **boys.**

This fact I have here alluded to, that nearly every invented theory has found some one else bring forward another theory exactly opposite to it, is proof that neither of them could be the correct solution of the problem of the causation of sex.

But the exception to the above statement is the theory which I propound—viz. that the **male** parent has nothing to do with the sex of the offspring, which is absolutely the prerogative of the woman or **female** parent, who has in her two ovaries the different sexed ova—the **male** in the **right** ovary, the **female** in the **left** ovary.

This theory receives considerable confirmation from the fact that the **right** side of the body in both the **male** and **female**

parents has always been allocated to the production of the **male** sex, and, *vice versa*, the **left** side has always been attributed to the **female** sex.

By this I mean that no one has ever yet, as far as I can discover, introduced an opposite theory, in which the **right** side has *in any way whatever*, or in either parent, been held responsible for the production of **girls**, or that the **left** side produced **boys**.

My theory, then, is remarkable as the only exception to the rule that, given a theory, an opposite or contradictory one is soon brought forward to disprove it.

In various ways and ideas, then, the **right** side has always been assigned to the **male**, and the **left** side to the **girls** or **females**. Thus—

The secretion of the **right** testicle plus that from the **right** ovary together produced **boys**, according to *Hippocrates*, *Anaxagoras*, and later *J. Hencke*.

The **right** side in both parents, because it was the warmer, produced **boys**, according to *Galen*.

Turning by the woman on to her **right** side after coition, to ensure semen falling into the **right** side of uterus, produced **boys**, according to *Avicenna* of Ispahan.

Habitually sleeping on the **right** side of the wife produced **boys**, according to *T. B.*, "Lancet," 1870.

Sex is due to the spermatozoa only: the **right-sided** spermatozoa are **male**, and produce **boys**, according to *Michael Scott*.

Sex is due to the ova only: the **right-sided** ova are **male**, and produce **boys**, according to *E. Rumley Dawson*.

Further, when pregnancy is present it has been said by *Albertus Magnus*:

If a pregnant woman in walking moves her **right** foot before her **left**, she will have a **boy**,

If in a pregnant woman the **right** breast is harder and larger, she will have a **boy**.

The following facts seem in a measure to support the allocation of the **right** side to **males**: Men, *Havelock Ellis*

says, have better sight with the **right** eye, women better sight with the **left** eye; and in domestic matters it is curious that men have the buttons on the **right,** women have their buttons on the **left** side of their clothes; and whereas men usually put the **right** arm first into their coats, women usually begin with the **left.** The name Benjamin, too, is suggestive.

CHAPTER VII

DOES THE MALE PARENT OR FATHER INFLUENCE THE SEX OF THE COMING CHILD?

IT will come as a serious blow to the vanity of man to know that this question must be answered with a decided negative.

Man, or the **male,** has nothing to do with the causation of the sex of the future child.

In the act of insemination, the semen comes *viâ* the ejaculatory ducts from both testicles simultaneously, and from the reservoirs or vesiculæ seminales which store the secretion from both the testicles. Out of this mixture of spermatozoa from the two testicles, some chance spermatozoon fertilises the carefully prepared and sexually distinct ovum derived from a single ovary. Which spermatozoon[1] from the number which collect around an ovum actually does fertilise the single ovum nucleus must be purely a matter of chance, but man's part in fertilisation and generation has ceased with the supplying of this single chance spermatozoon. Can we credit, then, that this sperm-cell, rapidly formed in the testis, can be the instrument chosen from among hundreds of thousands of others to determine the sex of the future child?

Its life-history is so short, and its successful junction with the ovum so much a matter of chance, that it compares very unfavourably with the ovum, which, though truly only a single cell, has enjoyed almost a monopoly in the maternal production.

This ovum, which was present in its mother's ovary prior even to her own birth, has been carefully preserved for some

[1] I here assume that only one spermatozoon is requisite for fertilisation.

twenty-five years; if the woman is of that age, and for some months has been an object of careful preparation and maturation, it is therefore no chance production. It carries with it, I say, its definite unalterable sex, and awaits only fertilisation.

That the human ova have their sex already definitely fixed prior even to their dehiscence, I stated in my paper in the Obstetrical Society's "Transactions" for 1900, vol. xlii., p. 356, The **male** ova arise from the **right** ovary and the **female** from the **left** ovary, so that the **female** infant is born with her primitive ova already either **male** or **female**, and thus the causation of sex comes to be dependent on the woman alone.

From a leading article in "The British Medical Journal"[1] I see that *Dr. Lenhossék*, Professor of Anatomy at the University of Budapest, has quite recently expressed a similar belief. He says the sex of the offspring is determined before impregnation takes place.

"It follows, then, that the sex of the offspring is decided not by both, but by one only of the parents, and Professor Lenhossék is of opinion that biological experiments show that it is the mother, and not the father, that possesses this power. The sex of the ovum is fixed before the spermatozoon fertilises it."

That our microscopes are not at present powerful or complete enough to differentiate a **male** from a **female** ovum is admitted, but we may by an improved microscope or Röntgen or other rays be able to some day thus recognise a difference in them.

To quote again from "The British Medical Journal":

"The ova in the human subject, and in many of the animals, do not indeed show any sexual dissimilarity either in their histological or in their chemical characters; but similarity in these details may be only apparent, not real. Nature is constantly teaching us that dissimilarity may exist when we cannot perceive it. He is a bold histologist who will nowadays maintain that no difference exists between two masses of protoplasm simply because his microscope reveals to his eye no difference between them."

I have already said the causation of sex is dependent on the woman alone; it comes to be essentially her prerogative.

[1] May 9, 1903, p. 1101.

She prepares an ovum (**male** or **female**) in much the same way as a parlour-maid prepares and lays a fire—it may be a coal or a wood one—and waits for the match to be applied before the fire develops. The application of the match to the fire in the grate, whether wood or coal, starts the fire—it does not make a coal fire into a wood one or *vice versa*; and in a similar manner the penetration of the spermatozoon into the prepared ovum starts the process of development of a child, a boy or girl being produced according to which ovary prepared the ovum. Hence the part played by man is that of applying the match or stimulus which starts the process of development and growth of the offspring from the ovum. Man, in fact, is the fire-lighter, not the fire-layer.

Aristotle long ago held that woman supplied the primary material for the development of the future individual; and it was the function of the man to *give the impulse* in consequence of which the future individual came into being: I now apply this to sex causation. The woman supplies a definite and unalterable sexed ovum, the prospective maleness or femaleness of her ova being fixed prior even to her own birth; man supplies the stimulus which causes the first steps in the child's development; together the man and woman impart to it, in varying degree, its individuality, its heredity, its ancestral characteristics and likenesses.

We shall now see how clinical facts and cases support these views: that the **male** parent does *not* influence the sex of the coming child is proved by such cases as these, where a woman has *one-sexed children only by different men*; thus:

Mrs. V. L. by her	first husband	had	2 **girls**	0 **boys** by either.
„ „	second „	„	4 „	
Mrs. S. A. by her	first husband	had	2 **girls**	0 **boys** by either.
„ „	second „	„	3 „	
Mrs. P. J. by her	first husband	had	5 **girls**	0 **boys** by either.
„ „	second „	„	1 **girl**	
Mrs. R. L. by her	first husband	had	1 **girl**	0 **boys** by either.
„ „	second „	„	3 **girls**	
Mrs. P. B. by her	first husband	had	2 **girls**	0 **boys** by either.
„ „	second „	„	2 „	

Mrs. Mk. by her first husband had 4 **boys** } 0 **girls** by
„ „ second „ „ 3 „ } either.
Mrs. S. by her first husband had 3 **boys** } 0 **girls** by
„ „ second „ „ 3 „ } either.
Mrs. L. T. H. by her first husband had 2 **boys** } 0 **girls** by
„ „ second „ „ 1 **boy** } either.
Mrs. L. D. by her first husband had 4 **boys** } 0 **girls** by
„ „ second „ „ 1 **boy** } either.
Mrs. W. by her first husband had 2 **boys** } 0 **girls** by
„ „ second „ „ 1 **boy** } either.

Surely if the husbands settled the sex, the above mothers would have had mixed children, instead of only one-sexed children by two different men; the wives were unilaterally sterile.

In the following cases the husband of more than one wife gets one-sexed children only from each wife; but as they differ in the different wives, while the sexual act is the same for each wife, the inference must be that the wife settles the sex.

Mr. G. Y. by his first wife had 3 **girls**, 0 **boys**.
„ „ second „ 3 **boys**, 0 **girls**.
„ „ third „ 1 **boy**, 0 **girls**.

Mr. L. by his first wife had 3 **boys**, 0 **girls**; then he married a widow *who already had one girl by her first* husband; by the widow, his second wife, L. had 3 **girls**, 0 **boys**.

Mr. P. by his first wife had 3 **boys**, 0 **girls**.
„ „ second „ 5 **girls**, 0 **boys**.
Mr. S. by his first wife had 7 **boys**, 0 **girls**.
„ „ second „ 1 **girl**, 0 **boys**.
Mr. H. B. by his first wife had 3 **boys**, 0 **girls**.
„ „ second „ 4 **girls**, 0 **boys**.

In the above cases the fathers produced both-sexed children with *different* wives, but only *one* sex with *each* wife,—*i.e.* the father did not influence the sex; the women were "unilaterally" sterile.

In the following cases the man gets both-sexed children with one of his wives, but only one sex with the other, because she is "unilaterally" sterile; if it depended on the male he should get both-sexed children with both wives.

Mr. Mll. by his first wife had four **girls**, no **boys**; by his second wife had first, a **girl**; second, a **boy**; third, a **girl**.

Mr. C. by his first wife had 2 **boys**, 7 **girls**.
„ „ second „ 4 **boys**, 0 **girls**.
Mr. P. T. by his first wife had 3 **girls**, 0 **boys**.
„ „ second „ first 1 **boy**, then 1 **girl**.
Mr. K. by his first wife had 2 **boys**, 1 **girl**.
„ „ second „ 2 **girls**, 0 **boys**.
Mr. T. F. by his first wife had 5 **girls**, 0 **boys**.
„ „ second „ 2 **girls**, 1 **boy**.

That the male parent or father has nothing to do with the causation of sex is borne out by animals also: I have noticed that in them a certain **female** will give with different **males** all the same sex of offspring.

Knight, quoted by *W. B. Carpenter*,[1] as long ago as 1809, remarked that:

"In flocks or herds of domesticated quadrupeds, it is no uncommon thing to meet with **females**, whose offspring is almost invariably of the same sex, although it have resulted from intercourse with several different **males**; on the other hand, he has never met with **males** that exhibited any such uniformity in the sex of their offspring with different **females**. Hence he concluded that the **female** parent exercises the chief influence in determining the sex."

In support of the truth of this statement the following cases in my own experience will suffice:

A brown retriever bitch known as "Brownie" had four pups, all bitches—no dog pups.

A black-and-tan bitch was covered by two different stud dogs at different times; at the

First litter she had 2 dogs
Second „ „ 4 „ } no bitch pups.

that is, two different fathers could not produce **female** offspring. Both these stud dogs the writer knows possessed

[1] "Principles of General and Comparative Physiology," 1841, p. 500.

both testicles. I mention this because many owners remove one testicle from fox-terriers especially, and this does not cause one sex pups only to be born to any bitch they may line. Hence the father does not determine the sex.

A cow was covered by fifteen different bulls, and she had seventeen calves, all cow or **female** calves—that is, fifteen different fathers could not breed a **male** between them. Surely if the **male** parent influenced the sex, we should have expected fifteen different **males** to be able to breed a bull between them.

A mare was covered by more than six different stallions (some being used more than once). She had ten different foals, all **males**—that is, she never once had a filly or **female** foal. The multiple fathers could not affect the sex of the foals. The mother evidently was *unilaterally* sterile, only the **right** ovary being active. And in the same way the bitch and cow must have been unilaterally sterile, so that the multiple fathers could only produce one sex.

And lastly, from the " Daily Mail " I read :

"A sow belonging to Mr. A. Watson, of the Grange Farm, Clavering, has given birth to a litter of ten, all of which are boar pigs."

CHAPTER VIII

CASES OF PREGNANCY WHICH PROVE THE THEORY

IN order to prove my theory that the cause of the **male** sex is due to the fertilisation of ova derived from the *right ovary only*, it will be necessary to show cases of **male** pregnancy with the corpus luteum in the **right** ovary.

We have seen that normally one ovary discharges a single ovum, and this when fertilised leads to the normal single pregnancy ; if on examining a child we find it to be a **male**, and the right ovary to contain a well-marked true corpus luteum, we are justified in saying that the ovum from that **right** ovary produced a **male** fœtus. This I find to be always so, and the following cases will prove it.

Jemima H., age 40, four months pregnant. Admitted an in-patient at Westminster Hospital for stiff knee-joint.

She suddenly developed acute suppurative peritonitis, which led to her aborting. The fœtus was removed shortly before her death, which occurred on November 30th, 1889.

On examination the fœtus was found to be a **male**.[1] Post mortem the left ovary was normal, the **right** slightly enlarged, and containing a *well-marked corpus luteum.*

Tufnell's[2] case.

"The patient had seven years before given birth to a living child. Again pregnant. . . .

"Post mortem three or four quarts of fluid and clotted blood were found in the abdomen, with a small fœtus floating therein. There was a rent in the **right** Fallopian tube, and a cyst, from which the fœtus had escaped. Right Fallopian tube and ovary agglutinated : fœtus one inch long. The *uterus contained a healthy male* fœtus, proportionate to the date of

[1] By Drs. J. B. Potter, R. G. Hebb, and E. R. Dawson.

[2] Tufnell, "New Sydenham Society's Year Book," 1862, p. 339.

conception. The cystic cavity in the **right** Fallopian tube contained a solid organised mass like a miniature placenta. There were *two* distinct *corpora lutea* in the **right** ovary."

We have here two fœtuses and two corpora lutea in the same ovary, the **right**; the sex (**male**) is only given of the intra-uterine fœtus. It is a twin **male** conception undoubtedly, the second fœtus developed in the **right** tube, and must have been a male. Cf. Chapter IX.

Dr. H. R. Spencer's[1] three cases of Porro's operation.—Dr. H. R. Spencer removed the pregnant uterus owing to cancer obstructing delivery in the third case.

"The child extracted was a **boy**, and there was a well-marked corpus luteum in the **right** ovary."

Mrs. P., of Leyton, was delivered of a **boy**, who survives. The patient died of puerperal septicæmia. At the post-mortem, at which I was present, there was a well-marked corpus luteum in the **right** ovary, none in the **left**. Placental site was rather more to the **right** than to the **left** of the mid-line of the anterior wall of uterus.

Dr. Macnaughton-Jones[2] describes a case of first pregnancy in a woman the subject of a large suppurating cyst of the **left** ovary, which had become so large as to increase the size of her abdomen a year previously to her becoming pregnant.

"The patient, aged 31, was delivered of a healthy **male** child. On operating, the tumour was found to be a cystoma of the **left** ovary, from which an enormous quantity of pus was evacuated. The **right** ovary I examined, and found normal."

Here it is evident that a large suppurating cyst of the **left** ovary did *not* provide the ovum which was fertilised, but the **right** *ovary must have done* so. As this was healthy, it was not opened at the operation, so the presence of the corpus luteum therein must be inferred. The child born was a **boy**, and the **right** ovary only was healthy.

Meredith's[3] case.—Both ovaries diseased, **right** the least.

[1] H. R. Spencer, "Trans. Obstet. Soc.," 1896.
[2] Macnaughton-Jones, "Trans. Obstet. Soc.," 1900, p. 141.
[3] W. A. Meredith, "Trans. Obstet. Soc.," 1892, p. 240, etc.

Child a male. Performed double ovariotomy during pregnancy.

"The larger tumour of the two was extremely multilocular. The **right** ovary, situated anterior to the main or larger tumour, contained one main cavity, etc."

"Subsequently the pregnancy terminated in the birth of a well-developed **boy**."

It is only reasonable to expect that the ovary that was only slightly affected should have yielded the ovum. It was the **right** ovary that had the smaller tumour, and the resulting child was a **boy**.

On the other hand, I find that the **female** sex is due to ova which arise from the **left** ovary only: to prove it it is necessary to give cases of **female** pregnancy with the corpus luteum in the **left** ovary, thus:—

Dr. Amand Routh,[1] in a case of "Uterine appendages showing Hæmatosalpinx," says:

"These bilateral appendages were removed. The uterus was enlarged, and this condition, with the dilated tube and the corpus luteum, was taken to mean that an early tubal gestation was present, especially as the corpus luteum was on the same side as the tubal swelling."

Subsequently the patient was found to be pregnant five months—

"So that at the date of the removal of the appendages she must have been two and a half months pregnant. Her labour was uneventful. Her child was small."

Dr. Routh now informs me that the corpus luteum was in the **left** ovary; the child when subsequently born was a **girl**.

Dr. Herman's[2] case.—Disease of right ovary. Child **female**. No corpus luteum mentioned.

"On the **right** side a cheesy-matter-containing body was attached to the right broad ligament: examined microscopically it was thought to be the ovary. The fœtus was a **female**."

The **right** ovary being disintegrated and diseased, the **left** ovary must have supplied the ovum, and the child was consequently a **female**.

[1] Amand Routh, "Trans. Obstet. Soc.," 1898, p. 307.
[2] Herman, "Trans. Obstet. Soc.," 1897, pp. 135–7.

Dr. H. R. Spencer's[1] three cases of Porro's operation.—Dr. H. R. Spencer removed the pregnant uterus owing to fibroids in the first case. The child was a **female**, and though the corpus luteum is not mentioned, it is distinctly stated that the **left** ovary was *larger* than the **right**.

The presence of a true corpus luteum invariably temporarily increases the size of the ovary in which it is contained, until it shrinks and disappears; so that in this case it is reasonable to conclude that the larger size of the left, or normally smaller ovary, was due to the presence therein of the corpus luteum of the pregnancy.

Gerrish[2] says:

"During pregnancy the gland (ovary) which contains the corpus luteum is much larger than its fellow."

And the difference in the size of the two ovaries caused by the presence or absence of the corpus luteum was strongly insisted on by *Montgomery* in 1837, in his book "Signs and Symptoms of Pregnancy," in which, besides giving a special plate, No. X., of such ovaries, he on page 221 gives measurements to prove it.

[1] H. R. Spencer, "Trans. Obstet. Soc.," 1896, pp. 397 and 399.
[2] Gerrish, *op. cit.*, p. 849.

CHAPTER IX

CASES OF EXTRA-UTERINE PREGNANCY WHICH PROVE THE THEORY

EXTRA-UTERINE pregnancy is the technical term for cases where a child develops in the wrong place—*i.e.* outside the uterus or womb.

The commonest position for the child to grow in, outside of the womb, is in one or other Fallopian tube, hence these cases are called tubal pregnancies. In a few instances it actually grows in the ovarian sac or Graafian follicle which contained the ovum, hence this is called ovarian pregnancy.

In the very great majority of cases of tubal pregnancy, the *tube* which becomes *pregnant* is the one on the *same side of the uterus as the ovary* which supplies the ovum which becomes fertilised—*i.e.* in the tube nearest the ovary.

The following cases will prove that the pregnancy and the corpus-luteum-bearing ovary are usually on the same side.

Dr. Pocock's case.[1]—Pregnancy in **right** tube; corpus in **right** ovary. Case of extra-uterine gestation.

"The fœtus had escaped from the ruptured sac formed at or near the fimbriated extremity of the **right** Fallopian tube, where the placenta was placed. There was a well-marked corpus luteum in the **right** ovary. The fœtus was about three months."

No sex is given, and though I wrote privately for it I could not discover it.

E. R. Dawson's case.[2]—Pregnancy in **right** tube; corpus in **right** ovary. The **right** Fallopian tube had contained the ovum.

"The **right** Fallopian tube had ruptured. The **right** ovary contained a corpus luteum."

The embryo was too young to distinguish its sex.

[1] "Lancet," March 3, 1888, p. 416.
[2] "Trans. Obstet. Soc.," 1898, p. 156.

Dr. W. Duncan[1] describes and has a drawing of a case of tubal gestation.

"The **right** tube had ruptured. The **right** ovary contained a large corpus luteum."

Dr. Lewers[2] describes a case of **right** tubal pregnancy:

"There was a large corpus luteum in the **right** ovary; no corpus luteum in the **left** ovary";

and again, p. 364:

"**Left** tubal (interstitial) pregnancy; corpus luteum in the **left** ovary."

Dr. Cullingworth[3]: also a **right** tubal pregnancy.

"The **right** ovary contained a corpus luteum ½ in. in diameter. **Left** tube and ovary were normal."

Dr. Amand-Routh:[4]

"Pregnancy in **left** tube; corpus luteum in **left** ovary. The **right** tube was normal; a nodule could be felt on the **left** tube."

The report on the specimen by Mr. J. H. Targett says:

"The specimen consists of the (**left**) Fallopian tube, ovary, and adjacent portion of the broad ligament. The ovary contains a recent corpus luteum. The Fallopian tube is dilated with an oval cyst. The histological evidence of gestation is thus assured."

B. Dyball[5] reports:

"**Left** tubal pregnancy, and the **left** ovary contained a corpus luteum of pregnancy ½ in. in diameter."

Mr. Bland-Sutton has diagrams illustrating the corpus luteum on the same side as the tubal pregnancy in his "Diseases of Ovaries," 1896, Figs. 105, 108, 115; and Fig. 95 in "Diseases of Women," 1904.

This is still further proved by cases of *repeated* tubal pregnancy; thus:

Dr. Lewers[6] describes a case where he removed the **left**

[1] "Trans. Obstet. Soc.," 1894, p. 68; cf. also 1896, p. 36—a similar case.
[2] "Diseases of Women," 1897, p. 375.
[3] "Trans. Obstet. Soc.," 1895, p. 143.
[4] *Ibid.*, 1898, p. 222.
[5] B. Dyball, "Case of Tubal Gestation," "Brit. Med. Journ.," March 26, 1904, p. 718.
[6] "Trans. Obstet. Soc.," 1900, p. 325.

pregnant tube and the **left** ovary, which contained the corpus luteum, in 1894; becoming pregnant again in the remaining, or **right** tube, that too was removed in May 1900, the accompanying **right** ovary necessarily containing the corpus luteum.

In the "Journal of Obstetrics and Gynæcology of the British Empire," vol. iv. p. 301, I have reported a very similar case, the **left** ovary containing the corpus luteum when the **left** tube was pregnant, and the **right** ovary necessarily doing so when the **right** tube became pregnant two years later, for the appendages of the opposite side had been removed.

And similarly *Lieut.-Col. A. J. Sturmer*, in the same volume (p. 139), has reported two such cases, the *corpus luteum* being on the *same* side as the *pregnant tube* in *each* case.

Opitz,[1] quoted by Dr. Russell Andrews, "found the corpus luteum on the same side as the pregnant tube in fifteen out of eighteen cases."

The above cases, then, should suffice to prove that the pregnant tube and the corpus luteum-bearing ovary are usually on the same side; but cases might be indefinitely multiplied.

From this fact it follows that if we find a pregnancy in the **right** Fallopian tube, and that fœtus is a **male**, even though the presence of a corpus luteum be not mentioned, we are quite justified in declaring the ovum came from the **right** ovary, or ovary of the corresponding side to the tube.

The following cases of this therefore support my theory that ova from the **right** ovary produce **male** children.

Taylor's case.[2]—Abdominal pregnancy. **Right** tube, **male** child.

"The pregnancy may be regarded as originally one of the **right** Fallopian tube. The child weighs 7 lb., and is a **male** fœtus."

"It was impossible to say whether the **right** ovary had been removed with the placenta, or whether it had been left in the pelvis below the reflections of the sac."

[1] "Journal of Obstetrics and Gynæcology," vol. iv. p. 290.

[2] J. W. Taylor, "Trans. Obstet. Soc.," 1897, pp. 183–5.

Cullingworth's case.[1]—Sac on right side ; **male** child.

"The sac containing the fœtus consisted of the **right** *broad* ligament. The stretched Fallopian tube ran diagonally upwards and outwards, and then ceased to be traceable as a distinct tube.

"The fœtus was one of the **male** sex."

Mr. Bland-Sutton's case.[2]—**Right** tubal pregnancy. Drawing shows sex **male**, and (?) corpus luteum in **right** ovary.

"Fluid blood has escaped from a rent in the **right** broad ligament. The Fallopian tube on that side was enlarged, and was removed with the ovary. The embryo appears to have lodged in the **right** Fallopian tube."

The drawing which accompanies the case shows the fœtus to be a **male**, and what is *possibly* the corpus luteum in the **right** ovary, for the **left** was *not* removed.

In the following case in the practice of one of my colleagues the patient was thought to have inflammation of the **right** ovary. She died from hæmorrhage internally rather suddenly on March 18, 1899.

At the post-mortem which was ordered I found that the **left** Fallopian tube and **left** *ovary were normal*, and there was *no* corpus luteum in it. The gestation sac was formed from the **right** Fallopian tube, which had burst between the layers of the **right** broad ligament. There the child (a **boy**) continued to develop for nearly three months longer, when a second rupture into the peritoneal cavity took place, killing the patient by the extent of the hæmorrhage. The **right** ovary and corpus luteum could not be found. The child (a **male**) had developed in the **right** Fallopian tube, and the **left** ovary did *not* contain a corpus luteum ; so we know the **right** ovary had originally provided the ovum.

In the following case the child (a **boy**) had originally begun to develop in the **right** Fallopian tube, from which it passed to finish its development in the abdominal cavity, forming the so-called tubo-abdominal form of pregnancy. The after-birth or placenta continued to chiefly develop in the **right** tube. There is no account of the corpus luteum, as the **right** ovary would probably be destroyed in the growth of the child and its placenta.

[1] C. J. Cullingworth, "Trans. Obstet. Soc.," 1893, pp. 157, 159.

[2] J. Bland-Sutton, *Ibid.*, 1891, pp. 71, 72.

J. B. Hellier[1] says :

"A dead fœtus was removed by abdominal section from the peritoneal cavity, together with a tumour which arose from the **right** oviduct, and contained the placenta. It was then found that the **right** foot was attached to a pelvic tumour which lay in the utero-vesical pouch and on the **right** side. The fœtus is a **male**. The placenta is contained within a sac . . . made up partly of the ampullar end of the tube."

Slamjer[2] in 1901 reported a case where the fœtus was a **male**, and had developed in the **right** broad ligament a **right** mesometric gestation.

In the "Medico-Chirurgical Review and Journal," vol. x., 1828, p. 223, is the case of Mrs. E. Bryan, who died as the result of an extra-uterine gestation. The child was "a full-grown **male** infant." It had developed in the **right** Fallopian tube originally, and had then, after rupture, continued to grow between the layers of the **right** broad ligament—a **right** mesometric gestation.

"The **left** ovarium and corresponding Fallopian tube are sound."

In the same journal (vol. v., 1826, pp. 618, 619) is another case. Post mortem a **male** fœtus was found to have escaped by rupture from a cyst on the right-hand side of the uterus, which had arisen from the **right** ovary.

In the same manner, pregnancy in the **left** tube practically always means a **left** ovulation ; so that finding a **female** fœtus in the **left** Fallopian tube, even in the absence of mention of a corpus luteum being present in the **left** ovary, may be taken as proof that the **left** ovary provided the ovum that was fertilised, and hence gives support to my theory ; thus :

Sir Jonathan Hutchinson's case.[3]—**Left** tubal gestation. Child **female**. Corpus luteum not mentioned.

"At the post-mortem examination we found the tumour adherent everywhere to the abdominal wall and omentum. On cutting into the cyst the body of a macerated fœtus was found. It was a **female**, and at full term. On further dissection of the parts the case proved to be one of

[1] Hellier, "Trans. Obstet. Soc.," vol. xlv. 1903, p. 366.

[2] "Brit. Med. Journ.," Epitome.

[3] "Case of Extra-uterine Fœtation simulating Ovarian Dropsy," "Lancet," July 19, 1873, p. 71, by Sir J. Hutchinson, F.R.C.S.

gestation in the **left** Fallopian tube. The **left** Fallopian tube could be traced for a short distance on the front of the cyst. The **left** broad ligament passed downwards from the front of the cyst, and between its extremity and that of the Fallopian tube was a thickened mass, which might perhaps be the remains of the ovary, but it was not practicable accurately to identify it."

Dr. Cullingworth's case.[1]—**Left** tube; child **female**. No corpus luteum given.

"On August 16, at St. Thomas's Hospital, Dr. Cullingworth removed a fœtus weighing 2 lb. 13 oz., and measuring 17 in. in length, through an incision in the anterior abdominal wall. The sac in which this was contained was very thin, and formed by the greatly dilated **left** Fallopian tube. The duration of the pregnancy was sixteen months; the fœtus was well preserved, and had the appearance of fully eight months' development."

On writing to *Dr. Cullingworth* to ascertain the sex, he says (September 1, 1888): "The *child was a* **female.**"

Lawson Tait[2] quotes a case by Dr. Wagner. **Left** tube and ovary implicated. Child **female.**

"The patient up to the age of twenty-four had given birth to five children; in her thirty-seventh year she again became pregnant, but was never delivered of the child. Labour pains were not present. For a long time the abdominal enlargement remained constant in size, and Cæsarean section was advised. Finally the tumour began to grow smaller. Her menses returned, and fair health was experienced, the only complaint being a feeling of weight in the abdomen. At the autopsy the tumour was found to fill the lower pelvis. The tumour weighed about ¾ lb., and was about the size of a man's head. It was covered by a yellowish membrane. The **left** *tube and ovary* seemed to be growing from the tumour, the uterus being pushed from the **right.** The fœtus was of **female** *sex.*"

Dr. Ruth reports a case in the "Medico-Chirurgical Review and Journal," July, 1825, p. 285, of the removal of a dead extra-uterine fœtus from the abdominal cavity. It had evidently been a **left** tubo-abdominal gestation:

"The umbilical cord was traced over the uterus to the **left** side, where it was lost in a softened mass, probably the remains of the placenta. The child was found to be a **female.**"

[1] "Lancet," August 25, 1888, p. 391.

[2] "Lectures on Ectopic Pregnancy and Pelvic Hæmatocele," p. 102, 1888.

Dr. A. Smith[1] describes a somewhat similar case—a **left** tubo-abdominal pregnancy. "The placenta was attached to the brim of the pelvis on the **left** side." The main blood supply came from the **left** ovarian artery. The **left** tube and ovary were destroyed by the growth of the child, which was a full-time **female**.

In the two following cases we have twin pregnancies, one in the uterine cavity, the other extra-uterine, that is, in one or other Fallopian tube. As we have already seen, the pregnant tube almost invariably obtains its oösperm from the ovary of the same side; and as twins or even triplets can occur in one tube, it is reasonable to claim that the uterine child was derived from the ovary of the opposite side to the pregnant tube—thus *Warnek*[2] found on operation a pregnant **left** tube, while the uterus gave birth to a **boy**.

So that this **male** had been derived from the opposite ovary to the **left**, that is the **right**.

Mrs. Stanley Boyd[3] removed a pregnant **right** tube (ovum evidently derived from **right** or **male** ovary), and the uterus contained a **female** child, which similarly must have been derived from the **left** or opposite ovary.

This case is further an example of failure to remove all ovarian tissue, owing to the "adhesions to the pelvic wall and the **right** side of the uterus" evidently preventing the entire removal of all ovarian tissue, probably in the ovarian ligament, though there are other possible sites.

It is of course evident that in very many cases, owing to the early rupture of the Fallopian tube, the sex of the contained fœtus cannot be ascertained.

Dr. Seligson, of Moscow, has, however, collected fourteen cases of **males** developing in the **right** tube, and **females** in the **left** tube.

The following are cases of pregnancy occurring in the **right** ovary (**right** ovarian pregnancy); the sex of the children was **male**, thus proving my theory.

[1] Dr. Alfred Smith, "Brit. Med. Journ.," October 5, 1901, p. 961.
[2] Warnek, "Brit. Med. Journ.," Epitome, January 25, 1902.
[3] "Brit. Med. Journ.," October 5, 1901, p. 962.

Bernutz and Goupil.[1]

"A woman, aged 34, had had three children prematurely, and was pregnant the fourth time, the condition being accompanied by extreme prostration and a good deal of pain on the **right** of the pelvis. At the end of the third month she expelled *per vaginam* a mole the size of an egg [the uterine decidua.—E. R. D.]. Six days after this she experienced most agonising pain in the hypogastric region, accompanied by severe vomiting, and soon after this she died.

"On examination a **male** fœtus was found in the **right** iliac fossa, but still attached to the **right** ovary by the umbilical cord. The ovary itself was ruptured on its under side. The organs on the **left** side were healthy. The uterus was much thickened, and large enough to admit a fœtus of three months ; such an one was found in the abdomen."

Bernutz and Goupil.[2]

"A lady had borne eight children when, after an interval of five years, she became pregnant for the ninth time.

"At the third month she became very weak, had colicky pains, with symptoms of approaching labour, and died in nine hours. On opening the abdomen a large quantity of blood was found effused, and in removing this a **male** fœtus about an inch long was discovered.

"It was found afterwards that the **right** ovary was ruptured in its length, and that the fœtus had been developed therein."

The following is a case of pregnancy in the **left** ovary (**left** ovarian pregnancy): the child was a **girl**, thus proving my theory that **left-sided** ova produce **female** children.

Reeves' case[3].—**Left-sided** pregnancy ; child **female. Right** ovary cirrhotic.

"On opening the abdomen a large tumour was exposed. The shoulder and head of a fœtus were then felt. The broad ligament was then tied close to the uterus. The placenta was inside the fœtal membranes, which were enclosed between the layers of the **left** broad ligament, and the normal-looking Fallopian tube was stretched across the upper and anterior aspect of the tumour. No trace of the **left** ovary could be seen or felt, and in peeling off the membranes, which were firmly adherent in places, a portion

[1] Bernutz and Goupil, "Diseases of Women," vol. i. p. 249, published by New Sydenham Society, 1866, quoted from "Bibliothèque médicale," vol. xxxviii. p. 265 ; and Dezeimeris, "Journal des connaissances médico-chirurgicales," 1837.

[2] Vol. i. pp. 249, 250. Quoted by Bernutz and Goupil from "Observation de M. de Saint Moressy, médecin de Riberac en Saintonge," 1662 (dans Duverney, "Œuvres anatomiques," Paris, 1761, vol. ii. p. 350).

[3] H. A. Reeves, F.R.C.S.Edin., "Ectopic Ovarian Gestation," "Lancet," October 25, 1890, p. 872.

of the posterior layer of the broad ligament, corresponding to the usual position of the ovary, was removed with them.

"The **right** *ovary was cirrhotic*, and was not removed. The fœtus, which looked like a full-termed one, was a **female**."

Mr. Reeves says, "There can be no doubt this was a genuine case of true ovarian pregnancy."

Whether this was a true ovarian pregnancy or not is immaterial; it was an undoubted **left-sided** pregnancy, with the resulting fœtus a **female.**

That the ovum came from the **left** ovary is rendered quite evident by the fact of the *cirrhotic* condition of the opposite or **right** ovary; it is thus a very convincing case.

CHAPTER X

CASES OF PREGNANCY AFTER OPERATIONS ON THE OVARIES, WHICH PROVE THE THEORY AND SHOW THE EFFECT ON CHILDBEARING OF OPERATIONS ON THE OVARIES

THE removal by a surgical operation of an ovary, usually on account of a tumour therein, is known as ovariotomy; if performed on one side only it is known as unilateral ovariotomy, or more definitely as **right** or **left** ovariotomy, according to which ovary was removed; if performed on both sides, it is a bilateral or double ovariotomy.

Unilateral ovariotomy does not prevent a woman having children, but they will, I maintain, be all of the same sex, provided that all ovarian tissue is removed from the one side. In this event all the ova must necessarily be derived from one ovary only, viz. from the ovary on the opposite side to the one removed.

If therefore the **left** ovary is completely removed a woman's subsequent children are all **boys**. In the following cases the **left** ovary *was* removed, and the subsequent pregnancies gave rise to **boys** because the ova necessarily were derived from the **right** ovary, hence they prove my theory.

Dr. J. A. Wetherell's case.[1]—**Left** ovary removed, subsequent birth of **male** child. Conception after ovariotomy.

"The patient, Ann H., unmarried; at the age of twenty-five, in 1882, her menstruation became irregular, and she first noticed a tumour rising in her abdomen. Her medical attendant diagnosed the case as one of ovarian tumour. She placed herself under the care of Dr. Granville Bantock in the Samaritan Free Hospital. The case was one of fibroid tumour of the uterus in a state of cystiform degeneration. I tried to lift out the tumour, but it so invaded the broad ligament on the **right** side that its removal in

[1] "Lancet," April 28, 1888.

the usual way was impossible. Fancying there was nothing to be done but to remove the ovaries, with a view of checking the growth of the tumour, I removed the **left** ovary, which was easily got at.

"The **right** ovary was nowhere to be found.

"I now looked again very carefully at the tumour. and as it felt as if there might be some deep-seated fluid in it, I tapped it, and got out nearly a pint of dirty-looking fluid. There was no way of removing the tumour. I laid the tumour very freely open. She left the hospital a mere shadow of herself before her illness.

"For four years she enjoyed fairly good health. She was now quite stout, and married.

"In July 1887 I delivered her of a fine healthy child. She nurses her baby **boy** herself."

Dr. Amand Routh[1] reports a case of tubal pregnancy.

"Pregnancy in **left** tube; corpus luteum in **left** ovary. The **right** tube was normal; a nodule could be felt on the **left** tube. The **left** ovary and tube were removed."

The report on the specimen by *Mr. J. H. Targett* says:

"The specimen consists of the (**left**) Fallopian tube, ovary, and adjacent portion of the broad ligament. The ovary contains a recent corpus luteum. The histological evidence of gestation is thus assured."

It follows that this woman, who thus had her **left** tube and **left** ovary removed in May 1898, had only the **right** ovary remaining to produce ova. That this **right** ovary was functionally active is evident from the sequel, for Dr. Routh writes me that she afterwards "became pregnant and gave birth to a **boy** in April 1899."

Dr. Macnaughton Jones[2] describes a case of pregnancy after removal of the **left** ovary and tube.

"In February 1903, at the operation, the sac of the **left** ovary was found about the size of an orange and full of blood; the cyst of the **left** ovary with the **left** tube was removed entire. Towards the end of 1895 menstruation ceased, and I found she was pregnant. She was delivered of a **male** child on May 31st, 1896."

Thus this woman with only the **right** ovary in her abdomen gave birth to a **boy**.

Dr. L. B. had the **left** ovary removed from a patient, and three years later she was delivered by him of a **boy**.

[1] "Trans. Obstet. Soc." 1898, p. 222.

[2] "Diseases of Women," 1900, p. 667.

Dr. P.'s case.—Mrs. M. F. married in April 1902; she became pregnant during September 1902 in her **left** Fallopian tube.

She was admitted to hospital, and her pregnant **left** tube and **left** ovary were removed.

Less than two years afterwards, in August 1904, she was delivered of a living **male** child.

The **right** ovary, the only one remaining in her abdomen, had given rise to a **boy**.

Similarly if the **right** ovary be entirely removed, any ovum subsequently fertilised must come from the **left** ovary, and a **girl** will be born, and thus will support my theory.

Dr. McKerron[1] has a paper on "Obstruction of Labour by Ovarian Tumours in the Pelvis." **Right** ovariotomy, subsequent pregnancy, and birth of **female** child. The tumour was removed. It was a **right** ovarian dermoid. She subsequently became pregnant once more, having, of course, then only the **left** ovary in her body. She was delivered on January 15, 1897, of a living **female** child.

After the **right** ovariotomy the **left** ovary must of necessity have supplied the ovum which was fertilised, hence a **girl** was born.

Mr. Alban Doran[2] describes a case of **right** tubal pregnancy. The **right** tube and **right** ovary were removed. "The **left** tube and **left** ovary were perfectly normal," and therefore were not removed. Mr. Doran has since informed me that he "removed the *whole* of the **right** ovary on December 2, 1899,

"The uterus was *not* pregnant at the time of the operation; the patient was confined of a **girl** in December 1900."

Thus having only the **left** ovary, the ovum fertilised therefrom produced a **female** child.

Mrs. D. C. had her **right** ovary and tube removed. She has since been pregnant on two occasions, a **female** child being born *each* time.

I delivered her of her *second girl* in April 1903, having assured her it would be a **girl** directly she became pregnant.

Mrs. B. P. had three **boys** born. When the youngest was

[1] "Trans. Obstet. Soc.," 1897, pp. 337 and 339.

[2] *Ibid.*, 1900, p. 135.

nearly ten years old an abdominal tumour developed. At the operation her **right** ovary was removed for a tumour in it. Subsequently a **girl** was born, just three years after the operation.

Her **right** ovary having been removed, she had only one ovary remaining in the abdomen, namely the **left**, and a **female** child was derived therefrom.

The Effects of Bilateral Ovariotomy.—It seems difficult to realise that any other result than absolute sterility can possibly follow the removal by operation of both ovaries.

There are however on record a dozen cases of pregnancy following the *so-called* removal of both ovaries.

It will of course be at once evident that the supposed removal was not complete, a portion of one or other ovary being allowed to remain in the abdomen. There is, as far as I can gather, no case on record of a portion of both ovaries being inadvertently allowed to remain and different-sexed twin-pregnancy following.

In one extreme case quoted by *Parvin*[1]—

"*Olshausen* performed, as he thought, ovariotomy; but the result being fatal, he found at the autopsy that *neither* ovary had been removed."

Complete removal, then, of all ovarian tissue from both sides absolutely stops ovulation, and therefore leads to permanent sterility; menstruation, too, is permanently arrested.

I do not propose here to go further into the question of the results of incomplete operations, which I have considered in Chapter XXIII., beyond pointing out the fact that, as a small portion of an ovary can carry on its functions, the operation known as resection of an ovary has been introduced.

The Effects of Resection of an Ovary.—Resection of an ovary is an operation by which, in a partially diseased ovary, the diseased part only is removed, the healthy part being allowed to remain. This conservative operation is due to the appreciation of the fact that a very small piece even of an ovary is sufficient to ensure the production of fertilisable ova, so that pregnancy may follow the entire removal of one ovary and the partial removal or resection of its fellow. Hence it follows that resection of one ovary and entire removal of

[1] Parvin, "Science and Art of Obstetrics," 1895, 3rd ed. p. 107.

the other resembles incomplete bilateral ovariotomy in its results.

The actual effect as regards the sex of children born after resection of *one* ovary depends necessarily on whether the opposite ovary has been entirely removed or not.

If *not* removed, the woman can have either sexed children, or "pigeon-paired" twins, because there is one complete ovary and part of the opposite one.

If the opposite ovary have been entirely removed, she can have but one sex of children, which will correspond to the ovary resected.

The following is a case in point, which very characteristically supports my theory :

Mrs. Stanley Boyd[1] operated on a patient and *entirely removed the* **right** *ovary.* She resected the **left** ovary, as a portion of it showed early cystic disease. The cystic portion was removed, and the healthy part of the **left** ovary was allowed to remain in the abdomen.

The patient subsequently became pregnant, and was duly delivered of a **girl.**

Necessarily the healthy remainder of the **left** ovary must have provided the ovum, and consequently the child born was a **female.**

Besides strikingly proving my theory, this case also exemplifies very plainly a fact which many critics either cannot or will not realise—viz. that the complete removal of an ovarian tumour is not synonymous with the complete removal of all the ovarian tissue on the same side as the tumour.

One cannot but regret that writers so often fail to record of which ovary it is that a portion is healthy, and so allowed to remain in the abdomen ; and also fail to record the sex of the child subsequently born.

From an interesting paper by *Mrs. S. Boyd*[2] it appears that probably 20 per cent. of women become pregnant after such operations.

[1] "British Medical Journal," "Conservative Surgery of Tubes and Ovaries," Sept. 15, 1900.

[2] Mrs. S. Boyd, "Journal of Obstetrics and Gynæcology," vol. iii., March 1903, p. 241.

CHAPTER XI

CASES OF PREGNANCY IN ABNORMAL UTERI WHICH PROVE THE THEORY

IT has been pointed out in the chapter on Anatomy that the uterus in the human female is a single-cavity-containing organ formed by the fusion of the two ducts of Müller.

If these two tube-like ducts, from which the uterus is developed, do not properly coalesce, the uterus in the human female becomes double, and is known as a bi-cornuate uterus.

The diverging branches of the uterus are known as cornua or horns, a right and a left, and their cavities being more or less separated, the whole cavity comes to be somewhat Y-shaped, and thus it resembles the uterus of many of the mammalia.

Though the uterus be thus doubled, the number of ovaries and Fallopian tubes remain the normal, one ovary and one tube being associated with each half of the uterus.

Pregnancy occurs in these as in normal uteri, and the child derived from the right ovary usually develops in the right cornu, and that from the left ovary in the left cornu; thus these cases confirm and prove the theory.

Dr. A. E. Giles,[1] in describing a case of complete double uterus, states that the right half of the woman's uterus had *never been pregnant*, the mouth of this **right** half of the womb being small, round, and virginal. The **left** half or cornu of the uterus *had* been pregnant It was the larger of the two, and its mouth was opened and elongated transversely, showing a child had passed through it. She had given birth to one child only, a **girl**, which was alive.

[1] Giles, "Trans. Obstet. Soc.," vol. xxxvii. 1895, p. 305.

That is, the **left** side of a double uterus had brought forth a **female** child.

Jurinka[1] describes a case, of which an abstract is given in the above journal, of double uterus. The left half was not pregnant.

"The cavity of the gravid **right** half contained an embryo of the **male** sex."

There is no mention of a corpus luteum, unfortunately, but the **right** side of a double uterus had brought forth a **male** child.

Thus these two cases strikingly confirm the theory.

Dr. Walls[2] described an unusual case where, from a double uterus, a **male** child was delivered. The placenta was attached in the **right** half of the uterus, and the greater part of the child was in the left half, its "head being in a cavity between the two cornua."

Possibly before labour set in it was entirely in the left horn; but the fact is evident that the **male** child first developed in the **right** half, as shown by the location of the placenta.

Hence this case is confirmatory also.

In some cases of double uterus, the two halves of the uterus are not equally developed.

In a case where the **right** half of the uterus had thus only partially developed, *Mr. J. H. Targett*[3] removed it and its contained child, which was a **boy**. That is, the **right** half of the uterus had brought forth a **male** child. The left half of the uterus was empty.

It is in these cases of double uterus that migration of the ovum most frequently takes place, for we find a fœtus in one cornu and the corpus luteum in the ovary of the other side. External migration of the ovum must necessarily occur in those cases where the two cornual cavities do not coalesce above a common cervix, but each ends in a separate cervix. There is no evidence to warrant a belief that a

[1] Jurinka, "Journal of Obstetrics and Gynæcology," vol. v., Feb. 1904, p. 173; and "Brit. Medical Journal," Epitome, Dec. 1903.

[2] Dr. Walls, "Practitioner," Jan. 1903, p. 82.

[3] Targett, "Trans. Obstet. Soc.," vol. xlii. 1900, p. 276.

fertilised ovum can pass out of the cornu and cervix of one side into the single vagina, and thence pass through the other cervix into the cornu of the opposite side ; certainly it cannot do so if the vagina is also doubled and distinct.

Dr. Lewers[1] showed a specimen consisting of pregnancy in

"the rudimentary left uterine cornu, with the left Fallopian tube and ovary attached to it. The ovary *does not* contain the corpus luteum, so that the case must have been an example of the external migration of the ovum from the opposite ovary" (the **right**).

The child was a **boy**.

Here is a case of a **male** child developing in the **left** rudimentary half of a uterus, and the left ovary proved *not* to have provided the ovum : a most convincing case. The right ovary was, of course, not examined, but remains in the abdomen.

A somewhat similar case is recorded by *Drs. Rudolph Smith*[2] and *H. Williamson.* The specimen was "a dilated rudimentary **left** uterine cornu bearing a fœtus." The **left** ovary was small and normal. No mention of corpus luteum in it, as it was evidently not in it, because, owing to the fact that "the pedicle attaching the sac to the uterus was imperforate," the means by which the oösperm reached this rudimentary cornual cavity must have been by external migration of the ovum.

The normal **right** tube and ovary remain in the abdomen, and the latter undoubtedly contains the corpus luteum. The child was a **boy**.

The ovum, I maintain, therefore came from the **right** ovary, and the child was a **male** ; it is a similar case to one published by *H. Kelly.*

[1] "Trans. Obstet. Soc.," vol. xlvii. 1905, p. 113.

[2] "Journal of Obstetrics and Gynæcology," vol. iii. 1903, pp. 27-30.

CHAPTER XII

THE CORPUS LUTEUM AS A SIGN OF PREGNANCY

PREGNANCY manifestly cannot occur without the provision of an ovum, so that ovulation precedes pregnancy.

The ovum is extruded by the bursting of a Graafian follicle. The ruptured follicle filled with blood is the first stage in the formation of a corpus luteum, hence ovulation is always followed by the formation of a corpus luteum.

The difference between the corpus luteum of menstruation and that of impregnation, or the "false" and the "true" corpus luteum, has already been pointed out to be one of size only; the larger size of the true corpus luteum being due to the increased congestion or blood supply incident to pregnancy.

Hence it follows that pregnancy is practically invariably shown by the presence of a true corpus luteum, and I have throughout looked upon the presence of a true corpus luteum as not only indicative of pregnancy, but as indicative of the ovary which provided the fertilised ovum.

As *Hirst*[1] says:

> "The true corpus luteum is of value as an indication of the ovary from which the impregnated ovule came."

But a large corpus luteum has been found in some instances where no pregnancy has existed.

In the great majority of such cases, where the uterus has not contained a fœtus, it has contained a growing myoma or fibroid tumour.

Two such cases are mentioned by *Bland-Sutton*,[2] a myoma being present in each; while in a third instance related by

[1] Hirst, "Obstetrics," p. 63.

[2] Bland-Sutton, "Surgical Diseases of Ovaries," 1896, p. 18.

Bland-Sutton,[1] not only was the ovary which contained the well-marked corpus luteum itself occupied by a large dermoid tumour, but the "uterus contained a large myoma which blocked up the pelvic cavity."

He therein also states he has seen several other instances in association with myomata; and other cases have been described by *Dr. Herman*[2] and *Dr. Popow*,[3] a fibroid being present in every case.

A placental polypus has also been known to act like a fibroid, and cause a subsequent menstrual corpus luteum to develop like one due to pregnancy.

Undoubtedly the presence in the uterus of a fibroid tumour and the irritation of its growth acting reflexly on the ovary similarly to what a fœtus does, cause the corpus luteum of menstruation to grow into a large or true corpus luteum indistinguishable from one due to pregnancy, or, as *Dr. Galabin*[4] expresses it—

"A fibroid causes a corpus luteum like that of pregnancy, owing to undue congestion."

One other cause of a "true" corpus luteum in women whose uterus contains no fœtus has been discovered in prostitutes, and *Dr. Popow*[5] has described such a case.

Here the life of drink and venery provides that irritation, stimulation, and "undue congestion," which would lead to the growth from the "false" to the "true" corpus luteum.

Some other cases are doubtless due to the occurrence of extra-uterine gestation, a tubal mole or abortion being overlooked, for the lately pregnant tube very quickly returns to its normal condition and appearance, and the fact that it had been pregnant is missed. See *Bland-Sutton's*[6] diagram of a normal-looking tube after recent complete tubal abortion: there is a well-marked corpus luteum in the ovary; the uterus would of course contain no fœtus in this case.

A few cases of pregnancy and no corpus luteum have been stated to have been seen. The rate, however, at which a corpus

[1] Bland-Sutton, "Trans. Obstet. Soc.," vol. xxxiv. 1892, p. 6.
[2] Herman, *Ibid.*, vol. xxxiv. 1892, p. 10.
[3] Popow, *Ibid.*, vol. xxiv. 1882, p. 100.
[4] Galabin, "Manual of Midwifery," 1900, p. 45.
[5] Popow, *loc. cit.*
[6] Bland-Sutton, "Diseases of Women," 1904, p. 290.

luteum disappears occasionally varies; thus *W. Williams*[1] says:

"In young women, in whom the circulation is active, the degenerated lutein cells are rapidly absorbed, so that in a short time the corpus luteum becomes replaced by a newly formed connective tissue, which corresponds closely in appearance to the surrounding ovarian stroma. But in more advanced life, when the ovarian circulation has become impaired, absorption goes on less rapidly."

It is probable, therefore, that in these cases the corpus luteum

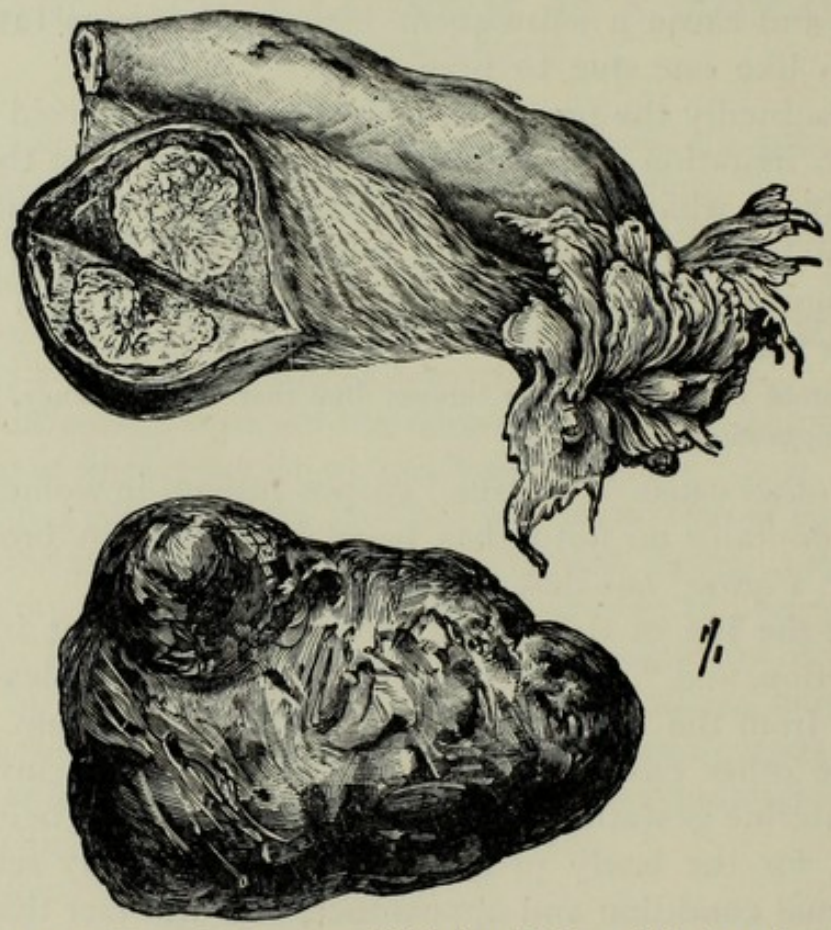

Fig. 14.—A Recently Pregnant Fallopian Tube, which has aborted the Large Mole shown. (After Bland-Sutton.)

There is a well-marked corpus luteum displayed in the opened ovary.

has become absorbed more rapidly than usual, and so has not been recognised.

We come then to the conclusion that a true corpus luteum is always present during pregnancy, and is indicative of it, or as *Parry*[2] puts it—

"The presence (of the corpus luteum in pregnancy) is the rule, its absence is the exception, especially in the early months of gestation."

[1] Williams, *op. cit.*, p. 68. [2] Parry, "Ectopic Pregnancy."

CHAPTER XIII

THE MIGRATION OR TRANSMIGRATION OF THE OVUM

AMONG the cases which might at first sight have appeared to disprove my theory, are those where the corpus luteum is found in one ovary, while the fœtus is found in the opposite Fallopian tube; or the opposite cornu, if the human uterus happen to be of the mammalian or bifid form. In these cases the sex of the fœtus corresponds to the ovary in which the corpus luteum is found.

Bischoff, in 1844, was the first to call attention to the fact that occasionally, in animals with a bicornuate or bifid uterus, the corpus luteum may be in one ovary and the embryo in the opposite cornu or branch of the uterus.

This he ascribed to a migration of the ovum, and alleged that the fertilised ovum had come from the ovary in which the corpus luteum was found, and had made its way into the cornu of the opposite side instead of attaching itself to the wall of the cornu corresponding to the ovary from which it was derived. This explanation is certainly the correct one.

Kussmaul first described its occurrence in woman, especially in tubal pregnancies, and pointed out that it might arise either (*a*) owing to the ovum passing from one ovary across the pelvic cavity along the peritoneal surfaces of the intestines, into the external opening of the opposite tube, which he called the External Migration of the ovum, or (*b*) from its passing down one tube, then across the uterine cavity and so up into the opposite tube, which variety he called Internal Migration of the ovum.

Hirst[1] says :

"It is possible for the ovum, after its discharge from the ovary, to be taken up by the fimbriated extremity of the opposite tube—an external transmigration of the ovum.

"It is also possible for the ovum to traverse one tube and the uterine cavity, and to enter the uterine ostium of the opposite tube,—an internal transmigration of the ovum."

Both forms of migration of the ovum are credited by, among others, *Dr. Herman*,[2] who said :

"There was abundant evidence in support of the external migration of the ovum, and some evidence in favour of internal migration."

W. Williams[3] says external migration "is probably by no means rare," and further points out that proof of internal migration is very difficult to bring forward, though "its theoretical possibility cannot be denied."

It will be necessary to discuss each event, to show that the occurrence is rather proof of the theory than otherwise.

The external migration of the ovum, or transperitoneal migration, as *Dr. Galabin* describes it, means that an ovum reaches the opposite tube without passing through the uterus. It was described by *Barnes*[4] as Extra-Uterine Transmigration of the ovum.

In the normal condition of the tubes and ovaries, the great majority of the ova, after leaving the ovary, enter the nearer or corresponding tube ; but, as *Bland-Sutton*[5] says :

"Probably a certain number of ova fail to enter the Fallopian tube, and are lost in the peritoneal cavity."

But not all are lost because they miss the nearer tube, for, falling into the general peritoneal cavity, they are caught up in the thin capillary layer of serous fluid which bathes the surfaces of the organs and intestines. This fluid acts by keeping their surfaces moist, and by thus preventing them from drying or adhering to each other, it enables one coil of intestine to readily pass over another.

[1] Hirst, "Obstetrics," 1900, p. 62.
[2] Herman, "Trans. Obstet. Soc.," vol. xlvi. p. 103.
[3] Whitridge Williams, "Obstetrics," pp. 79, 80.
[4] Barnes, "Midwifery," 1878, p. 346.
[5] Bland-Sutton and Giles, "Diseases of Women," 1900, p. 18.

The peristaltic movements of the intestines, as well as the natural changes in posture of the woman, must help to carry small floating bodies like ova along the moist surfaces of the pelvic viscera. In this thin layer of fluid a current exists, due to the wavy motion of the cilia or hairlike processes lining the fimbriated ends of the Fallopian tubes, and this current runs towards the large open abdominal end of the tubes, and so down the tubes into the uterine cavity.

But in addition to the peritoneal fluid or serum, we also have the follicle fluid (Liquor Folliculi), together with a little blood, which is discharged when the ovum escapes by the bursting of the ovarian or Graafian follicle. This must help also to float the ovum onwards towards one or other tubal end.

As *W. Williams*[1] says:

"The correctness of this view has been substantiated by the experimental work of *Pinner*, *Jani* and *Lode*. The former injected cinnabar, and the latter ova of ascarides, into the peritoneal cavity of animals, and found that they made their way to the pelvis, where they were taken up by the tubes, through which they were carried to the uterus, and eventually appeared in the vagina."

As was recently pointed out by *Dr. R. Boxall*,[2] the peritoneal cavity is, during life, with the abdomen unopened, a cavity in name only, the pelvic organs and intestines being in close apposition. It was therefore—

"quite easy to imagine how the ovum, floating about like a drop of oil, might readily find its way from one ovary to the abdominal ostium of the Fallopian tube of the opposite side, and so be swallowed;"

while *Dr. Cullingworth*,[3] after pointing out that not only were the ovaries and abdominal ostia of the tubes closer together than was generally supposed, but were often in actual contact, said:

"Writers spoke of the ovum travelling across the peritoneal cavity, and conveyed the impression of a long and almost inconceivable journey, whereas the ovum might merely have to step in next door."

Howard Kelly has reported a case of removal of the right

[1] Whitridge Williams, "Obstetrics," 1903, p. 79.
[2] "Trans. Obstet. Soc.," 1904, vol. xlvi. p. 104.
[3] *Loc. cit.*, p. 105.

Fallopian tube and the **left** ovary. The patient subsequently conceived intra-uterine, and bore a healthy child—

"The ovum necessarily passing from the **right** ovary up the **left** uterine tube, and so into the uterus."

Küstner has reported a similar case.

I have thus shown how external migration may occur with the tubes and ovaries normally situated or stationary; it must evidently more readily occur if the two tubes and ovaries should be misplaced, or in any way approximated to the same side.

The tubes are, it is generally admitted, very freely movable, and there can be no doubt that when a woman is lying on one side, gravity may help the *upper* tube to cross over or fall down towards the side she lies on, and thus cross over the body of the uterus, so that the tube's expanded abdominal opening is nearer to the opposite, or lower-in-the-pelvis, ovary; and thus it may come to pass that an ovum has almost a choice of tubes to enter. This used to be described as the tube of one side grasping the opposite ovary. That the tube ever actually grasped the ovary was incorrect, but it grasped an ovum, for by approximating its open end to the ovary of the opposite side, it is only reasonable to suppose it occasionally secured, grasped, or received an ovum from that opposite-sided ovary.

Dr. Byron Robinson[1] writes that, owing to its "wide range of movement, the abdominal or ampullar end of the tube is capable of securing ova from either ovary."

A case is described by *Alban Doran*[2] where the dilated **right** *pregnant* tube "had fallen behind the uterus and developed towards the **left** side."

He removed the **right** tube and the **right** ovary, which contained no corpus luteum. The **left** tube and ovary, being normal, were not touched; as the **right** ovary contained *no* corpus luteum, the sign of ovulation, the ovum must have come from the opposite **left** ovary, and got into the **right** tube, which had become approximated to the **left** ovary—that is, it migrated, or entered the opposite tube.

[1] Dr. Byron Robinson, "Anatomy of the Oviduct," Feb. 1903.

[2] Doran, "Trans. Obstet. Soc.," 1900, p. 135.

This, which may be described as normal or temporary approximation of the tubes to one side, occasionally becomes permanent and pathological through adhesions binding both tubes down to one side.

Mr. Bland-Sutton[1] has described and figured such a case; both tubes are lying attached to the **left** side of the uterus, so that the **right** tube is more likely to receive a **left** ovum than one from its own, or **right** ovary.

In other cases the tube of one side may be of *extra or abnormal length*, and this, in conjunction with its mobility, must increase the probability of its open end occasionally falling in close proximity to the ovary of the opposite side, and thus securing an ovum from it.

Dr. T. Wilson[2] describes a case of *extra long tube*, where, instead of the average length of four inches, "the **left** Fallopian tube runs longitudinally to the **left** for *nine* inches."

Occasionally, too, we find, as in cases by *Dr. Herman*[3] and *Mr. Bland-Sutton*,[4] a tube is misplaced, and fixed up to the *top of the uterus*, and in this position, therefore, it is as likely to receive an ovum from the opposite ovary as from its own ovary.

In other cases both tubes and ovaries are *displaced backwards* behind the uterus, hence it becomes equally possible for a tube to receive an ovum from the opposite ovary as from its own ovary. Thus *Howard Kelly*[5] says:

> "I have repeatedly found both tubes and ovaries lying low down behind the uterus, with the fimbriated extremity of the **right** tube in contact with the **left** ovary and *vice versa*."

Dr. Giles[6] describes such a case. The pregnancy was in the **left** tube, corpus luteum in **right** ovary, none in **left** ovary.

Both tubes and both ovaries were bent backwards behind the uterus, so that the receipt of the ovum by the **left** tube from the **right** ovary is not difficult to realise.

[1] Bland-Sutton, "Trans. Obstet. Soc.," 1892, pp. 9 and 10.
[2] Wilson, *Ibid.*, 1897, p. 172.
[3] Herman, *Ibid.*, 1897, p. 135.
[4] Bland-Sutton, *Ibid.*, 1897, p. 164.
[5] Kelly, "Operative Gynæcology," 2nd ed., vol. ii., p. 449, 1906.
[6] Giles, "Trans. Obstet. Soc.," 1897, p. 244.

I have thus shown that we may have—

Extra long tubes,
Displaced tubes, so that both approximate one ovary, either both tubes backwards, or to the same side of uterus, or to the top of uterus.

But besides these misplacements of the tubes, we may also have the ovaries displaced—so much so that one tube may almost have a choice of ovaries to secure an ovum from.

Dr. R. Pollock[1] says:

"In both ovaries there was a dermoid tumour; the left ovary was lying over the right in the right iliac fossa, and was fixed there by a piece of omentum."

There is also some evidence of the occasional transperitoneal migration of the spermatozoa as well as of the ova.

We can therefore take it as settled that External Migration of the ovum *does* take place in mankind, and the probability of its occurrence is increased by the frequent misplacements of one tube, or ovary even, as well as by the temporary physiological changes of relative positions due to the postural changes in the woman.

Internal Migration of the ovum is the passage of an ovum from one tube *viâ* the uterine cavity to the other tube.

It is much more difficult to prove that this internal migration actually takes place: that it is possible and feasible is evident from these facts. The journey for the ovum from one uterine ostium of the tube, across the uterine cavity, to the other uterine ostium, is not a long journey; for the uterine cavity transversely (the uterus not being at the time enlarged, because it is not pregnant) has a lesser diameter than the vertical one, which latter constitutes the usual length of journey made by the ovum on its passage out of the uterus, and in placenta prævia cases; so that if it is capable of making the longer one, it should not be unusual for it to sometimes make the shorter or transverse journey.

Richet (quoted by *Hart* and *Barbour*[2]) gives the following as the measurements:

[1] Pollock, "Trans. Obstet. Soc.," 1898, p. 120.
[2] Hart and Barbour, "Manual of Gynæcology," 2nd ed. p. 16.

	Virgin.	Multipara.
Vertical diameter of cavity of uterus	1·80 in.	2·44 in.
Transverse „ „ „	·60 „	1·24 „

—that is to say, the journey *down* the uterus is three times as far in the virgin as *across* the uterus, while it is twice as far in a multipara. Placenta prævia cases prove the complete vertical journey of the ovum.

Another point which is in favour of the occasional internal migration of the ovum is that a woman lying in bed on her side makes the transverse diameter of her uterine cavity (or shorter journey) into, for the time being, a vertical diameter, so that gravity may help the passage of the ovum from one uterine Fallopian opening to the other.

Kussmaul, quoted by *Playfair*,[1] thinks the muscular contractions of the uterus may work the ovum across.

There are, then, two explanations of those cases where a **male** fœtus, say, is found in the **left** Fallopian tube or **left** horn of the uterus, the corpus luteum being in the **right** ovary.

They are the External and Internal Migration of the Ovum, both of which evidently occur, though the external migration is more easily proved.

Owing to the two horns of the uterus freely joining each other in the body of the uterus in the mammalia, forming the uterus bicornis unicollis, internal migration of the ovum is very often seen, the fertilised ova being washed down one or other cornu, and attaching themselves as often as not in the opposite horn. This I have known to occur very often in sheep, cats, and rabbits.

We therefore see that the presence of a **male** fœtus in the **left** Fallopian tube in no way disproves my theory, *nor* do **females** in the **right** tube, or the **right** uterine cornu in the mammalia.

[1] Playfair, *op. cit.*, p. 194.

CHAPTER XIV

PREGNANCY IN THE MAMMALIA

PREGNANCY in mammals differs from pregnancy in the human **female** from the fact that in most of the mammalia the pregnancy is a multiple one.

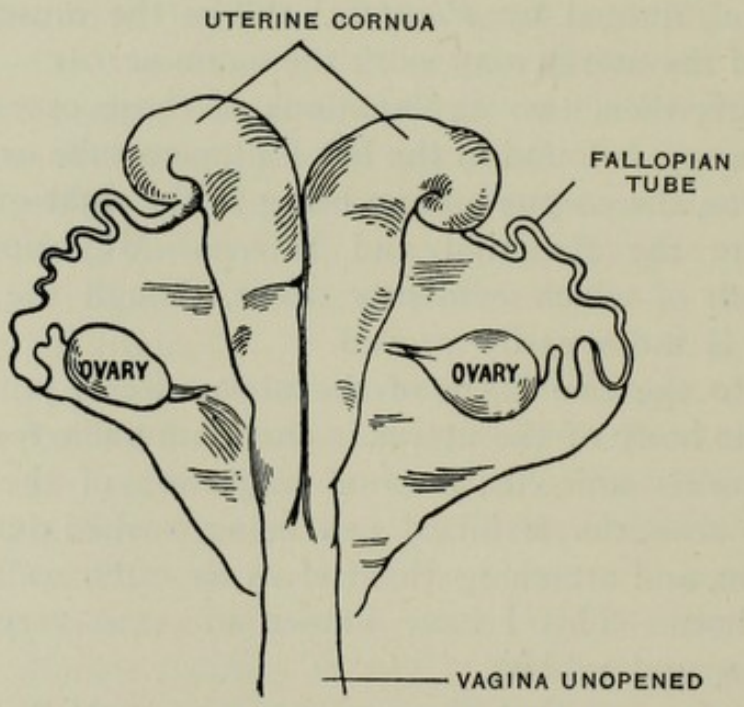

Fig. 15.—Uterus of a Sheep, Dorsal Aspect: unopened. (From nature.)

The chief difference, however, is due to the two anatomical facts that in mammals—

(*a*) The uterus is not a single-cavity-containing organ, but is practically bifid. It is said to be bicornuate—*i.e.* to possess two horns or arm-like processes. These join each other to form a more or less Y-shaped cavity.

Into the divergent extremities of the two cornua the Fallopian tubes, which are exceedingly small in comparison to the cornua, open.

The portion of the uterus formed by the coalesced ends of the two cornua forms the body, and terminates in the neck or cervix of the uterus.

(*b*) The uterus so lies in the mammalian abdominal cavity that when the animal is standing on all four feet the uterus lies parallel to the spinal column—*i.e.* is horizontal—with, as a rule, the tubal ends of the cornua at a slightly lower level in the abdomen than the cervical or vaginal end ; in fact, as *Arthur Johnstone*, of Cincinnati, puts it :

"The os uteri of the horizontal animal points upwards ; the other end of the uterus points downwards."

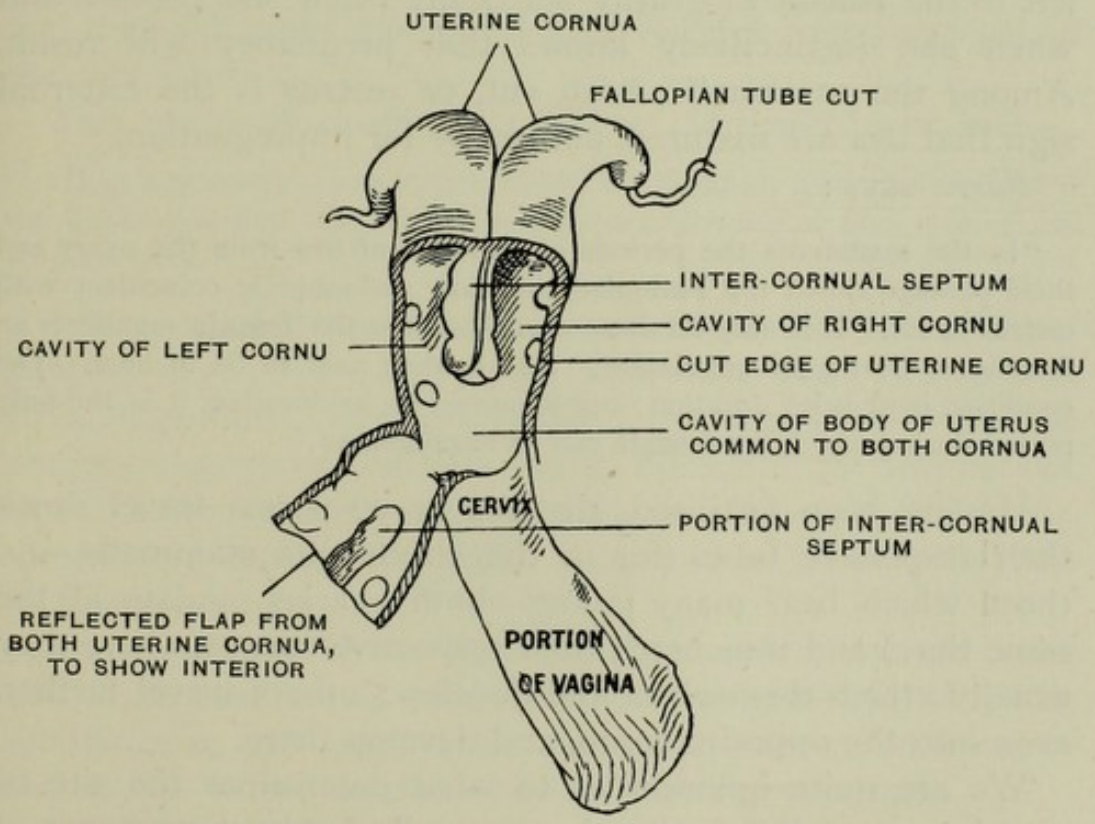

Fig. 15A.—Uterus of a Sheep: opened. (From nature.)

It will thus be seen that a great difficulty would have occurred in emptying the uterus had the mammalia menstruated regularly.

The erect posture of woman, with the mouth of her womb in the most dependent position, must facilitate drainage away of the menstrual discharge ; so that only vertical animals menstruate.

The horizontal or mammalian uterus, too, is very soft and

very readily bent, and does not easily spring back into position, as, owing to its hardness and elasticity, does the human uterus.

Physiologically, too, there is the difference that in the mammalia coition in the natural state practically always ends in pregnancy; sexual congress is only permitted by the **female** at those times when pregnancy will result—*i.e.* only when ova are already provided will the **female** permit insemination.

The occasional non-occurrence of pregnancy in the domesticated mammalia—*e.g.* mares, cows, etc.—when put to the **male** is due to the choosing of the day for sexual congress by the ignorant groom or herdsman, rather than its being left to the **female** to gratify her desire when she pleases, and when she instinctively knows that pregnancy will result. Among the mammalia, heat, rut, or œstrus is the external sign that ova are matured, and ready for impregnation.

Farre says:

"In the mammalia the periods of emission of ova from the ovary and their passage down the Fallopian tube are undoubtedly coincident with œstrus or rut. It is only on these occasions that the **female** manifests an instinctive desire for copulation. She is then said to be in heat. The condition is of brief duration; but whatever be its duration, it is the only period during which the **female** can be impregnated."

Having been fertilised, the ova or oösperms travel down their respective tubes (for in the polytocous mammalia—*i.e.* those which bear many young—both ovaries ovulate at the same time) and thus reach their respective cornua, where they usually attach themselves and develop; others travel farther, even into the opposite cornu, and develop there.

We are quite ignorant as to what determines the site of attachment of the fertilised ovum. Probably movements of the fluid in the uterine cavity are largely instrumental in causing the fertilised ovum to be carried to a distance before attaching itself, aided by changes in the posture of the animal. And we are not in a position to deny to the fertilised ovum some power of movement, or even of site selection.

Proof that the fertilised ova on arrival in the uterus travel some distance before being attached to the uterine wall is derived from the fact, as *Bischoff* pointed out long ago, of the occurrence of the fœtus, especially in cases of single

pregnancy, in the opposite horn of the uterus to the corpus-luteum-bearing ovary.

This necessitates a journey for the oösperm down its corresponding cornu into the body of the uterus, and thence into the opposite cornu. *Garrigues*[1] says:

"In animals it has been proved that an ovum can migrate from one horn of a bicornuate uterus to the other."

Another explanation of this occurrence, especially in cases where the cornua do not freely intercommunicate, is furnished in the chapter on the Migration of the Ovum.

However many ova are fertilised, a corresponding number of corpora lutea will be found in the two ovaries together, and they will equal the number of fœtuses found present in the two cornua.

This was pointed out years ago by *Abernethy*,[2] who said:

"If in any animal—in a virgin rabbit, for instance, after she had taken the buck—you find four or five young ones, you would find four or five corpora lutea."

I have satisfied myself of the correctness of this in different animals—*e.g.* cows, sheep, pigs, rats, mice, cats, and rabbits. In a large tame pregnant rabbit I examined there was the unusual number of fourteen young rabbits in the two cornua, and there was a corresponding number of corpora lutea—viz. six corpora lutea in the **right** ovary and eight corpora lutea in the **left** ovary.

That the body of the mammalian uterus is not the usual site of fertilisation is evident from the presence of living spermatozoa not only *in* the Fallopian tubes, but even *on the surface* of the ovaries shortly after insemination.

I have made numerous observations of the sexes of the young in the two cornua, and these confirm the opinion that fertilisation takes place in the tubes, and the fertilised ova often wander widely before attaching themselves to the cornual wall and developing.

Thus in the monotocous animal, though it is most usual to find the young animal in the cornu corresponding to the corpus-luteum-containing ovary—*i.e.* the ovary which yielded

[1] Garrigues, "Obstetrics," 1902, p. 13.

[2] Abernethy, "Lectures on Anatomy, Surgery, and Pathology," 1828, p. 422.

the ovum that was fertilised—this is not always the case, as I shall shortly show. The opposite or non-pregnant cornu undergoes sympathetic hypertrophy, and a decidua forms in its interior.

Early in March 1902 I opened the pregnant uterus of a cow, usually a monotocous animal, though not always. There was *no* corpus luteum in the **left** ovary; there was a large *typical corpus luteum* in the **right** ovary, so I foretold a *bull* calf before I opened the actual uterus. The **left** cornu was not pregnant; the **right** cornu was occupied by a **male** or bull calf (see fig. 16). The **left** cornu could be easily emptied of its fluid contents, etc., *viâ* the **right** cornu, showing the very free communication between the cornua.

I have also found the same occur on the other side in other cows, a **female** calf in the **left** cornu being found with the corpus luteum in the **left** ovary. I have found the same thing, too, in sheep.

In other cases, as I have said, the fœtal animal is in the opposite cornu to the corpus luteum, showing, in those cases where the cornu communicates, a journey down one cornu through the cervical portion of the uterus and so into the opposite cornu.

Thus in a sheep I have found a **female** lamb in the **right** cornu, with the only corpus luteum in the **left** ovary, and I have seen many similar cases in cows.

This condition of fœtus in one horn and corpus luteum in the opposite ovary occurs also in women, if the uterus be double or bicornuate, as in the following case:

Dr. J. R. Ratcliffe[1] reports a case of pregnant uterus bicornis.

"The **left** horn contained the fœtus. The **right** ovary (that on the opposite side to the pregnant horn) showed a true corpus luteum; none in the **left** ovary. The cervix was short and broad, only a quarter of an inch deep. The os externum is single."

The sex of the fœtus, which was between the second and third month of gestation, is not given.

The committee appointed to report on this specimen say:

"The ovum from the **right** ovary may have been washed up the **left** cornu just as it left the **right** cornu immediately above the os externum, but from the shallowness of the os this seems hardly probable."

[1] "Trans. Obstet. Soc.," 1892, vol. xxxiv. p. 469.

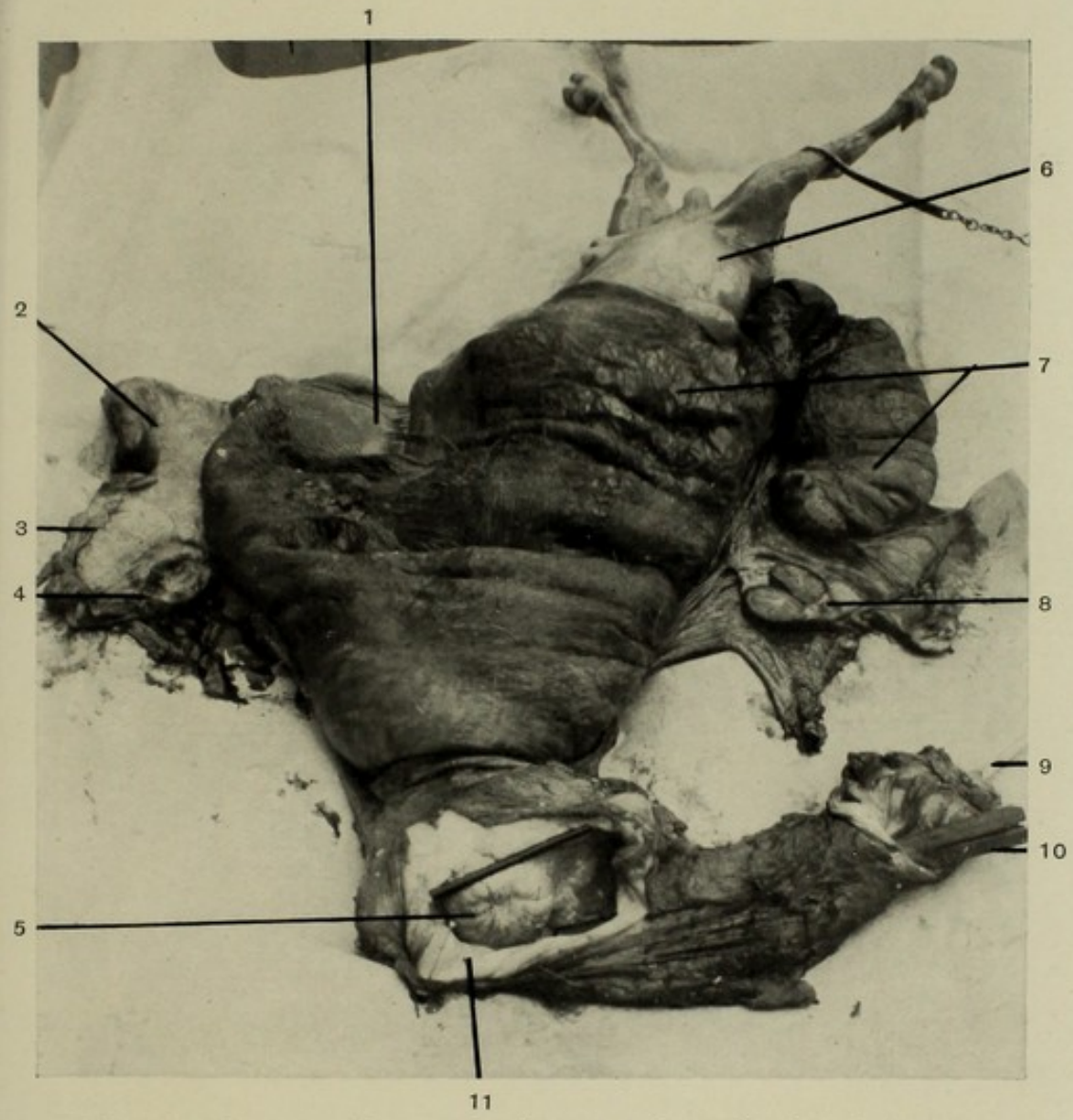

Fig. 16.—Pregnant Uterus of a Cow, seen from the Dorsal Aspect.

From a photograph of the Author's specimen.

1. Inter-cornual Fold and Sulcus. 2. Left Cornu of Uterus: not pregnant. 3. Left Fallopian Tube. 4. Left Ovary opened: no Corpus Luteum therein. 5. Cervix Uteri plugged with Mucus. 6. Male Calf partly extracted from the Right Cornu. 7. Right Cornu of Uterus: pregnant. 8. Right Ovary opened, showing large bisected Corpus Luteum. 9. Sound passed into Bladder. 10. Rod passed along Vagina up to the Cervix. 11. Vagina opened, showing the Cervix.

To face page 96.]

Why this shallow cervix, which was *a quarter of an inch deep*, should be thought an obstacle to an ovum of at most one hundredth of an inch diameter I cannot understand; the more so when we recall that it has already travelled down the Fallopian tube, whose diameter is infinitely less than a quarter of an inch, the depth of the cervix.

In the polytocous animals, or those which bear multiple

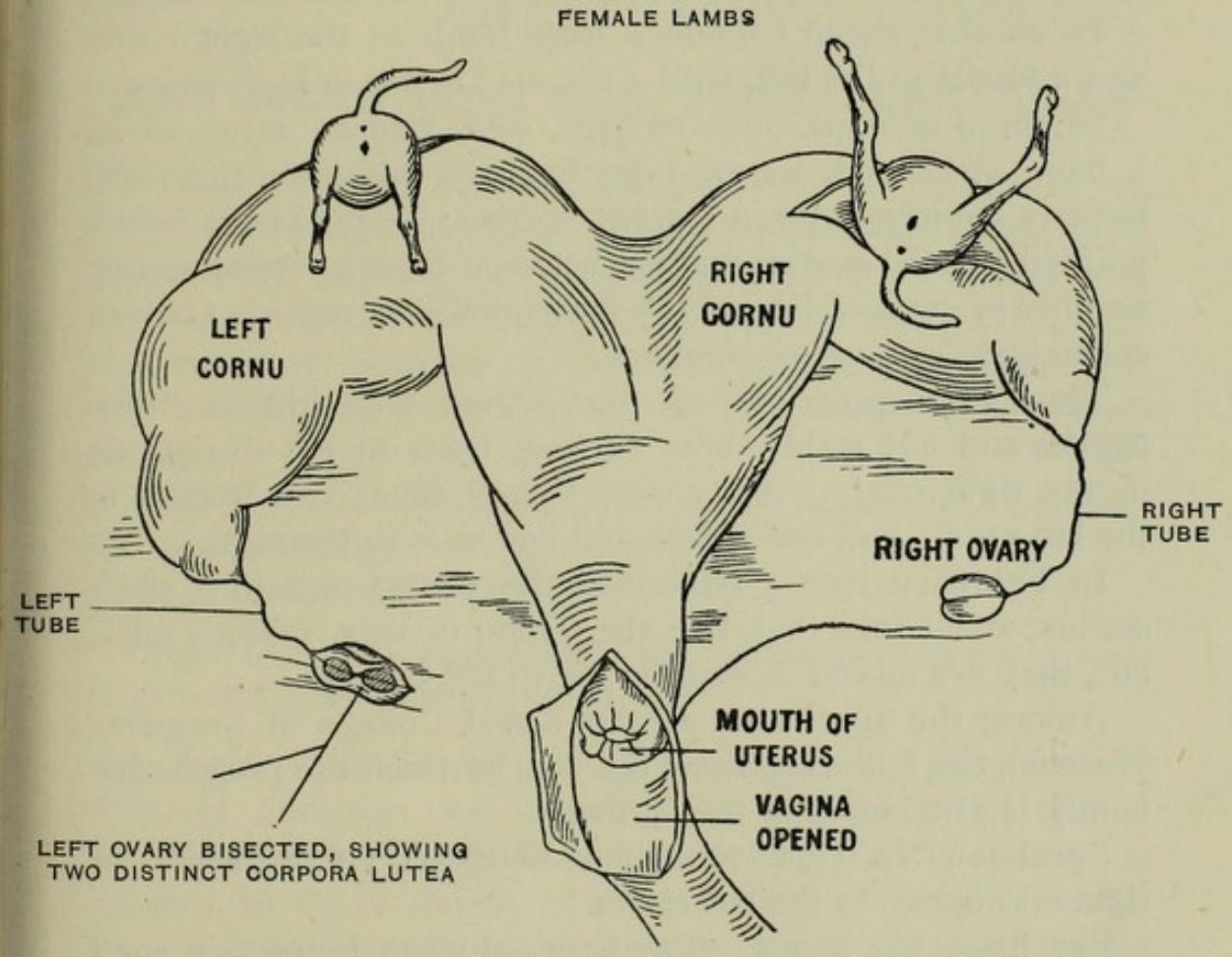

Fig. 17.—The Pregnant Uterus of a Sheep, Dorsal View. (Original drawing from nature.)

There is no corpus luteum in the right ovary; both uterine cornua are pregnant with a female lamb, and the left ovary contains two well-marked distinct corpora lutea, because it had provided both ova.

offspring, we find that one cornu is very rarely empty if there be more than one embryo—that is, it is rare to find two or more fœtuses in one cornu and none in the opposite cornu.

If an animal have only two fœtuses in the uterus, one will usually occupy each cornu regardless of its sex; thus in a pregnant sheep I opened, I found the **right** ovary small, with no corpus luteum. The **left** ovary contained *two quite distinct*

threepenny-piece-sized corpora lutea; though, as both horns were manifestly pregnant, I diagnosed before opening them a **female** lamb in each horn, and such they turned out to be when I slit them open.

I may add that there could be no question as to the sex, for they were covered in wool and so sufficiently developed to be able to tell by inspection; further, in most cases I opened the fœtuses and found the uterus, etc., or else the **male** organs.

In another sheep I found a **male** lamb in the **right** cornu and a **female** in the **left**, with a corpus luteum in each ovary.

In those animals, such as pigs, cats, rabbits, mice, which I have examined, whose offspring are truly multiple, the fœtuses are mixed up in the two cornua; but, as I have before pointed out, the ovaries contain between them a corresponding number of corpora lutea, both individually as regards sex and collectively as regards numbers.

Thus, in a pregnant cat there were four kittens, three **females** and one **male**; three corpora lutea in **left** ovary, one in the **right** ovary. They were lodged thus: two **females** in the **left** cornu, and one **female** and one **male** in the **right**.

In February 1902 I examined the young pigs in a sow's cornua, and found that, like the young of cats, rabbits, mice, etc., they are mixed as regards sex in the cornua.

Among the specimens at the Royal College of Surgeons Museum, the following show the way in which the prospective family is distributed in the cornua:

Specimen No. 3576.—Pregnant hedgehog: four fœtuses in **right** cornu, two in the **left** cornu.

Specimen No. 3566A.—Pregnant cat: two fœtuses in each uterine horn.

Specimen No. 3574.—Pregnant mole: three fœtuses in **right**, two in the **left** cornu.

Specimen No. 3469A.—Pregnant mouse: four fœtuses in each uterine cornu.

CHAPTER XV

WHY MORE BOYS ARE BORN THAN GIRLS

THOUGH there is no uniform proportion or numerical relation between the numbers of **male** and **female** children born to any two parents, *i.e.* in any one individual family, yet there is a very definite or normal numerical relation between the sexes at birth on taking the average of a country or several countries, the proportion being 106 **male** to 100 **female** children.

That this excess of **male** births is not accidental is evident by its universality.

As *Havelock Ellis*[1] says:

"There are more **boys** than **girls** born among the Germans, French, English, and most civilised European races";

the slight variation in the proportions as given for the different countries not affecting the average proportion of 106 **males** to 100 **females** for all countries. The proportion is reputed to be in excess of these figures in those countries only, *e.g.* Spain, Roumania, Greece—where we should least expect birth certification and registration to be carefully and accurately carried out. This fact of the excess of **male** births over **female** births has been noticed and recorded for over two hundred years, so that its explanation must apply to that time also.

Why it is imperative that Nature should produce more **boys** than **girls**, is evidently due to the necessity that exists to compensate for the greater mortality of **males**.

This excessive **male** mortality, as we shall presently see, does not only occur at birth.

[1] H. Ellis, "Man and Woman," 1904, p. 429.

At birth the difficulties and dangers of parturition, and the consequent higher fœtal mortality, are increased by the larger size of the **male** fœtus compared to the **female.**

This applies not only to the **boy's** head, which, as a rule, is larger than a **girl's**, but usually to the whole body also; hence we find that the proportion of still-born **boys** is very much larger than that of still-born **girls**, the ratio being 138 still-born **boys** to 100 still-born **girls.** So that we have not only more living **males** born than **females**, but also a still larger proportion of dead full-time **males** to dead **females.** Abortions and premature births are also more often **males** than **females**, so that **male** conceptions exceed **female** conceptions, the ratio being about 110 **male** conceptions to 100 **female.**

Even after birth there is, especially during the first year of life, a much greater liability for the **male** infant to die—so much so that although, as we have seen, more **boys** are born than **girls**, the proportions are reduced to almost even terms by the end of the first year, owing to this greater **male** mortality.

During the first four years of life, in a gradually diminishing degree, the mortality among **males** still exceeds that among **females**; and this is the more remarkable when we recall that the management of the two sexes does not materially differ—they are dressed practically identically, and receive the same food.

Dr. Harry Campbell[1] states that the proportion of **male** deaths to **female** for the first five years of life is 69·5 **male** to 59·7 **female** per thousand. He ascribes it to "an innate tenacity of life on the part of the **female.**" For some interesting particulars of this higher **male** mortality see also *Havelock Ellis*, "Man and Woman," chap. xvii., 4th ed., 1904.

The environment of adult men and women differs considerably; the woman's life is passed essentially within doors, the man's is more out of doors, and this very condition of life and work in the open is responsible for some of the deaths to which women are not so liable.

Lads and men, both in their pleasures and in their occupations, run many risks, and meet with not only fatal

[1] H. Campbell, "Differences in the Nervous Organisation of Man and Woman," 1891, pp. 123-5.

accidents, but with fatal illnesses also, and thus help to swell the adult **male** mortality.

One cannot, however, fail to agree with *Dr. Harry Campbell*[1] that—

"The part played by an unfavourable environment in causing the proportionately greater mortality of the **male** sex has been much exaggerated."

When, therefore, to the greater **male** *infantile* mortality we add the greater *adult* **male** mortality, it becomes abundantly evident that it was essential for Nature to produce more **boys** than **girls** to counteract the greater **male** mortality.

The greater **male** birth-rate is, however, more than counterbalanced by the greater **male** mortality, so that among adults the number of living **females** exceeds the **males**. In 1901 over eighteen thousand more **males** than **females** were born in England and Wales, but over twenty thousand fewer **females** than **males** died during the same time. So great has become this excess of women over men that the proportion now stands at 107 living women to 100 men, or a total majority in these islands of 1,082,000 women up to the year 1901.

Having considered the reasons *why* more **boys** should be born than **girls**, it remains to see *how* this excess of **male** births over the **female** is brought about.

How, then, does Nature insure the production of more **boys** than **girls**?

This simple-looking question has always been one of the most difficult ones to explain by any of the theories hitherto put forward to elucidate the cause of sex, and the means by which this excess of **male** births is brought about has evaded all theorists. It can be readily explained by the theory I set forth.

It is solved by the evident fact that in order to produce more **males**, or **boys**, it will first be necessary to provide more **male** ova ; but, as I have already shown, the **male** ova come only from the **right** ovary, hence it is essential to produce more **right-sided** than **left-sided** ova. This, then, is brought about by increasing the area of the **right** ovary as compared to the **left**, so that more ova are produced by the larger **right** or **male** ovary than by the opposite or smaller **left** ovary.

[1] H. Campbell, *op. cit.*, p. 122.

That the ovaries are not usually the same size I have already mentioned in the chapter on their anatomy, the **right** ovary being larger than the **left.**

This actual anatomical fact has been very slowly recognised by British writers, for unfortunately, in discussing the anatomy of the ovaries, they are generally spoken of in the singular, and their respective size is not given.

That the **right** ovary is the larger of the two ovaries is definitely stated by the following authors :

William Anderson[1] says, "The **right** (ovary) is usually a little larger than the **left.**"

Clarence Webster[2] says, "The **right** ovary is larger than the **left.**"

George A. Piersol[3] : "The **right** ovary being commonly slightly heavier and larger than the **left** ovary."

Parvin[4] : "The **right** ovary is usually somewhat larger than the **left.**"

Bonamy and Beau[5] show in Fig. 1, Plate 72, in a young virgin woman who died in the *intermenstrual* period, the **right** ovary considerably larger than the **left.**

Berry Hart[6] shows the **right** ovary about a third larger than the **left.**

In order to further satisfy myself of the correctness of this fact, I have inspected the specimens at the Royal College of Surgeons Museum, and find that specimens Nos. 293, 296, 297, in the anatomical series, and specimens Nos. 2818, 3619A in the physiological series, prove it to be true ; but one specimen, No. 294, of the "Uterus and appendages from an old woman who had borne children," shows the **left** ovary, a trifle only, larger than the **right.**

In several autopsies I have made in general practice on women in the reproductive period of life I have found the **right** ovary larger than the **left,** and the increased size was

[1] Anderson in "Henry Morris' Treatise on Human Anatomy," 3rd ed. 1902, p. 1106.

[2] C. Webster, "Diseases of Women," 1898.

[3] Piersol in Norris and Dickinson, *op. cit.*, p. 57.

[4] Parvin, "Science and Art of Obstetrics," 1895, 3rd ed., p. 76.

[5] Bonamy and Beau, "Anatomy of the Human Body," Paris, part iii., 1850, Plate 72.

[6] Hart, "Atlas of Female Pelvic Anatomy," 1884, Plate vi., fig. 4, p. 10.

not due to the increased size of an ovary incidental to the presence of the menstrual period, nor was it due to the presence of a corpus luteum of pregnancy.

Further, I have noted the relative size of the ovaries while watching others perform such operations as hysteropexy for conditions which do not imply disease of the ovaries themselves. These cases have also proved that the **right** ovary is the larger of the two.

Granting, therefore, that the **right** ovary is larger than the **left** ovary, we can correctly attribute the fact that more **boys** are born than **girls** to this other fact—that the area of ovarian tissue capable of producing **right-sided** or **male** ova is greater in extent than is the **left** ovary, and thus Nature secures the production of more **male** ova than **female** ova.

That this is the correct solution of this vexed question, why more **boys** are born than **girls**, is confirmed by the equally convincing fact that **twin boys are similarly much more numerous than twin girls**; for manifestly the probability of providing two distinct ova at the same time by the **right** ovary is much increased by enlarging the size of that **right** ovary, over the ovary of the opposite or **left** side.

Thus *Veit*,[1] out of 150,000 cases of twins, found that 50,000 cases were both **boys**, and 46,000 cases were both **girls**.

Galabin,[2] after quoting Veit, also gives from the Guy's Hospital Maternity Charity the percentages as 38 per cent. both **boys**, 28 per cent. both **girls**.

Porter Matthew[3] gives the percentages as 58 per cent. both **boys**, 16 per cent. both **girls**.

Rumpe, quoted by Jewett, gives "31 cases both **boys**, 16 both **girls**."

Spiegelberg,[4] too, states that twin **boys** occur more often, for "two **females** are rarest."

Parvin[5] also says that "twin **males** predominate over **females**."

[1] Veit, quoted in Lusk's "Midwifery," 1889, p. 230.

[2] Galabin's "Midwifery," 1900.

[3] Porter Matthew, "Clinical Observations on Two Thousand Obstetric Cases," 1898, p. 55.

[4] Spiegelberg, *op. cit.*, p. 271.

[5] Parvin, *op. cit.*, p. 165.

Garrigues[1] says: "The rarest combination is that of two **females.**"

Jewett[2] says: "The proportion of twin **males** is largely in excess."

Not only does Nature thus relatively increase the number of **male** or **right-sided** ova she produces, but she renders their fertilisation more probable by so placing the **right** cornu of the uterus, the **right** Fallopian tube, and the **right** ovary, that access to them by the spermatozoa is actually easier than to the opposite or **left** side. Further, the **right** tube is larger than the **left,** so that the passage of the spermatozoa is facilitated (see figs. 3 and 18).

Thus *Spiegelberg*,[3] *Playfair*,[4] and *Parvin*[5] agree that "a slight rotation occurs by which the **left** side (of the uterus) is thrown towards the front, and the **right** (side) backwards."[6] Consequently the **right** cornu uteri, tube, and ovary lie on a lower level in the pelvis than do those of the **left** side when the woman is lying on her back, and thus access of semen to the **right** tube is favoured. This is still further facilitated by the fact that more women invariably sleep on the **right** side than on the **left**—so much so, that *Spiegelberg* even considered the more usual **right** lateral posture for sleep as responsible for the inclination of the uterus to the **right** side of the body.

From inquiries I have made of many scores, of married women especially, I found the majority *do* sleep on their **right** side. Further, I find this habit is due to the anatomical fact of the presence of the heart on the **left** side; for in lying on the **left** side a woman's **left** breast is pressed upon the region of her heart, and its action is not only accelerated, but it becomes very distinctly audible to her—in fact, palpitation disturbs her rest, and this she avoids instinctively by turning on to her other side. Here the pressure of the **right** breast on the chest wall has necessarily no disturbing effect. I have further proved this by noting that women with ill-developed

[1] Garrigues, "Science and Art of Obstetrics," 1902, p. 259.
[2] Jewett, "Practice of Obstetrics," 1907, p. 316.
[3] Spiegelberg, *op. cit.*, p. 32.
[4] Playfair, *op. cit.*, p. 33.
[5] Parvin, *op. cit.*, p. 71.
[6] See also Gerrish in the chapter on "Anatomy."

breasts sleep on either side at will; a woman with well-developed breasts sleeps nearly always on her **right** side. Some of the semen usually enters the womb directly *during* coition, it being drawn in by a suction-like action on the part of the uterus. Were it not so, a mercurial vaginal injection just after coitus should invariably prevent pregnancy, which it does not. Owing, however, to the motility of the spermatozoa, this action of the uterus is not absolutely essential to successful fertilisation.

If the Fallopian tubes are to be looked upon as receptacles for the semen (see the chapter on "Fertilisation"), it is evident that the tube which usually lies on a lower level is the one into which gravity, acting soon after coitus, will help to carry most of the semen; and the larger **right** will contain more.

Although the spermatozoa are known to travel greatly through their own motility, yet this more dependent position of the uterine opening of the **right** Fallopian tube must to some extent help to secure the entrance into the **right** tube of a greater amount of semen, and thus the fertilisation of the **right-sided** ova is rendered more probable. On the other hand, women who sleep chiefly on the **left** side must render the access of semen to the **right** Fallopian tube more difficult, though of course, owing to the motility of the spermatozoa, far from impossible.

This greater accessibility of the **right** Fallopian tube to the semen must, of course, only rank as a contributory reason for more **boys** being born than **girls**; the chief reason being, as we have seen, that more **male** than **female** ova are produced.

The fact that the **male** birth-rate among Jews of all nations is higher than the **male** birth-rate among Christians—*Rauber* gives the figures as 107·6 **male** Jews to 106·4 **male** Christians—is due entirely to religious and social reasons, and has nothing to do with the prohibition of sexual congress till a week has elapsed after the cessation of a menstrual period.

The Jewish religion very strongly condemns—

(*a*) The artificial prevention of pregnancy.

(*b*) The procuring of abortion.

(*c*) The taking of drugs with the intention of inducing miscarriage.

We know that women more readily abort and miscarry with **male** children ; hence whatever prevents abortion or miscarriage leads to an increased number of **boys** being born.

The Jewish women, too, are more zealously taught the rearing of children after their birth, so that with greater care more **male** infants are reared than is the case among Christian women.

And, again, infanticide amongst the Jews is almost unknown.

The only exception to the usual greater birth-rate of **males** to **females** of 106 to 100 is found in illegitimate children.

We find that the percentage of illegitimate **boys** born to illegitimate **girls** is reduced to 103 to 100—a difference of 3 per cent. More **girls** are thus born relatively, not absolutely.

This birth of a greater number of illegitimate **female** children applies chiefly to young women and their first child—the result of indiscriminate insemination. It is not seen in those young women who have more than one illegitimate child, neither is it found among the children born of people "living together," but not actually legally or clerically married.

Illegitimacy is undoubtedly the chief cause of criminal still-birth, and most authorities put the chances of an illegitimate child being "still-born," when compared with the legitimate, as about 2 to 1. *Bertillon* puts it as 193 to 100.

As a rule in *first* labours, 1 child in 11 is still-born, whereas in other labours only 1 in 32 is born dead.

In this connection it is curious to note that, while *Bertillon* affirms that first children are more likely to be **males**, *Schenk* states just the opposite—that among the first-born there are a greater number of **females**.

Two important points must be borne in mind when we consider this greater relative birth-rate of illegitimate **girls**.

FIRST. We must not forget that in unmarried women very numerous attempts to procure abortion are made, and that women abort and miscarry with a **male** child more often and more readily than with a **female**.

Hence, abortion being more readily induced if the embryo be a **male**, it follows that if pregnancy is not thus interrupted a **female** is more likely to be born.

SECONDLY. If pregnancy proceed naturally, the careless

attention at the hands of old untrained women which the majority of these single women receive during the actual confinement, amounting almost to criminal neglect in the delivery of their infants, leads to the larger-headed **male** child not being helped into the world as he probably would be were his mother married. Therefore he is more likely to be born dead, and so is not registered.

It is possible to delay the birth, or to omit to deliver or to tie the cord quickly enough for the child to be alive—sins of omission. There are also sins of commission I need not allude to.

On the other hand, the smaller **female** infant slips more readily into the world, and hence we get a relatively larger number of **girls** born illegitimately.

As the law neither required the registration of the birth of children born dead, nor a medical certificate of the cause of the still-birth, many so-called still-born children were not really so, but came alive into the world, and died of neglect, exposure, suffocation, or other illegal means.

If full details and statistics of the sex of illegitimate conceptions, not live births only, could be procured, it is very doubtful if they would show this greater proportion of **females.**

CHAPTER XVI

THE INFLUENCE OF LATERAL DECUBITUS ON SEX CAUSATION

IT is difficult to trace back to its origin the belief in the influence of lateral decumbency on sex causation.

The theories which have been advanced as to the influence of a lateral posture on the causation of sex take three more or less distinct forms.

The *first*—I mention only to discredit it—is that sex is dependent on the woman lying on one side "at the time of coition."

This contention is manifestly absurd, as a lateral position is neither normal nor even common.

A *second* theory, first broached in the "Lancet,"[1] was that sex depended on which side you habitually slept of your wife: if on the **left** side, you beget **girls**; if on the **right** side, **boys** are born.

In answer to this the editor of the "Lancet" asked, How is the variations of sex in the same family to be accounted for? while I ask, Whence come **boy** and **girl** twins? and What settles the sex of the children whose fathers and mothers did not sleep together at all?

The *third* idea is of great antiquity, and has obtained wide notoriety and belief.

It is that a woman must turn on to her **right** side *directly after coition* for a **male** pregnancy to result, or on to her **left** side directly after, to insure giving birth to a **girl**.

This theory was certainly known to Avicenna, a physician living in Ispahan in the tenth century; and Albertus Magnus, in 1582, knew of it and quoted it.

[1] "Lancet," 1870, vol. i. p. 608.

Millot, a French doctor, writing in 1816, also supported the idea, and further ascribed **boys** to fertilisation of the ova from the **right** ovary, and **girls** to fertilised **left** ova; but, unlike my theory, he ascribed to the father his share in sex causation.

This theory of turning on to one or other side *after* coition,

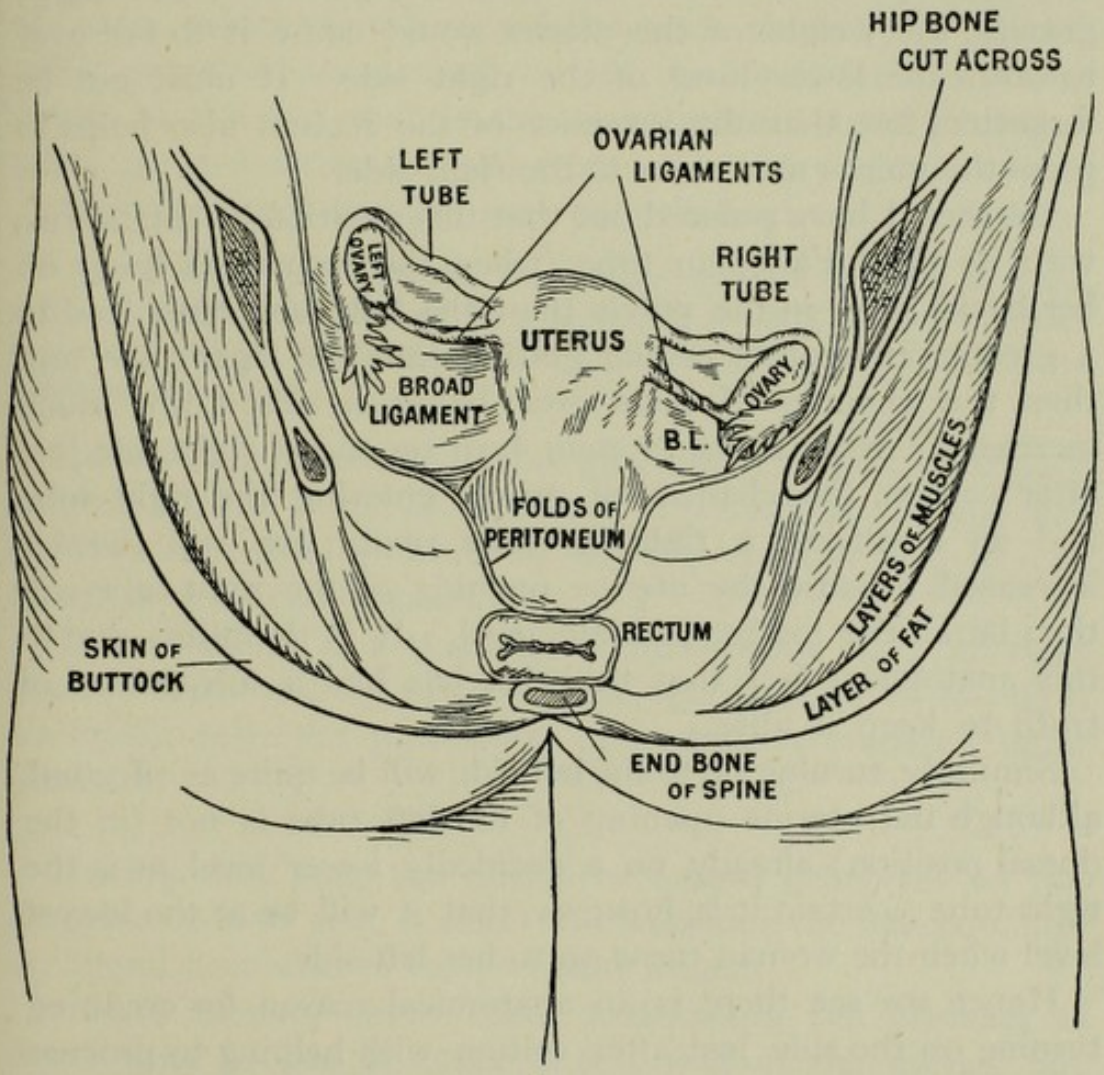

Fig. 18.—Posterior View of Uterus and Ovaries, with the Folds of Peritoneum forming the Broad Ligaments, etc. (Modified from Dickinson and Hodge.)

The figure shows the uterus lying more in the right half of the pelvis, its anterior surface facing more to the right, and the right tube and ovary carried backwards. The back of the pelvis, etc., has been removed.

to produce the sexed child desired, is credited in many parts of the country to this day, so that it may be called the popular view. It has been advocated without in any way being aware of or appreciating the anatomical conditions which secure for it at least some element of truth, as well as

prospect of success; for it is only recently that the Fallopian tube has been acknowledged to be the most usual site of fertilisation.

I have already alluded in Chapter XV. to the fact that the majority of women sleep on their **right** side, and that to this fact of lying chiefly on the **right** side *Spiegelberg* credited the usual position of the uterus in the pelvis; for, owing to gravity, the weight of the uterus would cause it to fall over towards the lower level of the **right** side. It must not be forgotten, too, that the presence of the rectum also helps to press the uterus more over to the **right** side.

Further, I have pointed out that this position of the uterus, with its **right** Fallopian tube (when the woman is lying on her back) lower in the pelvis than the **left** tube, must lead to a greater amount of semen getting into the **right** tube, and thus the chances of **male** ova being fertilised are much increased. Now, if the woman turn on to her **right** side just after coition, the chances of semen entering the **right** tube and so fertilising a **right** or **male** ovum are still *further* increased, because the uterine opening of the **right** tube will then be at the lowest possible level. It is doubtless due to this anatomical fact that the idea has had a substratum of truth to keep it alive.

Similarly, turning on to the **left** side will be quite as effectual, although the uterine opening of the **left** tube is not (in the dorsal position) already on a decidedly lower level, as is the **right** tube; certain it is, however, that it will be at the lowest level when the woman turns on to her **left** side.

Hence we see there is an anatomical reason for crediting turning on the side just after coition with helping to procure the sex required; we must not forget, however, that the primary essential to successful fertilisation, following turning on one or other side, is the presence in the tube of that side of a fertilisable ovum from the corresponding ovary.

We must not overlook that, although position may lead to one or other tube receiving most semen, yet the spermatozoa are able to, and do, travel very greatly in virtue of their own motility, as is proved in cases of pregnancy without actual penetration or vaginal insemination.

This fact of lateral inclination leading the semen to the

tube whose uterine opening is thus on the lower level is made use of by stock-breeders, who, by placing a cow or mare looking down, and standing with one side down a slope, endeavour thus to direct the spermatozoa into the "side" of the uterus which is down-hill, and so give them the sexed fœtus they require.

I have seen this followed by the desired result, though it is of course evident that it may fail *because the ovary of the side which gives the sex desired has not ovulated*; for everything points to the fact that in the monotocous animal ovulation takes place unilaterally, and from each ovary alternately.

A Scotch stock-breeder puts the whole matter to me thus:

"It is a well-known fact that the mother carries a colt foal or a bull calf on the **right** side, and a filly or heifer on the **left**; so that if a mare is covered and left standing with her **right** side down hill, she will have a colt (or **male**) foal."

He has been successful in this way, and tells me a veterinary surgeon at the West of Scotland Agricultural College has claimed successful production of the desired sex in one hundred consecutive cases.

This, therefore, is a practical demonstration that the **right** ova are **male**, and by directing the spermatozoa to the **right** Fallopian tube the production of a **male** is rendered more probable.

Having thus seen the effects of lateral decubitus on the determination of sex, I shall now consider the effects of sex on lateral decubitus in the pregnant woman.

I have already shown that occasionally the placenta is fixed quite to one or other lateral wall of the uterus, but more usually it is situated on the anterior or posterior wall, slightly more to that side of the mid-line which corresponds to the ovary which produced the ovum. *Dorland*[1] says:

"The point of attachment of the fecundated ovum is generally high upon the posterior uterine wall, *near the orifice of one of the Fallopian tubes.*"

From manual examination of the interior of the uterus just after the birth of the child, *Dr. Tuckey*[2] was able on

[1] Dorland, "Modern Obstetrics," 2nd ed. 1901, p. 46.
[2] "Medical Press and Circular."

several occasions to find the placenta attached chiefly to the **left** side of the uterine mid-line when the child was a **female**, and to the **right** side of the mid-line of the cavity when the child was a **boy**; from this he too came to the conclusion that **boys** were derived from the **right** ovary and **girls** from the **left**, but he did not dissociate the father from any share in sex causation.

It is evident, from this lateral position of the placental site, that the child usually develops more to one side of the uterus than the other; and from this *R. von Braun*[1] has derived the earliest evidence of pregnancy—a furrow forming and dividing the uterus into two different-shaped lateral halves, the pregnant and the non-pregnant.

"Its presence he attributes to changes in consistence and the alteration between contraction and relaxation of the portion of the organ in which the ovum is situated."

The pregnant side of the uterus being thicker in an antero-posterior direction.

It is thus somewhat akin to the pregnant and non-pregnant cornu of a bifid uterus.

The **male** ovum having entered the **right** lateral half of the uterus chiefly develops on that side, while the **female** similarly develops more on the **left** of the uterus; hence it comes to pass that the sex of the child a woman is carrying influences the posture in which she sleeps, for if a woman being pregnant with a **girl** lies on her **left** side she has no pain because the relations of the fœtus and the placenta are not disturbed; if she turn over on the other side, however, the child falls downwards to the lower level of the **right** side and thus leads to dragging on the placenta situated to the **left** side, and the pain soon makes her turn again to the painless side. It is to be remembered that by the time the placenta is formed, the child floats in the liquor Amnii and is capable of considerable movement in utero.

Similarly, if pregnant with a **boy**, turning on her **left** side gives pain because the child, falling downwards towards the lower **left** side, drags by its umbilical cord upon its placental

[1] Quoted by W. Williams, *op. cit.*, p. 162.

site on the **right** side of the uterus ; if however she lie on her **right** side, the side corresponding to the sex of the child, no pain is complained of, for the child and the placenta are approximated.

The following cases will prove this :—

Mrs. H. R. B., when pregnant with her **girl**, noticed she could only sleep on her **left** side—*i.e.* she could lie on her **right** side for a short time but could not get off to sleep if lying on the **right** side.

Now (April 1902) she is again pregnant, *she can only sleep on her* **right** *side*, and she finds her position for comfortably sleeping is exactly opposite to what it was during her last pregnancy.

From this one fact alone I foretold she would have a **boy**. A **boy** was safely born in June 1902.

Mrs. O. S. had 7 **boys** and 1 **girl**. She noticed that movement in bed gave her far more pain on the **left** side, when carrying the **girl**, than on her **right** side. She could not lie on the **right** side when pregnant with the **girl**—in fact, she said "She could not sleep at all on the **right** side when carrying the **girl**." She found lying on the **left** side eased the **left-sided** pain. She *always* slept and lay on her **right** side when pregnant with the **males**, and noticing the difference in the decubitus made her think she was not going to have a **boy**, when, unknown to her, she was pregnant with a **girl**.

Mrs. D. B. had 5 girls followed by 3 boys. She could only lie on her **left** side (for any length of time) when she was pregnant with a **girl**. During her last three pregnancies she found it was uncomfortable to lie on her **left** side—in fact she could not do so for long.

After the first **boy** was born, when she was again pregnant, she felt sure, and correctly foretold on two occasions, that she was again to have a **boy**, owing to her inability to lie on her **left** side in those last two pregnancies.

She could only lie on her **right** side for long when she "carried" the **boys**.

The next case is not quite so conclusive.

Mrs. C. S. had 4 **girls** followed by 2 **boys**. When pregnant with the two **boys** she could *only* sleep on her **right** side.

When pregnant with the **girls** she could sleep in any position.

We thus see that the sex of the child has in some few cases at least a determining influence on the position in which the pregnant woman can most comfortably lie.

Of course if the placenta be attached to the mid-line of either the anterior or posterior wall of the uterus the patient does not experience these definite unilateral pains when lying down.

CHAPTER XVII

THE PROPORTION OF THE SEXES IN INDIVIDUAL HUMAN FAMILIES

THERE is no fixed or stereotyped composition in the human family, and the proportion of the sexes to be born to any one couple is an uncertainty, while the different families which different parents have, or rather used to have, present an infinite variety.

This uncertainty has given rise to endless heartburnings and suspense.

The statistics of present-day families, however, are quite useless for the study of the proportion of different-sexed children born to each married couple; hence we have to look backwards to the days of our grandparents, to the olden days of earlier marriages, and prior to what may be called "the artificial prevention of pregnancy era." Then the marriage of two healthy individuals naturally led to large families, with the children of different sexes; and many and diverse were the designs in pins, etc., expressive of welcome to the "little stranger." These are now rarely seen, though suspense as to the sex of the coming infant still precedes its birth.

The following may be looked upon as cases of natural families; they are examples of well-assorted ovarian activity.

Mrs. R. had her children thus: 1, B[1]; 2, 3, 4, 5, G[1]; 6, B; 7, 8, twin G; 9, 10, 11, 12, 13, 14, 15, B; 16, 17, B and G twins.

Mrs. K. had 1, 2, 3, 4, 5, B; 6, 7, G; 8, B; 9, G; 10, B; 11, 12, twin B; 13, 14, B.

[1] B = boy, G = girl. The figures denote the order of birth, and show the number in the family.

Mrs. W.: 1, B; 2, G; 3, B; 4, 5, G; 6, 7, 8, B; 9, 10, G; 11, B; 12, 13, G.

Mrs. P. B.: 1, G; 2, B; 3, G; 4, B; 5, G; 6, 7, 8, 9, 10, 11, B; 12, G; 13, 14, B; 15, G.

Mrs. B. R.: 1, G; 2, B; 3, 4, G; 5, 6, B; 7, 8, G; 9, B; 10, 11, 12, G; 13, B.

Mrs. L. V.: 1, 2, twin B; 3, B; 4, G; 5, B; 6, 7, 8, G; 9, 10, 11, B; 12, 13, G; 14, B.

Mrs. G.: 1, 2, 3, B; 4, G; 5, 6, B; 7, 8, 9, 10, 11, G; 12, 13, 14, B.

Mrs. G. L. P.: 1, 2, 3, 4, G; 5, 6, B; 7, 8, G; 9, B; 10, G; 11, B; 12, G.

Mrs. O.: 1, G; 2, 3, B; 4, G; 5, 6, 7, B; 8, 9, G: 10, B.

In the following cases of families with numerous children, the different sexes came quite alternately:

Mrs. W.: 1, 3, 5, 7, **girls**; 2, 4, 6, 8, **boys**.

Mrs. R.: 1, 3, 5, 7, 9, **boys**; 2, 4, 6, 8, 10, **girls**.

Mrs. A. P. S.: 1, 3, 5, 7, 9, **girls**; 2, 4, 6, 8, **boys**.

Mrs. T. S.: 1, 3, 5, 7, 9, **boys**; 2, 4, 6, 8, **girls**.

Mrs. N.: 1, 3, 5, 7, 9, 11 and 12, **boys**; 2, 4, 6, 8, 10, **girls**.

Mrs. L.: 1, 3, 6, 7, 9 and 10, **boys**, 2, 4, 5, 8, 11, **girls**.

Mrs. H. C.: 1, 3, 5, 7, **boys**; 2, 4, 6, **girls**.

Mrs. C. B.: 1, 3, 5, 7, 8 and 9 (twin), **girls**; 2, 4, 6, **boys**.

Mrs. D.: 1, 4, 6, 8, 10, **boys**; 2, 3, 5, 7, 9, 11, **girls**.

These cases of women giving birth to children of different sex alternately give some support to the contention of the alternate action of the ovaries; certainly they are proof of the activity of both ovaries. They manifestly quite disprove such theories of sex as the relative age of parents, or relative vigour of the parents. For we can hardly expect relative vigour to alternate, say, every second year; while for the relative age to alternately vary is of course impossible.

That in the healthy state both ovaries are active, and that both normally ovulate regularly, is borne out by the occurrence in families of an equal number of children of each sex, irrespective of the order of their birth. Thus, from many of my patients and friends the following cases will support this statement:

Mrs. K. H. B. had 8 **boys** and 8 **girls.**
Mrs. P. „ 7 „ „ 7 „
Mrs. L. K. „ 7 „ „ 7 „
Mrs. B. D. R. „ 6 „ „ 6 „

Mrs. F. K., Mrs G. S, Mrs. C., Mrs. P. G. G., Mrs. C. G., Mrs. A., Mrs. R., Mrs. K. V., and Mrs. M. all had ten children, five of each sex.

These cases go to prove that the two ovaries settle the sex, and that each sex is equally likely to occur, with the slight preponderance of **males** (106 to 100) due to the larger **right** ovary.

These cases *also* should disprove such theories of sex causation as relative age and vigour of parents, as neither age nor vigour can be supposed to change about so as to allow an *equal* number of children of both sexes to be born.

I have the names and particulars of many other families of eight children, four of each sex, and of six and four showing sexes equally divided ; but I have only included the more numerous families, to show it was no coincidence.

If, instead of both ovaries being active, only one ovary is active, the other being functionless or absent—that is, Unilateral Sterility—we get all the children borne by that woman of the same sex, because ova of only one side, and therefore one sex, are provided.

UNILATERAL STERILITY.—There are several reasons to account for the inactivity of one ovary, or Unilateral Sterility, as I have elsewhere called it.

The CHIEF CAUSE of this sterility of an ovary is an inflammatory one. Very frequently after a confinement some inflammatory mischief sets in round about the uterus, in the Fallopian tube or ovary, and leads either to the tube being obliterated or bound down, or the ovary being thus affected. This may occur after the first or any subsequent confinement.

Indeed, *Drs. Hart and Barbour*[1] say :

"It is the rare exception to examine a parous female pelvis without finding some traces of a previous cellulitis or peritonitis ;"

[1] Hart and Barbour, *op. cit.*, p. 159.

and on p. 155 (prognosis as to sterility after pelvic peritonitis),

"The mechanical closure by pressure of the Fallopian tube, and ovaritis, rendering ovulation impossible, are conditions often produced."

ANOTHER CAUSE of Unilateral Sterility is a rudimentary or undeveloped condition of one ovary, as in the following case:

A. W., aged 32, died in Westminster Hospital of cancer of the breast. P.M. "The uterus was large and subinvoluted. The **right** ovary was rudimentary." It was a case of undeveloped ovary.

Such cases lead to all children being of the same sex.

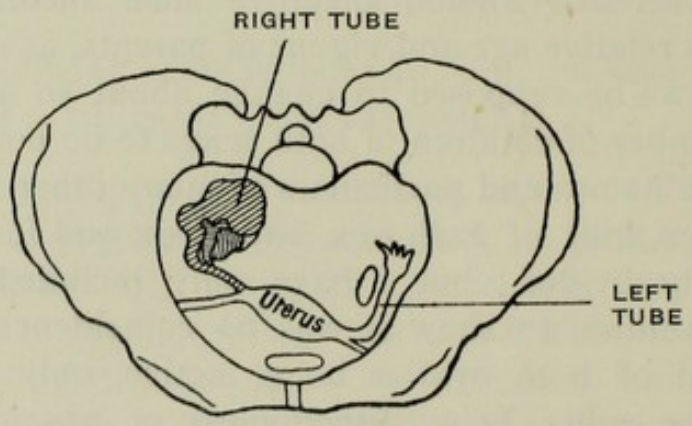

Fig. 19.—Diagram of Right Salpingitis. (Modified from Martin.)

The right tube is both thickened and closed from inflammation and adherent to the right ovary, leading to right-sided sterility, so that future children would be females.

OTHER CAUSES of unilateral inactivity of an ovary are shrivelling, atrophy, or cirrhosis of the ovary, the proper ovulating tissue of the ovary being destroyed.

H. Reeves,[1] F.R.C.S. Ed., described a case of cirrhotic **right** ovary in a woman the subject of **left** ovarian pregnancy. The fœtus developed *in and from* the **left** ovary, and was a **girl.**

ANOTHER CAUSE of Unilateral Sterility is advanced disease in one ovary sufficient to prevent ovulation.

Dr. Spencer[2] described a case of large dermoid tumour of the **right** ovary: the woman became pregnant and gave birth to a **girl**, because, owing to the diseased condition of the **right** ovary, the **left** ovary must have provided the ovum.

[1] H. Reeves, "Lancet," Oct. 1890, p. 872.
[2] H. Spencer, "Trans. Obstet. Soc.," 1898, pp. 16-18.

Dr. Galabin[1] showed tumours of both ovaries removed at the fourth month of pregnancy :

"The **right** tumour was a dermoid cyst containing gruel-like fluid, which solidified on cooling. It contained also hair, loose teeth, and bone."

"The **left** tumour was an ordinary cystic adenoma, except that three small cysts in it were evidently dermoid. In the **left** tumour was seen a large corpus luteum of pregnancy, and near it a small fragment of unaltered ovary."

Unfortunately the sex of the child when ultimately born was not given ; but I feel confident it was a girl.

Milander described a case where the **left** ovary was calcified and detached, and was lying free in the pelvis. It is evident that *that* ovary could not ovulate.

CONGENITAL ABSENCE of one ovary must, of course, result in Unilateral Sterility, or the production of one sexed children only. Such cases are rare, but of course give absolute proof that one ovary produces only one sex.

A very remarkable case is described by *J. Bland-Sutton.*[2] A woman, aged 33, had given birth to a **boy**, when, because of a painful swelling behind the uterus, abdominal section was performed :

"The uterus was found to be of the unicorn variety, and to possess *one* Fallopian tube and a *well-developed ovary on the* **right** *side.* The **left** side of the uterus was smooth and rounded, and *lacked a broad ligament, ovary, and Fallopian tube.*

"The **right** kidney occupied its proper position ; the **left** one lay in the hollow of the sacrum, and proved to be the body behind the uterus. The patient made an uninterrupted recovery. About fourteen months afterwards the patient conceived, and had the satisfaction of being delivered of a fine child, a **boy**."

No case could be more conclusive. The patient had given birth to a **son** before an operation disclosed the fact that her left kidney was congenitally misplaced—further, that not only was the uterus undeveloped and defective on the **left** side, but that her **left** Fallopian tube and **left** ovary *were entirely absent.* After the operation she became pregnant, and gave birth to *another* **boy**.

[1] Galabin, "Trans. Obstet. Soc.," 1896, p. 101.

[2] Bland-Sutton, "Surgery of Pregnancy and Labour complicated with Tumours." "Lancet" Reprint, vol. i. p. 50, 1901.

Thus there were *two* **sons** born to a woman who possessed only the **right** *ovary* in her body.

This unilateral sterility is of course also caused by unilateral ovariotomy, or the complete removal of an ovary and tube from one side by operation. The post-operative children in these cases (compare Chapter X.) are all of the same sex, because one ovary only breeds one sex.

Children all the same sex

I have in Chapter VII. alluded to the fact that many **females** have *all the same sex offspring* even with different husbands, or in the case of animals with multiple **male** animals, showing that the question of sex rests only with the mother; but in the ordinary married state of one husband to one wife it is very remarkable, to say the least, how often that couple will only give birth to children of one sex. It points to the fact that only one ovary is active.

The following are cases in point, selected from families where the mother has finished childbearing. Only those having six or more children are given, less than that number hardly being conclusive:

Mrs. G. M.	had	18	**boys**		Mrs. W.	had	20	**girls**	
„ T. P.	„	9	„		„ H. B.	„	14	„	
„ S. H.	„	9	„		„ R. H.	„	13	„	
„ B.	„	8	„		„ M.	„	11	„	
„ K. W.	„	8	„		„ D. M.	„	10	„	
„ H. S.	„	7	„		„ C. B.	„	8	„	
„ R. S. B.	„	8	„		„ S. H.	„	8	„	
„ C. S.	„	7	„	No **girls**	„ L. C.	„	7	„	No **boys**
„ D. C.	„	7	„		„ A.	„	7	„	
„ E. W.	„	7	„		„ H. U.	„	7	„	
„ B. S.	„	7	„		„ F. W.	„	7	„	
„ W. N. S.	„	7	„		„ W. H.	„	6	„	
„ L. S. H.	„	7	„		„ L. F.	„	6	„	
„ M.	„	6	„		„ W. S.	„	6	„	
„ Z.	„	6	„						

I have details of many other families of smaller numbers not necessary to quote.

In cases of succession to title or fortune the extreme importance of having a son and heir is evident; some women,

however, are quite unable to provide a **male** ovum for fertilisation, owing to Unilateral Sterility, however caused.

"A celebrated case,[1] which attracted great attention, occurred in the family of Sir Francis Willoughby, who died seised of a large inheritance. He left *five daughters* (one of whom was married to Percival Willoughby), *but not any son.* His widow at the time of his death stated that she was with child by him. This declaration was evidently one of great moment to the daughters, since, if a son should be born, all the five sisters would thereby lose the inheritance which descended to them. Percival Willoughby prayed for a writ *de ventre inspiciendo*, to have the widow examined, and the Sheriff of London was accordingly directed to have it done. He returned that she was twenty weeks gone with child, and that within twenty weeks *fuit paritura.* Whereupon another writ issued out of the Common Pleas, commanding the Sheriff safely to keep her in such an house, and that the door should be well guarded; and that every day he should cause her to be viewed by some of the women named in the writ (wherein ten were named), and when she should be delivered, that some of them should be with her to view her birth, whether it be **male** or **female**, to the intent there should not be any falsity. And upon this writ the Sheriff returned, that accordingly he had caused her to be so kept, and that on such a date she was delivered of a **daughter.**"

So she had in all six **girls** and no **boy**.

I conclude these cases with the following two extracts from newspapers, but cannot vouch for their accuracy, as I can of the above-mentioned cases:

"Daily Mail," April 22, 1901:

"The recent census in Italy has revealed some extraordinary cases. The wife of a Turin labourer, named Marie Danna, who married at 19, and is now 59, has had *thirty-four sons.* Thirty-one are now living, and are all at home with their parents."

"Daily Mail," March 5, 1897:

"An inhabitant of Arendskerke, in Holland, has notified to the municipal registrar the birth of his *twenty-first son*, all the others being alive and in the enjoyment of good health."

The above, then, are cases where the activity of one ovary

[1] Montgomery, "Signs and Symptoms of Pregnancy," 1837, p. 35.

is lost, the first fertilised-ovum-supplying ovary being the only one remaining active, and hence all the children are of the same sex.

Another class of family is where the sex of the first pregnancy differs from those that follow, thus:

Mrs. B. B. had first a **boy**, then 5 **girls**.
Mrs. H. M. had first a **boy**, then 6 **girls**.
Mrs. V. B. had first a **boy**, then 10 **girls**.
Mrs. Y. had first a **boy**, then 7 **girls**.
Mrs. H. had first a **boy**, then 6 **girls**.
Mrs. D. had first a **boy**, then 8 **girls**.

Mrs. F. E. had first a **girl**, then 16 **boys**.
Mrs. McC. had first a **girl**, then 6 **boys**.
Mrs. B. P. had first a **girl**, then 9 **boys**.
Mrs. P. L. had first a **girl**, then 10 **boys**.
Mrs. W. M. had first a **girl**, then 6 **boys**.
Mrs. C. H. B. had first a **girl**, then 11 **boys**.

Here the ovary which supplied the ovum for the first pregnancy became after *that* pregnancy functionally useless, either from adhesions, or disease in it or its tube; so that in all the subsequent pregnancies the ova came from the other uninjured ovary, and the children were all of the same sex, and different from the first or primary pregnancy.

Here *unilateral* sterility *after the first* pregnancy is the cause.

A further class of family consists of cases, like that of the German Empress, where several **boys** are followed by a **girl**, and likewise a number of **girls** followed by a **boy**, such as:

Mrs. P. had 8 children, 7 **boys** followed by 1 **girl**.
Mrs. S. had 8 children, 7 **boys** followed by 1 **girl**.
Mrs. C. had 7 children, 6 **boys** followed by 1 **girl**.

Mrs. H. had 8 children, 7 **girls** followed by 1 **boy**.
Mrs. R. had 12 children, 11 **girls** followed by 1 **boy**.
Mrs. G. had 9 children, 8 **girls** followed by 1 **boy**.

Or again these—

Mrs. H. G. P. and also Mrs. J. both had 5 children, and both had 2 **boys**, then twin **boys**, and lastly a **girl**.

Mrs. H. had 8 children, 5 **boys**, then twin **boys**, and lastly a **girl**.

Mrs. G. had 12 children, 9 **girls**, then twin **girls**, and lastly a **boy**.

Mrs. B. C. S. had 22 children, 18 **girls**, then twin **girls**, followed by a **boy**, and lastly another **girl**.

In these cases the binding down of the ovary and tube which *did not act* must have been undone either by the number of pregnancies, or by the last one, so that the ovary and tube were set free, as it were, once more, and at last were able to act, with a change of sex as a result. That this liberation from adhesions is possible is stated by *Hart* and *Barbour*[1]:

"The adhesions (of Fallopian tubes) may ultimately yield to the stretching brought to bear on them by the developing uterus."

That this does definitely occur is absolutely proved by cases reported by *Dr. Herman*,[2] where he says:

"The ovary and tube, which were in 1886 so embedded in adhesions that the operator could not identify them, were in 1901 almost free, and were easily pulled up.'

And by the writer,[3] in the same journal, "the right appendages were so matted and bound down," they could not be inspected in July 1901; while less than two years afterwards no adhesions were met with, they had been absorbed, and thus liberated the ovary and tube.

This undoing or absorption of adhesions is now copied by surgeons who artificially release bound-down tubes, so that "many pregnancies have occurred after simple freeing of tubes from adhesion." (*Mrs. S. Boyd.*)

Frequent repetition of pregnancy—that is, a woman having several children rapidly; as well as cases of hydramnios (dropsy of the womb); and also cases of twins, which lead

[1] Hart and Barbour, *op. cit.*, p. 155.

[2] Herman, "Journal of Obstetrics and Gynæcology of the British Empire," vol. ii. 1902, pp. 226-228.

[3] E. R. Dawson, "Journal of Obstetrics and Gynæcology," vol. iv., Sept. 1903, pp. 301-3.

to excessive distension of the uterus during pregnancy; would all, owing to the stretching caused by them, be most likely to lead to absorption of adhesions round an ovary or tube.

Note, therefore, the cases of twins being followed by a change in the sex of the succeeding child.

In some cases the presence of children all of the same sex is doubtless due to mere chance, fertilisation happening always to occur to the ova from one and the same ovary; *i.e.* conception occurs to an ovum from the same ovary that supplied the ovum for the last child born, hence the same sex child is again born; whereas, had conception occurred a month earlier or later, a different sex child would have appeared.

CHAPTER XVIII

ON WHAT DOES THE GREATER RESEMBLANCE OF A CHILD TO ONE ONLY OF ITS PARENTS DEPEND?

THE very interesting question why one child should most resemble one parent, and another child, even if of the same sex, should resemble perhaps the opposite parent, has always been a difficult one to explain.

I cannot do better than first give from my note-books a few examples of families to show how variously the children behave as regards their likeness[1] to one or other of their parents. They have been carefully authenticated.

Thus Mr. and Mrs. B. had 2 children : B like F ; G like M.[2]

B. G. had 2 children : B like M ; G like F.

C. W. had 6 children : 2 B like F ; 4 G like M.

W. H. had 4 children : 2 B like M ; 2 G like F.

G. A. had 4 children : 2 **boys** 2 **girls** : 1st child, B, like F ; 2nd child, G, like M ; 3rd child, G, like F ; 4th child, B, like M.

L. P. W. had 6 children : 3 **boys** 3 **girls** : 1st child, G, like F ; 2nd child, B, like F ; 3rd child, B, like M ; 4th child, G, like M ; 5th child, B, like M ; 6th child, G, like F.

S. C. had 4 children, all **girls** : 3 G like F ; 1 G like M.

S. had 2 children, both **boys** : 1st B like M ; 2nd B like F.

S. B. had 3 children, all **girls** : 1st and 3rd like M ; 2nd G like F.

[1] Likeness refers not only to physical likeness, but to a less extent disposition also.

[2] B = boy ; G = girl ; F = father ; M = mother.

M. G. had 7 children, 4 **boys** 3 **girls**: 1st, 2nd, 4th, B, like F; 1st and 2nd G like M; 3rd B like M; 3rd G like F.

F. had 4 children, 1 **boy** 3 **girls**: 1st child, B, and 4th child, G, like M; 2nd and 3rd, G, like F.

M. L. had 8 children, 5 **boys**, 3 **girls**: 1st 2 B like M; 3rd B like F; 4th B like M; 5th B like F; 1st G like F; 2nd and 3rd G like M.

P. had 7 children: 2 B and 1 G like F; 4 G like M.

L. had 11 children: 4 B, 1 G like F; 2 B, 4 G like M.

L. R. B. had 3 children, 1 **boy**, 2 **girls**, all like F; no children like M.

B. U. had 3 children, 2 **boys** and 1 **girl**, all like M; no children like F.

O. had 6 children, 4 **girls**, 2 **boys**: 1 B dark, like M; 1 B fair, like F; 2 G dark, like M; 2 G fair, like F.

From the examples given it would seem that it is quite impossible to tell which parent a child will resemble or "take after."

All the children may "take after" one parent only, or all the children of one sex may resemble the parent of that same sex; or, on the other hand, they may all resemble the opposite or other sexed parent.

More frequently, however, some of the children of both sexes will take after one parent, while others take after the other parent; and this division in the family will bear no relation to the order of their birth. The cases clearly prove that all **boys** do not take after their male parent, nor do all **girls** resemble their **female** parent; and the opposite is no more true, for all **boys** do not take after their mothers.

I shall now try to point out on what resemblance to a parent actually depends.

Fertilisation, as has been already pointed out, consists in the union of the spermatozoon with the ovum, or, to be more correct, the head and nucleus of the spermatozoon with the nucleus of the ovum.

Prof. Halliburton[1] says :

"Fertilisation consists of bringing to the ovum of a certain amount of germinal plasma from another individual or male."

This union starts a process of growth which eventually gives rise to a new being, a **boy** or a **girl**, according to which ovary the ovum came from.

To reach the nucleus of the ovum it is essential that the wall or tunic of the ovum shall be first traversed by the spermatozoon.

In the chapter on fertilisation I have pointed out the absence in the human ovum of a micropyle, or special "way in" for the spermatozoon. It therefore follows that the spermatozoon must enter through any part of the ovular wall. See Fig. 12, p. 36.

Gerrish[2] says :

"The zona pellucida is marked by numerous radiating striæ, and for this reason is sometimes called the zona radiata. The striæ are supposed to be minute canals, through which nutrition reaches the ovum, while it is still in the Graafian follicle, and through which the spermatozoa may afterwards pass in the process of fecundation."

Cunningham,[3] too, says :

"The perforations in the zona also allow the spermatozoa to reach the ovicell."

That they find no difficulty in traversing the true delicate wall of the ovum is evident ; nor is this difficult to credit when we recall that spermatozoa have been seen to push aside epithelial cells many times larger than themselves.

Hirst[4] says :

"From the swarm of spermatozoa around the ovum a number may penetrate the cell-wall of the ovum, but only one penetrates the cell contents" ;

while *W. Williams*[5] says :

"as many as 60 spermatozoa having been counted about a single ovum. They rapidly penetrate the vitelline membrane, but it appears that only one of them makes its way into the ovum" (that is ovum nucleus).

[1] Halliburton, "Handbook of Physiology," 1902, p. 805.
[2] Gerrish, "Text-book of Anatomy," 2nd ed. 1903, p. 852.
[3] Cunningham, *op. cit.*, p. 12.
[4] Hirst, "Text-book of Obstetrics," 2nd ed. 1900, p. 69.
[5] Williams, *op. cit.*, 1903, p. 86.

How many spermatozoa usually actually penetrate the ovular wall is not known ; and though 60 have been counted *around* the ovum, a further 60 or even 6,000 may have *already* entered the ovum by traversing its wall.

Having traversed the wall of the ovum, the spermatozoa are in the yolk or fluid contents of the ovum, and in which, situated usually eccentrically, lies the nucleus ; hence to reach the nucleus some of the spermatozoa must travel or swim through more of the yolk than do others of the spermatozoa.

Prof. Halliburton[1] says :

"In the perivitelline fluid spermatozoa which have penetrated the zona pellucida may be seen swimming."

How many spermatozoa of those seen to have actually passed through the zona pellucida subsequently enter the nucleus of the human ovum *is not known*, though from analogy it has been thought that only one usually does so.

First referring to my remarks in the chapter on fertilisation as to the possibility of polyspermy, let us accept that only one spermatozoon *is* required to fertilise the nucleus.

We have now, therefore, got to the stage of fertilisation of the ovum by the entry into its nucleus, of the head of one of the many spermatozoa which had previously entered the ovum proper through the wall and zona pellucida.

Now it does not seem reasonable to credit this small head of one spermatozoon, in size $\frac{1}{6000}$ inch long, with bringing to the nucleus of the ovum, in size $\frac{1}{700}$ inch diameter, nearly nine times as large, *sufficient* male plasma or albumen loaded with the hereditary tendencies, etc., of the **male** parent to so affect the forthcoming embryo as to cause the future child to resemble the father or to be tainted with his diseases ; yet this is what some believe.

Dr. Bevan Lewis[2] says that :

"Intemperance is a potent cause of all the convulsive neuroses, that it is responsible for over $\frac{2}{3}$ of the adolescent forms of insanity, and that in 80% of these cases the father is at fault."

Does it seem feasible that one spermatozoon's head from a drunken man can so affect the ovum as to cause the future

[1] Prof. Halliburton, *op. cit.*, p. 805.

[2] Dr. Bevan Lewis, "Text-book of Mental Diseases," p. 204.

child to be born so permeated with its father's alcoholic taint that the child becomes subject to convulsive neuroses or insanity in a large proportion of cases? It appears from the above that the paternal taint of drunkenness is more readily transmitted than the maternal—*i.e.* that the chance of a child suffering from the effects of drink in one of its parents should be greater from the head of one spermatozoon, than from the mother's larger ovum nucleus, together with the subsequent intimate interchange of nutriment which takes place *viâ* the placenta, while the child is developing in its mother's womb!

If inheritance of paternal characteristics depended on this one spermatozoon's head, then the influence of the mother would surely always be paramount and children would never take after the father, for I cannot credit the infinitely small head of the spermatozoon with bringing to the **female** or ovum nucleus sufficient **male** germinal plasma to cause the developing child to acquire either the likeness, the virtues, or the vices of the father.

I maintain that, though one spermatozoon's head may be and probably is sufficient to fertilise the ovum *nucleus* and initiate its growth, yet scores or hundreds, perhaps thousands, are required to convey to and impress the growing germ with the paternal characteristics; if otherwise, the maternal characteristics predominate, and the child is a mother's child and resembles not its father. He gave it life, but not individuality. On the other hand, we have proof that the mother is more capable of transmitting to the ova a disposition to insanity than is the father, by a study of the proportion of cases of post-partum insanity, in which heredity could be traced. See Dr. Robert Jones.[1]

He finds that heredity was far more often (nearly twice as often) to be traced directly to the patient's mother than to her father.

The insanity is certainly not due to the sex of the child to which the woman had recently given birth.

We next have to consider what happens to the crowds of spermatozoa which entered the yolk of the ovum but failed to enter its nucleus.

[1] Dr. R. Jones, in "Trans. Obstet. Soc.," vol. xlv., 1903, pp. 9–14.

Dr. Harry Campbell[1] says :

"Practically all biologists now agree that the union of nucleus with nucleus constitutes the essential act of fertilisation," others, while admitting this, "are unwilling to deny to the body plasm of the ovum (*i.e.* the yolk or protoplasm of the ovum other than the nucleus) some share in transmitting hereditary tendencies."

The spermatozoa which have entered the ovum must incorporate themselves among the protoplasmic and deutoplasmic yolk of the ovum, they become chemically absorbed, and dissolved within it, and thus form the first food for the fertilised germ, and this must suffice for *at least* five or six days, for we learn from Peters' ovum that probably by the end of the first week after impregnation the oösperm is deriving nourishment from the maternal blood.

This diffusing throughout the yolk of the ovum of several scores *at least* of masses of protoplasm (spermatozoa) from the male parent must materially alter the composition of the maternal or ovular yolk.

I have already said that how many spermatozoa actually enter the ovum besides the lucky one which enters the nucleus is unknown : probably the number is uncertain and very variable—sometimes many dozen and sometimes several hundreds or thousands. Be it remembered that *Lode* estimated the number of spermatozoa in a single ejaculation as over 200,000,000.

Surrounded by the yolk of the ovum, the now fertilised nucleus begins to grow, and it is evident that the growing fertilised nucleus of the ovum lives for the first five or six days at least on this surrounding yolk.

But this yolk is not a simple albumen derived from the mother, for it has been affected and its composition altered by the entrance and absorption into it of scores, and often many hundreds, of masses of **male** protoplasm or germinal plasma, the dissolved spermatozoa ; consequently the difference in composition of this yolk or food material, after fertilisation has occurred, depends on the varying numbers of spermatozoa which entered the ovum.

The degree, therefore, to which the vitellus or yolk of the

[1] Dr. H. Campbell, "Differences in the Nervous Organisation of Man and Woman," p. 11, 1891.

ovum is affected by the incorporation with it of numerous spermatozoa, determines whether the fertilised nucleus, at first nourished by the yolk, shall most resemble the father or the mother. The spermatozoa contain the **male** hereditary characteristics, traits and tendencies, the ova contain the **female** hereditary tendencies, etc. ; but the small head of one spermatozoon conveys not sufficient to impress the ovum with the paternal qualities, *besides* initiating the growth (fertilising) of the ovum into an oösperm.

If the yolk is almost entirely a maternal product, owing to very few spermatozoa having entered into it, the child, whether a **boy** or a **girl**, takes after its mother ; if on the other hand the yolk has been literally swarming with spermatozoa, so that it becomes nearly saturated with **male** germinal protoplasm, then the child, as a result of at first living on this yolk heavily loaded with **male** plsama, takes after its father, quite regardless of its own sex.

Hence in the same family one child may take after its father and the next child after its mother, or *vice versa*, even though both children are of the same sex ; and similarly one child may inherit the paternal defect or disease, while the other inherits the maternal fault.

In the case of twins of different sexes, both may take after the same parent, or one resemble one parent, and one the other parent. If the children are of the same sex, whether the ova came from the same follicle or two different Graafian follicles, one child may take after one parent and one after the other, or both may resemble the same parent.

Only in those cases where an ovum has a double nucleus must both the children of necessity resemble the same parent, *because the yolk of the ovum is common to both nuclei*; they therefore not only take after the same parent, but they also, as is well known, very closely resemble each other, they are of the same sex, and their hair even is identical in colour. Of course if we admit of polyspermy, or the entrance of multiple spermatozoa into the ovum *nucleus* when fertilisation takes place, we can more readily realise how the child would mostly resemble the father if the yolk had also been well permeated or saturated with male germinal plasma.

We see, then, that Hertwig's contention that the two nuclei,

male and **female**, are the essential elements both in fertilisation *and in inheritance* is incorrect, and to dissociate the carrying of hereditary characteristics from the protoplasm of the spermatozoa and ovum (other than their nuclei) is unwarranted. Thus the child or new individual is a mixture or combination of paternal and maternal characteristics and tendencies, and they in their turn were combinations of their parents' and grandparents' tendencies.

Hence the new being differs always in some degree from either parent or ancestor; parent and child are never absolutely identical.

Owing to the differing number of spermatozoa which at each impregnation enter each individual ovum-yolk, we get in the same family children differing in the relative degree in which they resemble one or the other parent, quite irrespective of their sex, for a child does not exhibit an equal mixture of its two parents' characteristics.

This also supplies the explanation to the remarkable diversity seen in twins even of the same sex; for one boy, say, may resemble his father's ancestors while the other boy resembles his maternal ancestors, because in the former ovum very many spermatozoa were incorporated in the ovum-yolk or first food for the growing germ, while in the other ovum, though coming from the same ovary, only a few spermatozoa entered the yolk, and so the child took after the mother.

Hence it is quite beyond our power to insure that a child shall "take after" one or other parent at will, because we are quite unable to influence the number of spermatozoa which shall enter an ovum.

Here is a strikingly confirmatory case from my own practice:

Mrs. C. H. was delivered of twin **boys**; they were born twenty minutes apart; there were two placentæ, each quite separate, and two distinct sets of membranes. They were thus *binovular* twins, derived from two distinct ova from the same **right** ovary.

The boys A and B, as they grew up, differed entirely; they are quite unlike in disposition and looks. A is thin and fair; B is fat and dark.

I maintain the difference to be due to the varying number of spermatozoa which entered the ovum and incorporated

themselves with the yolk. In one ovum many entered, so that the child B resembled his father; into the yolk of the other ovum only a few spermatozoa entered, so that the resulting **boy** A, owing to the preponderating maternal character of the yolk, resembles his mother, and is much unlike his twin-brother.

We also see the reason why, in cases of *uni-ovular* twins, where the ovum contains a double nucleus, owing to the yolk being the common property of the two fertilised nuclei, the resulting twin children are not only remarkably alike in every way, even the colour of their hair, but resemble the same parent.

Even if, as some believe, uni-ovular twins are due to a splitting or cleavage of a single fertilised nucleus, the yolk being common to both germinal areas, this explanation of the extraordinary similarity in these twins, and their resemblance to the same parent, holds good, and by no other theory can the similarity of such twins be explained.

CHAPTER XIX

MULTIPLE CONCEPTIONS OR MULTIPLE PREGNANCY

HAVING explained the production of single births by means of my theory, it remains to see whether the theory will equally well explain the production of plural conceptions, twins and triplets, etc.

In looking for an explanation of the occasional birth of more than one child, we must not forget that, to quote *Playfair*,[1] "Plural births must not be classified as natural forms of pregnancy," or, as *Garrigues*[2] says, "Multiple fœtation must be looked upon as an abnormal event."

TWINS.

As regards the origin of twins, there are four ways in which they arise.

Variety A. 2 G. Fs.,[3] 2 ovaries, 2 ova, 2 sexes.

In these cases each ovary matures a G. F. at or about the same time, so that we get *one G. F.* with an ovum each from *each* ovary, therefore the fœtuses are of opposite sexes, one **male**, one **female**.

Playfair says :

"In the largest number of cases of twins the children are of opposite sexes."

Spiegelberg, *Pinard*, and *Simpson* all confirm this.

[1] Playfair, *op. cit.*, vol. i, 1898.
[2] Garrigues, "Text-book of Obstetrics," 1902, p. 258.
[3] G. F. = Graafian follicle.

Veit,[1] quoted by *Lusk*, found in 150,000 cases of twins, in 54,000 the children were **boy** and **girl**, in 50,000 they were both **boys**, and in 46,000 they were both **girls**.

Churchill,[2] out of 1,321 cases of twins, found there were 495 cases of **boy** and **girl**, 416 cases of two **boys**, while 409 were cases of two **girls**.

Rumpe, quoted by *Jewett*, "Practice of Obstetrics," 1899, p. 296, found in 101 cases of two-egg or binovular twins, 54 were **boy** and **girl**—more than half, 31 both **boys**, and 16 both **girls**.

This marked preponderance of cases of **boy** and **girl** twins over twin **boys**, or twin **girls**, must have its definite cause, and they are necessarily of opposite sexes because the two ova come from opposite ovaries. And these cases of different sexed twins are necessarily most numerous, because the two ovaries together are manifestly larger than either alone, so that the tendency for the two ovaries to produce two ova at, or about, the same time must be far greater, than for either ovary by itself to produce two ova at once.

Hence we find that an ovum from each ovary is fertilised at or about the same time more often than are two ova from the same ovary; but opposite sexed twins are the commonest, therefore we are justified in saying that opposite sexed twins are due to the opposite ovaries ovulating almost simultaneously.

There would be a corpus luteum in each ovary. It is in this variety of twins that we most often find two separate and distinct placentæ; they may, however, be fused together.

This is the only mode of origin of different sexed twins.

Variety B. 2 G. Fs. from 1 ovary, 2 ova, 1 sex.

Here the children are of similar sex, either two **boys** or two **girls**.

They are derived from two G. Fs. from one or other ovary; each G. F. contains a single ovum. In these cases, which are not so common, we find (instead of *each* ovary supplying *an* ovum) *one* ovary *alone will supply two* Graafian follicles, so

[1] Lusk's "Text-book of Midwifery," 1889, p. 230.
[2] Churchill, "Midwifery," 1866, 5th ed. p. 482.

that two ova are derived from the same ovary, and therefore the twins are the same in sex, either two **males** or two **females,** according to which ovary the ova came from. *Playfair* (*op. cit.* p. 184) says :

"The most common cause of multiple pregnancy is probably the nearly simultaneous maturation and rupture of two G. Fs., the ovules being impregnated at or about the same time."

This therefore applies to both the varieties A and B.

The occurrence of both a dark and a light child in a negress is possible only in one or other of the above two varieties.

Birnbaum described a case of twin pregnancy where post mortem the **left** ovary contained two corpora lutea, but no sex was given.

In the following conclusive case *two* corpora lutea were in the **right** ovary, the **right** Fallopian tube had burst and a fœtus had escaped ; its sex is not given, but I have elsewhere shown that a fœtus in the **right** tube and corpus luteum in the **right** ovary means a **male** gestation. The uterus contained another fœtus, a **male.**

"New Sydenham Society Year Book," 1862, p. 339, quotes the following :

"*Tuffnell's case.*—Patient pregnant between three and four months. *Post-mortem* —Three or four quarts of fluid and clotted blood were found in the abdomen with a small fœtus floating therein. There was a rent in **right** Fallopian tube, and a cyst from where the fœtus had escaped. **Right** Fallopian tube and ovary agglutinated. Fœtus one inch long. The uterus contained a healthy **male** fœtus proportionate to the date of conception. The cystic cavity in the **right** Fallopian tube contained a solid organised mass like a miniature placenta. There were *two distinct corpora lutea in the* **right** *ovary.*"

This case proves a *twin* **male** *pregnancy*, with *both* ova coming from different Graafian follicles, but from the *same ovary*, *the* **right.** Hence the *same sex*, and that **male.** One fœtus had developed in the **right** tube, the other in the uterus. It was a combined Extra- and Intra-uterine **male** pregnancy.

In this variety of twins the placentæ may, or may not, be fused or grown together, and though there are often two

quite distinct placentæ, I have found a single fused placenta (showing evidence of the amalgamation of the two original placental areas) in a small majority of my cases.

Variety C. 1 G. F., 1 ovary, 2 ova, 1 sex.

In this variety the children are of the same sex. One or other ovary supplies the single G. F. which happens to contain two ova; the sex will be identical, but will depend on which ovary supplied the G. F. *Playfair*[1] says:

"It may happen that a single follicle contains more than one ovule, as has actually been observed before its rupture."

This anatomical fact has the support of *Lusk*[2] and *Hirst*,[3] who reproduce a drawing of *Waldeyer's* showing the two distinct ova in a single G. F. Its occurrence is also admitted by *Piersol*.[4]

In these cases only one corpus luteum would be found in one or other ovary, although two children were born. This fact was distinctly pointed out by *Montgomery*,[5] who says:

"A vesicle may contain two ovules, in which case twins may be accompanied with only one corpus luteum."

The children in this variety will more closely resemble each other than in Variety B.

Variety D. 1 G. F., 1 ovary, 1 ovum with 2 nuclei, 1 sex.

The children are of the same sex; because they have arisen from a double nucleus or germ-bearing ovum derived from one or other ovary, they will be very much alike. This variety thus differs from the former, as the single G. F. contains but a *single* ovum, but that ovum contains a *double* germ or germinal vesicle (as is common in fowls' eggs); we thus get the so-called unioval or homologous twins, which are stated to be seven times more rare than other forms, and we find them not only *always* alike in sex (which

[1] Playfair, *op. cit.*, p. 185.
[2] Lusk, *op. cit.*, p. 37.
[3] Hirst, *op. cit.*, p. 54.
[4] Piersol, *op. cit.*, p. 143.
[5] Montgomery, "Signs and Symptoms of Pregnancy," 1st ed., 1837, p. 231.

fact *Schroeder* pointed out long ago), but often joined together. *Playfair* (p. 186) says:

"Conjoined twins must of necessity arise from a single ovule with a double germ, and there is no instance on record in which they were of opposite sexes."

This should, I think, help to prove my theory, by showing that *one ovary always "breeds true."* That is, ova from one ovary only produce one sex. The children's hair will *always* be the same colour when derived from a single ovum, whether the twins are conjoined or not. Undoubted examples of ova with double germs or two nuclei have been reported by several observers. *Norris and Dickinson*[1] reproduce a drawing of *Von Herff's* showing two well-marked nuclei in one ovum, and *Whitridge Williams*[2] figures a good example, the two germinal vesicles or nuclei being distinctly separated in the ovum; while he states that "the existence of such ova (containing two distinct germinal vesicles) is indisputable."

Dr. T. Wilson[3] says:

"There is a much greater predisposition to the occurrence of hydramnion in cases of twins derived from a single ovum than in the commoner variety of twins developed from separate ova.

"The unioval variety of twins is of interest for many reasons. The fœtuses are always of the same sex, and are much more alike than are those developed from different ova. They have a single placenta, in which an anastomosis takes place between their vessels; acardiac monsters are generally admitted to arise only in this variety of pregnancy."

Some cases of twins from a single ovum—possibly all the acardiacs—are *believed* to arise, not from double nuclei in an ovum, but by splitting or division into two of a single nucleus, though no one has seen such an occurrence; but *single nuclei have* been seen to contain *two nucleoli* or germinal spots, as in a specimen figured by *Nagel* in *Playfair's* "Midwifery"; so it is possible that, division of the nucleus being merely supposition, it is not necessary, if it occur at all.

It must not be supposed, if two G. Fs. rupture, and two ova are discharged, that they are sure both to be fertilised;

[1] Norris and Dickinson, "American Text-book of Obstetrics," 1897, p. 71.
[2] W. Williams, *op. cit.*, p. 327.
[3] "Trans. Obstet. Soc.," 1899, p. 237.

even if both be fertilised, one may easily die in the uterus. *Playfair*[1] says :

"This is proved by the occurrence of cases in which there are two corpora lutea with only one fœtus."

This is confirmed, as pointed out by *Montgomery*,[2] by many authors, and by its occurrence in domestic animals. In one case Montgomery examined there were "ten corpora lutea in the ovaries of a sow, but only nine fœtuses in the uterus." After a diligent search "the remains of another fœtus which had been blighted" was found. I have practically proved the truth of this with rabbits.

The explanation of the development of the second corpus luteum in the absence of the second fœtus is that the presence of one fœtus is quite sufficient to cause both corpora lutea to develop into true corpora lutea.

The Sex of Twins

From the foregoing particulars we see that as regards their sex twins occur in the following order of frequency :

A. **Boy** and **girl** twins.
B. **Boy** and **boy** twins.
C. **Girl** and **girl** twins.

The first variety are known as pigeon-pair or different sex twins, and occur most often ; B and C, consisting of children of different sex, are usually classed together as same sex twins, and if so added together these two varieties of same sex twins outnumber (as we should expect) the first variety, or twins of different sex.

Variety B are more numerous than C.

It is necessary to point out very clearly this misleading inclusion of children of different sexes under the heading of "same sex twins," as astonishing errors and discrepancies appear in some text-books as to the relative frequency of the sexes in twin births.

We see, therefore, that different sex twins are more often born than either 2 **boys** or 2 **girls**, but add together the twin **boys** and the twin **girls** and call them "same sex" twins,

[1] Playfair, *op. cit.*, p. 184. [2] Montgomery, *op. cit.*, p. 230.

then this *combination of* **boys** *and* **girls** together outnumber the *cases of* **boy** *and* **girl** *twins*—that is, though different sex twins are most often born, yet same sex twins are most numerous!

TRIPLETS.—It will be quite easy to understand how triplets occur from what has been said about twins, and how triplets follow the same rule as to their sex. Usually one ovary gives rise to twins, and the other to a single birth. In this case two of the children are alike in sex. If the children are all of the same sex, one or other ovary provided them all, one G. F. providing either two ova, or else one ovum with a double germ, and the other G. F. supplying a single ovum; though one ovum may rarely give rise to all three children—uni-ovular triplets.

W. Williams[1] says:

"Occasionally two, and sometimes three, distinct ova may be found in a single follicle, and it is from such structures that multiple pregnancies not infrequently develop";

so that one corpus luteum only may be found in a case of triplets of the same sex. The case described by *Saniter*[2] would have been such an example had it been possible to have examined the ovaries, for the triplets were *all* **males**, derived from a *single ovum*, and there was only *one placenta*.

I have not been able to find a report of a case of three corpora lutea of pregnancy discovered in one and the same ovary; but probably the case described by *Dr. G. Bate* in the "Lancet" would have shown three corpora lutea in the **left** ovary, for the triplets were "all girls, and there were three separate placentæ."

G. W. Thompson[3] records a case of triplets—a double **female** monster and a single **male** child:

"The single **male** child was born first, was still-born, and had a *separate* placenta and membranes. The sex was **female** of the united fœtus, which had two heads, four arms, and four legs, and two bodies united by the thoraces."

This is absolute proof that the **female** monster came from the ovary opposite to that from which the single **male** child did.

[1] Williams, *op. cit.*, p. 63.
[2] Saniter, "Brit. Med. Journ.," Epitome, March 30, 1901.
[3] "Indiana Med. Journ.," April, 1899.

Triplets follow the rule of twins—that owing to the larger **right** ovary there are more **boys** than **girls** produced, the commonest occurrence being 2 **boys** and 1 **girl**, this combination being twice as numerous as any other combination; it therefore corroborates and explains the statement of *Saniter* quoted by *Williams*,[1] that "in triplet pregnancy the children are usually derived from two ova—one from one, and two from the other," because twin **boys** from one ovum are far commoner than twin **girls** from one ovum; and a case of triplets in a colleague's practice bore this out, the two **boys** being uni-ovular twins, and the **girl** was from a different and distinct ovum—from, I maintain, the opposite ovary.

QUADRUPLETS.—If both ovaries give rise to twins, we get quadruplets; or if one ovary gives triplets and the other a single birth, as in a case by Simpson, 3 **males** and 1 **female.** Here the **right** ovary must have ruptured two G. Fs., one of which contained two ova, or else had a double germ in one; while the **left** ovary supplied a single ovum only.

If all four children are the *same* sex, it is possible only two G. Fs. are present, both G. Fs. containing two ova; or one G. F. with two ova, the other G. F. having one ovum but a double germ. If there were three G. Fs. the arrangement is quite simple.

It is possible for one G. F. to supply quadruplets; the children would be all the same sex. The G. F. would then contain two ova, and each ovum a double germ.

The following case is very suggestive, from the appearances of the placentæ, of the origin from the two ovaries of two ova *each* to form the quadruplet birth:

M. Etchecoin[2] reported a case of quadruplets:

"The mother had borne her first child nineteen months before she was delivered prematurely, at the fifth month, of 4 infants—2 **males** and 2 **females.** There were four placentæ adherent in pairs."

The following case proves very decisively that the one ovary produced the **male** child, and the other ovary the three **females**:

[1] Williams, *op. cit.*, p. 327.

[2] "British Medical Journal," October 19, 1901, p. 1166.

Baudouin, in the "Paris Medical Gazette," describes a recent delivery of quadruplets, in which—

"one ovum contained *three* fœtuses, two of them forming a sternopagus (*i.e.* were joined together at the chest), all of the **female** *sex*. After their delivery a second bag of waters ruptured, and a *still-born* **male** child followed."

There were thus two ova only.

Dr. Lloyd Roberts[1] reports a case of quadruplets—

"all **females.** Placenta was single. Four cords were distinct. A single chorion enclosed four amniotic sacs."

They were therefore derived from one ovum, and therefore from one ovary—I should maintain the **left.**

Dr. Nijhoff,[2] of Gronigen (Netherlands), reports a case of quintuplets—4 **girls** and 1 **boy.** Three of the **girls** were derived from one ovum, and represented uni-ovular triplets; while the other **girl**, and the **boy**, arose from two separate ova.

"The placenta consisted of one continuous cake. At the fœtal side five separate umbilical cords were inserted, each in a distinct sac formed by the fœtal amnion. Three of these sacs were enclosed by a common chorion. The two others had a separate chorion."

This is proof of fertilisation of three ova, and I maintain the **girls** were derived from the **left** ovary and the **boy** from the opposite one.

Baudouin,[3] in discussing SEXTUPLETS, brings out the fact that, as in twin births, the number of **boys** far exceeds the **girls.** Thus in one case all the six children were **boys**; in another case 4 **boys** and 2 **girls**; while another was 5 **boys** and 1 **girl.** Thus three cases give 15 **boys** to 3 **girls**!

It will thus be seen that plural pregnancies entirely support my theory; and *no other* theory, such as either the pre- and post-menstrual impregnation theory, the relative *vigour* theory, or even the relative *age* theory of the parents, can possibly explain the occurrence of **boy** and **girl** or "pigeon-pair" twins, to say nothing of triplets and quadruplets. This fact also disproved Schenk's theory; for if an ovum in a woman, whose

[1] "Journal of Obstetrics and Gynæcology," vol. iii. 1903, p. 91.
[2] *Ibid.*, July 1904, vol. vi. p. 32.
[3] *Ibid.* vol. vi. p. 52.

urine through dieting habitually contained sugar, invariably developed when fertilised into a **girl**, and the presence of that sugar rendered the birth of a **boy** impossible, how *could* any woman be pregnant with both a **boy** and a **girl** at the same time, or with two of each? In fact, a preliminary careful study of plural pregnancy would have prevented many theories of the causation of sex ever being broached.

The varying arrangement of the fœtal membranes, and the fact that conjoined twins are always of the same sex, are both only satisfactorily explicable by the present theory.

Close study of plural pregnancy demonstrates clearly that such an occurrence must be ascribed to the mother and not to the father.

We know that many thousands more spermatozoa are provided every time (*Lode* estimated them as over 200,000,000 in a single ejaculation) than are necessary to simply fertilise the normal single monthly provided ovum.

If, however, for some reason, probably anatomical, more ova are regularly provided, we must expect plural pregnancies. *Puech* definitely alleges "superior development of the ovaries" as the cause of the simultaneous development of multiple ova, and here we may recall that an ovary has been found to measure $3\frac{3}{4}$ in. in its long diameter, while the average is $1\frac{1}{4}$ in. We should expect *that* ovary to provide more than the normal, one ovum at a time.

That it is the woman who is responsible for plural pregnancies is proved by the following case reported by *Vortisch*[1]: A woman by her *second* husband gave birth to sextuplets, 5 **boys** and 1 **girl**; by her *first* husband she "had previously given birth to twins, quadruplets, and triplets in successive pregnancies." That is, 15 children in four pregnancies. The maternal origin of multiple births is thus evident, there being two different husbands.

This contention is borne out, too, by the cases we frequently read of, the woman having twins, or other form of plural pregnancy, repeatedly; thus *Dr. Lloyd Roberts*, in 1893, related a case of a woman having twins fifteen times. In my own practice a woman had twin **boys** seven times over,

[1] Quoted in "Journ. Obstet. and Gynæcology," July 1904, vol. vi. p. 53.

besides four single **male** births—*i.e.* 18 **boys**—and oddly they were preceded by 6 **girls** before a **boy** was born. She had 24 children in all.

"Lloyd's Weekly News," October 26, 1902, quoting the "New York Herald," says that an Italian woman, Signora M. Giannetta, of Nocera, near Naples, had 59 **boys** and 3 **girls**. She had triplets on eleven occasions, quadruplets on three occasions, sextuplets once, besides 11 children in single births.

Other cases are seven times twins and two single births; or from Anvers a case of four times twins, followed by triplets; or the case at Belgrade of triplets followed by sextuplets; or from Madrid, triplets followed by quintuplets.

On the other hand, the "Lancet"[1] quotes the case of a peasant, Kinlow, who was twice married; he had 72 children. He had 57 children by his first wife, four times 4 infants, seven times 3, and ten times 2 at a birth. By the second wife he had triplets once, and twins six times. This historical case seems to point to the husband or **male** being responsible; it is the exceptional case, however.

Among cows and sheep plural births are not a very uncommon occurrence, but certain *individual* animals are well known nearly always to have more than the normal single offspring. With sheep twins very often are born, but some have three or even four lambs at a birth. Mares rarely have more than one at a birth.

[1] "Lancet," Jan. 28, 1905, p. 243.

CHAPTER XX

DOES A DISEASED OVARY LEAD TO DISEASED CHILDREN?

IT is a remarkable fact that in many families containing both **boys** and **girls** we find that all the children of one or other sex are in some way or other affected: they may be physically affected or deformed, or else mentally deficient; while the children of the other sex are quite normal.

The following cases of insanity are very remarkable, and are more than coincidences:

Mrs. W. had 5 children, thus: 1st a **boy**, 2nd a **girl**, 3rd a **girl**, 4th a **boy**, 5th a **boy**. The three sons are all mentally very deficient, two are idiotic, and one quite insane. The two **girls** are quite sane.

Mrs. P. had 5 children: 1st a **boy**, 2nd a **boy**, 3rd a **girl**, 4th a **boy**, 5th a **boy**. The four sons are healthy and quite sane. The daughter is an idiot.

Mrs. S. had 3 children: 1st a **boy**, 2nd a **girl**, 3rd a **boy**. The two sons are insane; the girl is quite sane.

Note that the unhealthy or abnormal children do not follow each other; the birth of normal children of the opposite sex takes place between them.

The following remarkably confirmatory case I take from the "Lancet," June 7, 1902:

Drs. Keraval and Raviart report a case of insanity *in twin brothers* who had for many years lived quite apart from one another. The mother of the men was alive and well. Neither men had had syphilis, and both were temperate in their habits. Both were married. The special interest of the case lies in—

(1) The twinship of the brothers.
(2) The absence of hereditary antecedents of insanity.
(3) The freedom from syphilis and alcoholism.
(4) The fact that both were married and fathers of children.

It will be observed that the two patients were of the same sex, and hence had been derived from ova from the same ovary—evidently the **right.**

In these cases the children derived from one ovary only are deaf and dumb:

Mrs. F. had 3 children—1st a **girl,** 2nd a **girl,** 3rd a **boy**—in this order. Parents were not related before marriage. The two **girls** are normal; the **boy** is deaf and dumb.

Mrs. G. had *7* **girls** and no **boys.** Parents not related or deaf and dumb. All the girls are deaf and dumb.

In these cases the children of one sex are blind:

Mrs. M. L. R. had 4 children: 1st a **boy,** 2nd a **girl,** 3rd a **girl,** 4th a **boy.** Parents not related. Both **boys** born blind; both **girls** all right.

Mrs. S. had 4 children: 1st a **boy,** 2nd a **boy,** 3rd a **girl,** 4th a **girl.** Both **boys** born blind; both **girls** all right.

In this case convulsions occurred only in the boys:

Mrs. K. had 16 children, 12 **boys** and 4 **girls,** thus: First 3 **boys,** then 2 **girls,** then 5 **boys,** then 2 **girls,** then 4 **boys.** The four **girls** are *all* alive and have had *no* fits. *All the* twelve **boys** *have had fits;* seven **boys** died actually during a fit, the eighth just after one concluded: he had had several.

We thus see that a succession of defective children is broken by the birth of a child or children of the other sex; and this should be noted, that the affected children are separated chronologically by healthy ones of the other sex, showing the cause of the imperfection is not a temporary one due to mental distress, or illness, or "maternal impression" on the mother's part; nor can it be some general blood disorder—*e.g.* syphilis—or else the children of both sexes would be similarly affected. No, some local cause: I say the ovary of one side must yield defective ova.

In the following cases the children of one sex only are left-handed :

Mrs. H. H. Parents not related, and neither left-handed. First child, **girl,** not left-handed ; second, twin **boys,** both left-handed.

Mrs. H. C. had 7 children : 4 **boys,** 3 of them left-handed ; 3 **girls,** none left-handed.

In the following case the **female** children both had hare-lip, the **boy** was unaffected :

Mrs. S., no relation to her husband, had 3 children : 1st a **girl,** hare-lip ; 2nd a **boy,** normal, no hare-lip ; 3rd a **girl,** hare-lip. This case is interesting, as hare-lip is twice as common in boys as girls.

All the above cases lead one to inquire, does a diseased condition of one ovary which does not prevent ovulation, and which is possibly not even recognisable by the microscope, lead to the production of ova which are imperfect or diseased ?

In cases of syphilis it is admitted that the ova may be affected before they are impregnated even ; and though this disease would affect the ova in both ovaries, yet it is justifiable to suppose that one ovary may be affected by some congenital peculiarity or disease, not a blood disorder, which would be unilateral in its effects. Thus, while not arresting ovulation from the ovary, the ova when fertilised would lead to a diseased or structurally deficient child.

Such is probably the explanation of the case described by *Tarnier* and *Budin*[1] of a woman who—

"gave birth alternately to living and dead children. The first child was living and healthy, the second dead, and so on, until the tenth pregnancy. It was born alive, however."

In the following case, reported by *Dr. H. R. Andrews*,[2] a woman, L. S., aged 36, with no history of syphilis, gave birth to twins prematurely—a **girl** and a **boy.**

"A living **female** child was born, followed by a placenta which presented no abnormal macroscopical appearance. A second bag of membranes was ruptured, and a **male** child was born, followed by an enormous placenta. The **male** child was still-born, it was universally œdematous and dropsical. Its placenta was very large, pale, œdematous, soft and friable."

[1] Quoted by Hirst, *op. cit.*, p. 179.

[2] "Trans. Obstet. Soc.," vol. xliii. 1901, pp. 169-71.

As the two placentæ were entirely separate, we know that the two ova fertilised were also separated ones, and as the sexes were different I ascribe one to each ovary (the commonest mode of origin for twins). One child, the **female,** however, was normal, while the other was abnormal, showing that the diseased condition of the **male** child was not due to a general diseased condition of the mother or of her womb, or else both children would have been similarly affected, as they would have probably been had both been derived from the same ovary. Thus we have proof of the origin of a *healthy* child with a healthy and separate placenta from *one* ovary, while the ovum from the *opposite ovary* was evidently *diseased*, and so, though fertilised, a diseased child and placenta followed as a consequence.

The case, therefore, supports the theory that one ovary may yield imperfect or diseased though fertilisable ova, which very early show their effects by a diseased condition of both child and "after-birth."

The following cases seem to show that the ova may be so imperfect from an ovary, which to all appearances is normal, that the children from that ovary always die :

Mrs. B. had 6 children—3 **boys** followed by 2 **girls**, then a **boy**. Both **girls** died shortly after birth. The **boys** all lived.

Mrs. W. by her first husband had 4 children—3 **boys** who all died, and a **girl** who lives. By her second husband she had 4 children—3 **boys** who all died, and a **girl** who lives.

This hardly seems a case of coincidence, or as due to the greater infantile mortality of **males.**

Mrs. P. had 3 **boys**, 5 **girls.** All the **girls** died in infancy.

Mrs. L. had 6 **boys**, all died, 3 **girls** lived, thus—

1st, **boy**, died.	2nd, **girl**, lived.
3rd, **boy**, died.	4th, **girl**, lived.
5th and 6th, **boys**, died.	7th, **girl**, lived.
8th and 9th, **boys**, died.	

In the following cases the ova are imperfect, and lead to delicate children, who do not necessarily die, but they remain the delicate ones of the family, thus—

Mrs. L. S. had 5 **girls**, 1 **boy**. The **girls** are all strong and healthy. The **boy** is very delicate; he was the fourth child born, so that two healthy **girls** succeeded him.

Mrs. T. had 5 **boys**, 1 **girl**. The **boys** are healthy and strong. The **girl** was deformed and a cripple, and has since died.

Mrs. M. had 4 **boys**, 1 **girl**. The **boys** are healthy and strong. The **girl**, the third born, is delicate; her two younger brothers are very healthy.

Mrs. C. had first a **girl** insane, then 5 **boys** all healthy, then lastly **girl**, delicate, died of phthisis.

This diseased condition of the ova is supported by the description by *Dr. Mary Dixon Jones*[1] of fatty and colloid disease of the *ova in the ovary*, so that—

"In advanced cases not a single healthy ovum is found in the whole ovary."

We can thus see that in some cases a few of the ova may be perfect while the majority are affected.

Mrs. W. B. had 6 children—1st, 2nd, 3rd, **boys** all deaf and dumb; 4th a **girl**, normal; 5th a **boy**, not deaf and dumb; 6th a **boy** deaf and dumb.

It will be seen that the **female** child was healthy, and all the **males**, with one exception, were deaf and dumb; so that the majority of the **male** ova were diseased or imperfect. That the condition was not due to "maternal impression" is evident from the fact that one healthy **boy** was born between two deaf and dumb ones.

The following very interesting case also supports this view, of one healthy ovary, and the other ovary containing only a small proportion of healthy ova.

Dr. J. W. Ballantyne[2] describes the case of a woman who had her children thus—

1st, **boy**, living; 2nd, **boy**, living; 3rd, abortion, 2nd to 3rd month (probably **male**).

4th, **girl**, hydrocephalic, dead.

5th, **girl**, normal, living.

[1] Dr. Mary D. Jones, quoted by Macnaughton-Jones, *op. cit.*, pp. 654, 657.

[2] Ballantyne, "Journal of Obstetrics and Gynæcology," vol. ii. Dec. 1902, p. 529.

6th, **girl,** anencephalic, dead.
7th, **girl,** "delicate," died at 5 weeks.
8th, **girl,** deformed and premature, died 3 days old, commencing hydrocephalus.
9th, **girl,** normal, living.

Here we have the **male** children normal and living, followed by the birth (with an abortion between, which was possibly a **male** embryo) of six **female** children, only two of which were normal and lived.

Of the remaining four, three at least were monsters, whilst the fourth, of which few particulars appear, was "delicate from the first" and soon died.

Surely some local as distinct from general condition must have accounted for this string of **female** monstrosities. I ascribe it to defective ova in one of her ovaries—the **left.**

Hegar reported a case of removal of a malignant tumour of one ovary, subsequent birth of a deformed child; the remaining ovary also being *then* found to be sarcomatous and inoperable. Here both ovaries are diseased, and though an ovum is fertilised, yet the child is born deformed, so that the diseased ovum from the diseased ovaries, *which* is not stated, gave a diseased child.

Dr. Ballantyne[1] reports a case where a woman had 1st child, **girl**, deformed (spina bifida); 2nd and 3rd children, **boys**, normal and healthy; 4th child, **girl**, deformed (iniencephalic monster).

This case looks as though the **left** or **female** ovary had supplied diseased ova, the healthy **males** being born, in between the deformed **female** ones, from healthy ova from the other or **right** ovary.

Dr. J. E. Blomfield reports in the "British Medical Journal," April 11, 1903, a case of a woman who had two children, two years or so apart. Both were **boys**, and both were malformed in an almost identical manner. Surely here the **right** or **male** ovary had provided abnormal ova on the two occasions.

In the following extracts we see that both *Kossmann* and *Marchand* credit diseased ova as occurring in the ovaries,

[1] "Manual of Antenatal Pathology: The Embryo," p. 273, 1904.

and prior to fertilisation. Thus, *Dr. R. Andrews*[1] quotes *Kossmann* as—

"noting the frequency with which the ovaries present some abnormal appearance in cases of tubal pregnancy, and suggesting that these pathological ovaries may have supplied pathological ova."

And similarly *Marchand*, quoted by *Dr. Cuthbert Lockyer*,[2] says:

"The influence of the maternal organism makes itself felt upon the ovum in the ovary, the latter transmitting any peculiarities it may possess to the developing ovum. These tendencies to disease show themselves during the development of the ovum *in utero*. Twin pregnancies, in which one ovum develops normally and the other degenerates into a mole, afford an argument in favour of the view that the diseased ovum acquired its pathological tendencies whilst it was within the ovary. That ova may be primarily diseased seems very probable."

I should maintain that the healthy child in such a twin pregnancy usually came from one ovary, while the diseased one came probably from the opposite ovary; though it is possible to have some healthy and some unhealthy ova in the same ovary, as in a case reported by *Birnbaum*[3] and quoted by Dr. Stevens, where a woman in a twin pregnancy had "a vesicular mole and a healthy fœtus," so that one ovum was diseased and one healthy. Post mortem both corpora lutea were in the same, the **left** ovary; and whilst one of these was quite normal the other was diseased—proof indeed that one ovary can give both healthy and unhealthy ova.

Most abnormalities are commoner in **male** than in **female** children—*e.g.* colour-blindness affects the **male** sex almost entirely, as also does double hare-lip; but congenital dislocation of the hip is, *Dr. Tubby*[4] states, "seven times as common in **females** as in **males**." For further details of variations in the respective liability of the sexes to other abnormalities I refer the reader to *Dr. Havelock Ellis*, "Man and Woman," chap. xvi., though he does not specify any cause therefor.

It is evident that the condition of health or want of health

[1] "Journal of Obstetrics and Gynæcology," vol. iv., Sept. 1903, p. 290.
[2] "Trans. Obstet. Soc.," vol. xlv. 1903, p. 495.
[3] "Journal of Obstetrics and Gynæcology," vol. v., May 1904, p. 475.
[4] A. H. Tubby, "Clinical Journal," July 1, 1903.

in a woman more or less affects all her organs, and therefore her ovaries and their contained ova are influenced by her state of health or disease ; hence the first step in eugenics must be the improvement of the general health of the mother, so that her ova are quite healthy.

Certainly this subject of the deformity, disease, or death of all, or most, of the children of one sex in a family, the children of the other sex being perfect, opens up a wide field for investigation.

CHAPTER XXI

HERMAPHRODITISM

THE subject of hermaphroditism has very shortly to be considered in connection with this inquiry into the cause of sex.

True hermaphroditism may be defined as the presence in one individual of the reproductive organs of both sexes, in a condition of functional activity.

In this strict sense of the term, hermaphroditism is a condition which does not exist in the human species, for, as *Mr. Bland-Sutton*[1] says—

"no example has yet been recorded in the human family of a functional ovary coexisting with a functional testis."

Many individuals are born in whom the external genitals are so imperfectly developed and deformed that it may be difficult to say to which sex they belong ; they certainly do not possess the complete and active sexual organs of both sexes, and so are not true hermaphrodites : they are known as false or pseudo-hermaphrodites—the "Will-Jill" of the laity. These false hermaphrodites may appear to possess the genital organs of both sexes, but they do not really do so.

Dr. G. F. Blacker[2] says :

"If functional activity for the two kinds of glands is insisted upon, it is most unlikely that any case of true hermaphroditism will ever be met with in man."

So that we may say that the true test of a **female** is the presence of functional ovaries, of a **male** the presence of active

[1] "Diseases of Ovaries," 1896, p. 7.
[2] Blacker, "Trans. Obstet. Soc.," 1896, p. 265.

testicles, and the malformed external genitals of the pseudo-hermaphrodite are no guide to the nature of the internal genital organs.

If in conjunction with modified external genitals there be a **female** gland on one side and **male** on the other, then one or other set are functionless, so that one or other characteristic predominates; hence the *pseudo-hermaphrodites are either* **male** *or* **female,** and though they are generally sterile they are certainly not a third sex; had they been, I should have expected there to be a third ovary, possibly situated in midline of body; but such an occurrence is quite unknown.

A pseudo-hermaphrodite is an abnormality due to a developmental error; the condition is not confined to the human species, but occurs in some animals, especially in pigs and cows.

It is a remarkable fact that a cow calf twin-born with a bull calf is usually a pseudo-hermaphrodite, and is *often* but *certainly not always* sterile: it is popularly known as a "free-martin." On the assumption presumably that what applies to the vertebrata must also always apply to women—an assumption which I strongly deprecate and deny—it has been believed by many that the **girl** twin-born with a **boy** would also be a free-martin and sterile. Such, however, *is not a fact*, and there are abundant cases on record of women in cases of pigeon-pair twins being fruitful and bearing children.

In one instance with which I am acquainted, a woman twin-born with a man had had nine children, four **boys** and five **girls**; while in another case both the man and woman twin-born had children of both sexes when they married, showing that neither brother nor sister was sterile. Further, in "The British Medical Journal" of November 1902, p. 1691, a case is mentioned of a man, the co-twin of a woman, marrying a woman who was the co-twin of another man—*i.e.* the man and woman of two different pairs of pigeon-pair twins married and had a child; which also conclusively shows that neither child in a case of different sexed twins is necessarily or even usually sterile: cf. also "The British Medical Journal," November 29, 1902, and December 20, p. 1940. Most human pseudo-hermaphrodites are single

births; I have found no example of twins being both hermaphrodites.

It is evident, from the fact to which I have called attention —viz. that the child is born with definite sexed ova already in her ovaries—that the idea that the early condition of the sexual organs in mankind is one of embryonic hermaphroditism can no longer be supported. It is partially disproved, too, from the fact that *Nagel* has distinguished the rudimentary testicle from the rudimentary ovary in an embryo of only five weeks' growth.

To enter into a minute description of the varying deformities and peculiarities of different false hermaphrodites is quite unnecessary, and to find a reason for their abnormalities of development does not come within the scope of this book, neither would it help to solve this question of the cause of sex.

CHAPTER XXII

OBJECTIONS TO THE THEORY ANALYSED

THE first objection raised to my theory of the causation of sex which I shall notice is that of a very well-known consultant—that the theory is "too mechanical." This seems a very inconsistent objection when we recall how essentially mechanical the whole of life is. Is not our very respiration mechanical in its regularity? So, too, is our heart's action; and why the latter should be the more rapid of the two we know not, neither can we alter their respective rhythms. Disease, such as pneumonia, does so; but this is abnormal rhythm, and recovery soon leads to a return to the normal. Menstruation, too, has a mechanical regularity in its recurrence which in many cases is quite marvellous, for most women can tell to a day, while some women to my own knowledge can tell to an hour almost, when their period is due.

Seeing, therefore, the essentially mechanical nature of the three important functions of respiration, circulation, and menstruation, we can hardly look upon this as a valid objection to the theory.

The objection to the theory which carries some weight, and is in fact more difficult to explain, is that in the majority of birds only one ovary, and that the left, is present in the body, yet the hen lays eggs from which both sexes are derived.

Here, to begin with, before discussing the matter one is met with the query, Are we to look upon any other animal or class of animals as analogous to women?

To attach any importance to the objection requires that we should cease to look upon woman as the highest animal even

among the vertebrata, and we must assume that reproduction throughout all living things must be on one identical plan and without any essential differences. This is not so, however. I have throughout refused to look upon women as analogous to any living thing; and to prove my theory I neither go for facts to bees nor tadpoles, water-fleas, worms, or trout, star-fish or plants, and from them attempt to argue that the same conditions are applicable to the human species.

If we are to study reproduction and sex from sea-urchins and thread-worms and apply the results to women, we may as well assume that, like snails and leeches, all women are hermaphrodites, as to affirm that fertilisation of the human ovum *must* be identical with the fertilisation of sea-urchins' eggs.

From the fact that reproduction in the lowest forms of animal life is *asexual—i.e.* sexual generation is absent—really there is in them no such thing as sex; while in other classes of the animal kingdom both kinds of sexual organs exist in the same individual—for in the invertebrates true hermaphroditism often occurs; it follows that the contention of some of my critics that "the cause of sex must act universally throughout the animal kingdom" is impossible and untenable, and knowing the cause of sex in the lowest creatures does not teach us the causation of sex in woman, the highest.

Other critics modify this, and hold that "any theory of sex to be accepted must apply to the whole of the vertebrata," and then, owing to this absence of the right ovary in birds, which are vertebrates, consider the theory untenable.

This fact in the anatomy of birds of the atrophy of the right ovary and right oviduct is a very remarkable one, and has so far been quite unexplained; it is an extraordinary example of asymmetry.

In the chick before hatching both ovaries are present. At birth atrophy has set in, so that the egg-laying hen bird has but one ovary, and that the left one, in her body. From this left ovary undoubtedly both sexed eggs are produced.

This fact in the birds might appear to negative my theory were it not that, as *Ballantyne* has said, "what took place in the chick did not necessarily occur in the human embryo"; and, "in the past what was observed in the chick embryo was regarded as proven also for the human embryo, with

results which were disastrous so far as accuracy was concerned."

Birds are remarkable in other respects as asymmetrical creatures, as not only is the right ovary absent, but the right carotid artery and the right jugular vein are also both absent; so that if we are to alter our opinions as to the cause of sex in mankind owing to the absence of the **right** ovary in birds, we must similarly alter our views on the human circulation of the blood owing to the absence of the large blood-vessels from the **right** side of the neck in birds.

The circulation of the blood in woman requires large vessels on both sides of the neck. All the birds are warm-blooded; and although the heart is four-chambered and the two sides of the heart are completely separated from one another, these large vessels on the **right** side are absent; but this will not make us alter our views of the human circulation.

In women there are two ovaries, and they produce two sexes; but because the left or only ovary of the birds produces eggs (very large comparatively to the bird's body) from some of which one sex, while from others the opposite sexed bird is produced, that is no reason to assume identity in the causation of sex in women and birds. The absent ovary, like the absent blood-vessels, will not make us alter our views on the causation of sex in mankind.

And here we must again refer to the great difference between the large egg of the bird and the very small ovum or egg of the mammal. In structure and development the holoblastic ovum of the mammal, including woman, differs so essentially and materially from the meroblastic ovum of birds that it is quite irrational to claim for them identical biological properties or possibilities.

Hence, from the fundamental differences in the holoblastic and the meroblastic ovum, I claim it to be unscientific to insist that there must be an identical causation of sex of the embryos derived from these widely differing ova.

I may further recall to those critics who insist that the cause of sex in birds and in mankind must be identical, the great anatomical differences between birds (belonging to the

vertebrates) and the *placental* mammals. First, then, the absence of an intromittent organ in the **male** bird, and then in the **female** the fact of ovulation occurring outside the body, together with the absence of utero-gestation, lactation, and menstruation.

In another class of the vertebrata—the reptilia, if we claim the causation of sex in woman is the same as in snakes, we must, to be impartial, revise our ideas of respiration in woman, owing to the undeveloped condition of one of the lungs seen in various snakes and reptilia. It is often quite absent, as is the bird's ovary.

Among the highest animals, the placental mammals, we get the nearest approach to mankind ; but even here we meet with great differences, and analogy in sex causation becomes more possible. But we know that women may and do have appendicitis, whereas lions and tigers (placental mammals) have *no* vermiform appendix, therefore we cannot say that whatever occurs in mankind must similarly occur in these mammals, for this is anatomically impossible in this case of absent appendix.

And so, other things being different, we are unable to claim that the cause of sex *only* must be identical in woman and the vertebrata. As *Dr. J. W. Ballantyne*[1] says :

"It is not safe to conclude that what occurs in the lower animals will occur in the human subject."

Admitting, as we must, that the one or **left** ovary in birds produces both sexed eggs, it is remarkable that it produces a *strikingly large excess of* **female** *ones.*

In this respect it lends some support to my theory, for this solitary **left** ovary leads to a greater proportion of **female** to **male** birds being born, and, though varying somewhat in different kinds of birds, yet there is always a large excess of **females.**

Rauber gives the proportions as 75 **males** to 100 **females** or hens in some kinds, and 9 **males** to 108 hens in others ; while in domestic fowls there are 94 cocks to 100 hens.

[1] J. W. Ballantyne, "Manual of Antenatal Pathology : The Embryo." 1904, p. 24.

As a result of the study of the relative numbers of **male** and **female** sparrows, I find that the hens outnumber the cocks by nearly 4 to 1—*i.e.* 25 cocks to 100 hens. This can be confirmed, especially in the winter, by noticing a group of sparrows feeding in the roadway: the hens will largely predominate. In the summer, or breeding season, young cock-sparrows resemble in their plumage the hens so closely that their sex can only be ascertained by actual examination. This I have done in nearly two hundred sparrows I shot, with the above-stated result.

CHAPTER XXIII

CASES THOUGHT TO DISPROVE THE THEORY

AMONG the disbelievers of my theory the greatest reliance in supporting their scepticism has been placed on those cases (after all only a quite small number) in which an ovary or an ovarian tumour has been removed by operation, and the woman has subsequently given birth to a child, whose sex corresponded to the ovary which had been removed. In a few cases a woman has even had twins, **boy** and **girl**, after the removal of one ovary.

It is, of course, at once evident that my theory of the causation of sex entirely fails if this rare occurrence cannot be fully explained.

The explanation is, shortly, that it is very difficult, and often impossible, to be sure that all ovarian tissue has been removed by the operation of taking away an ovary or an ovarian tumour.

It is not usual to remove normal ovaries, but even when removing an apparently normal ovary it is quite easy to leave a portion of ovarian tissue in the stump or pedicle—*i.e.* in the ovarian or utero-ovarian ligament which runs from the ovary to the side of the uterus. This ligament is normally about an inch to an inch and a quarter long. I have seen one of the most experienced of abdominal surgeons unintentionally leave ovarian tissue in the pedicle when doing hysteropexy, the normal ovary being removed to facilitate reposition of the uterus.

Mr. Alban Doran[1] states he had "more than once detected ovarian tissue in the ovarian ligament close to the uterus and far from the anatomical ovary," so that though the anatomical

[1] "Trans. Obstet. Soc.," vol. xlvi., 1904, p. 102.

ovary be removed, some ovarian tissue is still left behind in the pedicle stump.

If the pedicle be long, owing to stretching and dragging out of the ovarian ligament by a tumour, we cannot say *how far along it* ovarian tissue extends, and so we are quite likely to leave some ovarian tissue in it when we divide it to remove the tumour; if the pedicle be short, as *Doran*[1] says, "the operator rightly dreads slipping of the ligature, and so is apt to make it too long and leave a piece of ovary behind."

Dr. J. Halliday Croom[2] confirms this: he says, "it is often difficult to state for certain that the whole of the ovary has been removed; a small portion may be left in the pedicle."

In cases of ovariotomy performed during pregnancy, *Dr. W. Walter*[3] says—

"the closer to the uterine wall the pedicle was ligatured, the greater the chance of irritation (of the uterus) resulting in miscarriage, *hence* the pedicle was secured as far from the uterine wall as safety permitted."

Here we see a reason why ovarian tissue is sometimes left behind in the pedicle, and a case published by *Baldwin*[4] proves it. The patient was pregnant. She had two ovarian cysts, which—

"had become adherent, but the tumours were distinct, and each had quite a long pedicle. Owing to the known fact of her pregnancy, care was taken to avoid any manipulation of the uterus."

The tumours were removed.

She has had two other children since the operation, but the sex is not given.

It is evident that *some ovarian tissue was not removed*, for though both ovarian tumours were removed, she became pregnant twice after the operation, and I maintain that those children were of the same sex if the ovarian tissue was left on one side only; had some been left on *both* sides, then it is possible she had children of both sexes—that is, either pigeon-paired twins, or else **male** and **female** children at different

[1] Doran, "Journal of Obstetrics and Gynæcology," vol. ii., 1902, p. 7.

[2] Halliday Croom in "Allbutt and Playfair's Gynæcology," p. 343.

[3] Dr. W. Walter, "Journal of Obstetrics and Gynæcology," January 1903, vol. iii. p. 93.

[4] Baldwin, *op. cit.*, vol. iii., March 1903, p. 264.

times—after the double or bilateral ovariotomy had been performed.

In the following case, reported by *Dr. R. Stansbury Sutton*,[1] the patient had an ovarian tumour on each side. Double ovariotomy was performed, *i.e.* both ovarian tumours were removed.

"This operation was done on October 20, 1892. On June 10, 1894, the patient gave birth to a **male** child. Again, on February 25, 1896, she was delivered of a **male** child."

Therefore a portion of an ovary *must* have been left behind in the abdomen, and of whichever ovary it was (I maintain it was a portion of the **right** ovary) the fact remains, that that portion of ovary "bred true,"—that is, it yielded two **boys**, not first a **boy** and then a **girl**. This surely cannot be looked upon as a coincidence.

In another case, Dr. Balding, after ovariotomy by Spencer Wells (whether bilateral, or which side is not mentioned), delivered a patient of **male** triplets,—not two **boys** and a **girl**, note. That is, the ovary not removed yielded three children *all the same sex*. I contend that either only the **left** ovary was removed, or, if both were supposed to be taken away, a piece of the **right** ovary was allowed to remain.

Here it will be well to call attention to a paper by *Dr. J. H. Dauber*,[2] who therein shows conclusively the reason why patches of ovarian tissue are often to be found in the ovarian ligament, and also he suggests sometimes in the ovario-pelvic ligament. It is due to traction on the ovaries, during development, by the muscle fibres in the ovarian ligaments.

Besides being situated in these ligaments, there is very strong reason to believe ovarian tissue is sometimes to be found in between the layers of the broad ligaments, and unconnected with the ovarian ligaments, or ovary.

Dr. Dauber[3] corroborates thus:

"It is generally believed either that accessory ovaries, or additional

[1] Dr. R. S. Sutton, "Geneva Gynæcological Congress," September 1896; and "Trans. American Gynæcological Society," 1896, p. 105.

[2] Dr. J. H. Dauber, "Lancet," Jan. 28, 1905, p. 224.

[3] *Loc. cit.*

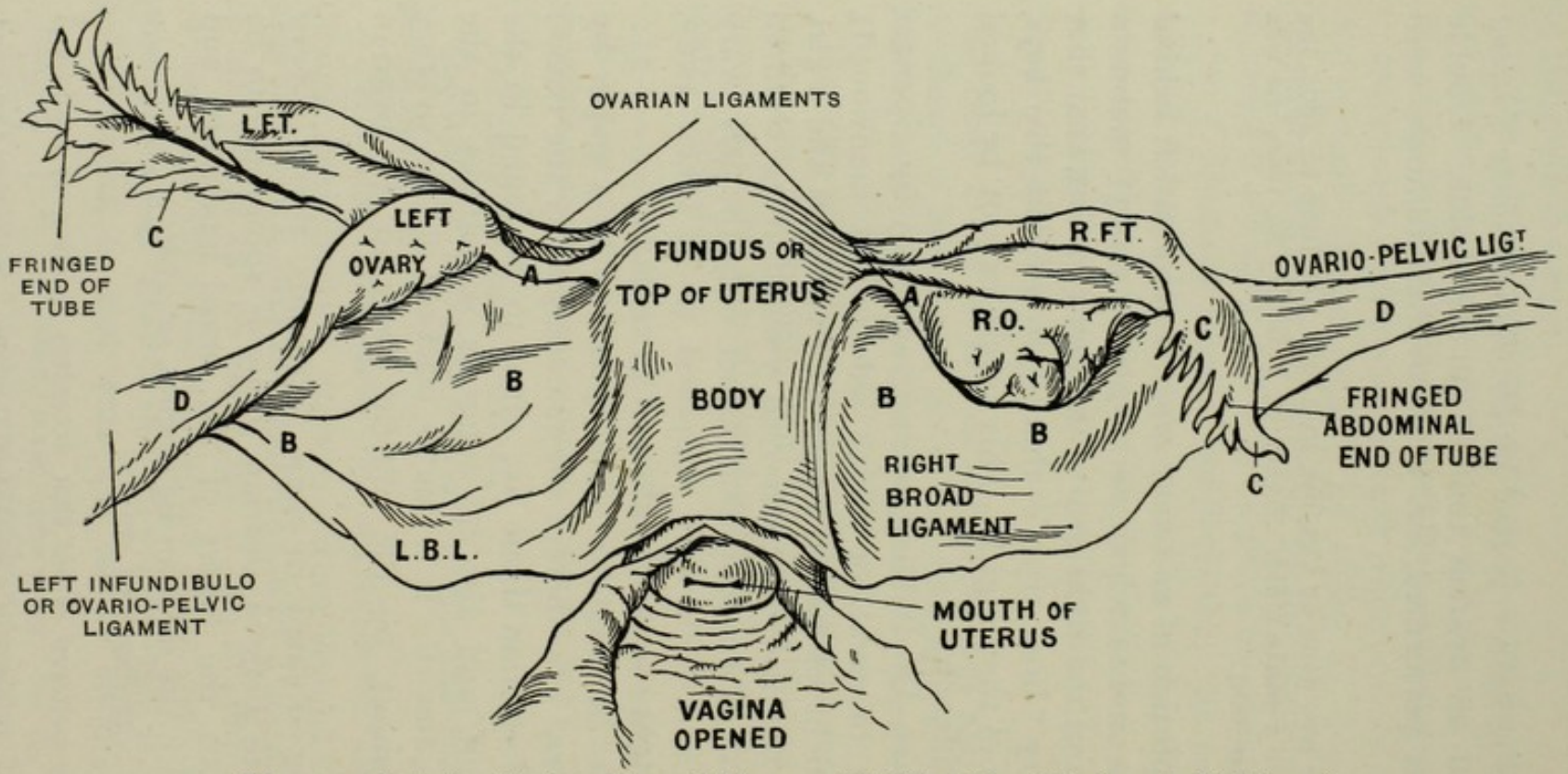

Fig. 20.—Posterior Surface View of Uterus. (Modified from Norris and Dickinson.)

Shows its investment by the peritoneum, forming at the sides of the uterus the right and left broad ligaments, the top edges of which, running from the ovaries to the bony side wall of the pelvis, form the ovario-pelvic ligaments. R.F.T. and L.F.T. Right and Left Fallopian Tubes, the left stretched out. L.B.L. Left Broad Ligament. R.O. Right Ovary: both ovaries are displaced for sake of clearness; both show ovulation scars.

Sites where accessory masses of ovarian tissue may occasionally be found are shown:

A, in the Ovarian Ligament; B, in either Broad Ligament, between layers; C, in a Tubal Fringe; D, in the Ovario-pelvic Ligaments.

patches of ovarian tissue, like accessory thyroids in the neck, may exist in the broad ligaments";

and a case reported by *Baldwin*[1] proves this conclusively:

"On July 15, 1893, both ovaries and tubes were removed. No adhesions were encountered. Sixteen months later, in November 1894, careful examination revealed a small mass of tissue to the left of the uterus. When this was pressed upon, a sensation was experienced similar to that caused by pressure upon an ovary."

The abdomen was again opened:

"This mass of tissue, which was between the layers of the left broad ligament, and apparently just below the remains of the ovarian ligament, was identified and removed. It was about the size and shape of a small Lima bean, and presented all the characteristics of ordinary ovarian tissue. No other ovarian tissue could be found at any other point, and the abdomen was closed. Menstruation continued, however, showing that some ovarian tissue still remained somewhere."

Let it be noted that both ovaries are definitely stated to have been removed, yet ovarian tissue was *found and removed from between* the layers of the left broad ligament; but in spite even of this, "some ovarian tissue still remained," as evidenced by the return of menstruation.

I have therefore now enumerated three possible anatomical sites in which ovarian tissue may sometimes be found independently of the true ovary, and therefore the removal of the whole ovary or the whole of an ovarian tumour, on both sides, does not invariably prevent a subsequent pregnancy.

And now we must consider the possibility of a supernumerary ovary.

An extra or third true ovary, having the size, shape, and activity of the normal organ separated from it, and in association with a third Fallopian tube, is quite unknown.

Accessory ovaries, however, do occur, but not with the frequency which *Beigel* claimed for them.

They are, *Dr. J. W. Ballantyne*[2] says, "probably constricted portions of the normal organs which have been

[1] Baldwin, "American Journal of Obstetrics," December 1902, quoted in "Journal of Obstetrics and Gynæcology," vol. iii., March 1903, p. 265.

[2] Ballantyne, "Allbutt and Playfair's System of Gynæcology," 1906, pp. 130, 131.

separated at an early period in the development " ; they occur, he says, in " 2 to 3 per cent. of post-mortem examinations." In rare cases, " the ovary has been found divided into two nearly equal parts by such a constriction."

Mr. Bland-Sutton[1] has always denied the existence of a true third ovary. He admits of ovaries so deeply fissured that a " portion of the gland is almost isolated," and the ovary " seems to consist of two parts united by a narrow isthmus."

Hence it must be possible for an ovarian tumour to develop in one part and not the other, and by its weight and traction to gradually elongate this isthmus, so that, when operated on, the isthmus between the two isolated parts is divided by scissors instead of the true ovarian ligament, and therefore a piece of ovary proper is left behind, though the whole ovarian tumour is claimed to be removed.

A case reported by *Dr. Galabin*[2] is very corroborative. Two portions of the ovary, one containing a tumour, were separated by three-quarters of an inch of ovarian ligament. The portion nearest the uterus was the unaffected portion; " on the ovarian ligament, close to the angle of the uterus, another ovary was seen " ; then, three-quarters of an inch further along the ovarian ligament, the " outer portion of ovary had become cystic." This was removed, the healthy portion remaining untouched.

Hence, the complete removal of this ovarian tumour would not be synonymous with the complete removal of all ovarian tissue.

Mr. Alban Doran[3] reports a reliable case of accessory ovary. He says:

> " In one ovarian ligament I found an accessory ovary, a condition which may, in some cases, explain the persistence of menstruation and the possibility of normal pregnancy after the removal of both ovaries in operations for ovarian tumours, inflammatory disorders of the appendages, and ectopic gestation."

That it was a true additional mass of ovarian tissue was proved by *Dr. Cuthbert Lockyer*, who examined it micro-

[1] Bland-Sutton, " Diseases of Ovaries," 1896, p. 25.
[2] Dr. Galabin, " Trans. Obstet. Soc.," vol. xliii., 1901, pp. 268, 269.
[3] Alban Doran, " Trans. Obstet. Soc.," vol. xlvii., 1905, p. 384.

scopically. *Ballantyne*[1] has found an accessory ovary which had ovulated "at least once, for a cicatrix was found."

A further case is recorded by *Dr. W. P. Manton*, of Detroit, in the "St. Louis Medical Review," January 1906. He describes the case as a third ovary, which was found beneath the peritoneum of Douglas's pouch:

"The patient was a woman from whom one ovary had been removed and the other one resected. The third ovary was about one inch long and three-quarters of an inch wide. It had always been very sensitive to pressure, and apparently gave rise to backache. It was removed on the occasion of a second operation, and since that time the symptoms have been relieved. Microscopical examination showed that the structure had typical ovarian stroma, and contained a few degenerated Graafian follicles."

It is very doubtful if this was a true third or supernumerary ovary. It was probably an additional patch of ovarian tissue, or accessory ovary.

We are forced, therefore, to believe in the very occasional presence of an accessory ovary, quite apart from fragments of ovarian tissue which may be left behind, either in the ovarian ligament or elsewhere, when attempts are made to remove ovarian tumours, more especially in those found to be bound down by adhesions. And this supplies another anatomical reason for the occasional occurrence of the birth of a child after unilateral ovariotomy, whose sex agrees with the ovary thought to be removed. The sceptic may claim that the child came from the untouched ovary, but this fails him when *both* ovaries have been removed; we then have direct proof that all ovarian tissue has not been removed, because ovulation *must* have occurred to permit of pregnancy.

Another reason why ovarian tissue may be left behind, *Mr. Bland-Sutton*[2] says, is:

"The ovaries may be so firmly fixed to the floor of the pelvis that they break, and portions of ovarian tissue are left; this often impairs the subsequent results, as menstruation (and ovulation) continue if only a small portion of an ovary is left."

[1] *Loc. cit.*, p. 130.
[2] Bland-Sutton, "Diseases of Women," 1904, p. 485.

Dr. Cullingworth[1] reports a case which is an example of this:

"The much enlarged **right** ovary with the Fallopian tube . . . were removed. The appendages of the opposite (**left**) side were then separated; during the process rupture of the (**left**) ovary took place. The (**left**) tube and ovary were removed, the greater part of the ovary remaining as part of the pedicle."

On examination of the parts removed—

"The **left** Fallopian tube was beaded from kinking, but was otherwise healthy. No ovarian tissue was found in the parts removed on the **left** side."

So that the removal of this **left** ovary was a complete failure; not only did the **left** ovary break, but the "greater part of it remained in the pedicle," and not even a portion of the **left** ovarian tissue could be detected as having been removed, with its accompanying **left** tube, and this in spite of the statement that "the (**left**) tube and ovary were removed."

The patient recovered from the operation, since when "menstruation has been regular," because of the incomplete removal of all ovarian tissue.

Olshausen (see Chapter X.) performed bilateral ovariotomy. At the post-mortem he found that *neither ovary* had been removed!!

As ovarian tissue can be left behind when operating on one ovary, so too it can occur if both ovaries are removed; it is even possible that a piece of ovarian tissue might remain on both sides, so that **boy** and **girl** twins *might* be born after double or bilateral ovariotomy! though I know of no case.

THERE ARE ON RECORD NOW A DOZEN GENUINE CASES OF PREGNANCY AFTER DOUBLE OR BILATERAL OVARIOTOMY; and we could not realise this were we not aware of the extreme difficulty, amounting to impossibility in some cases, of completely removing all ovarian tissue, more especially if there has been any inflammatory action of, or around, the ovarian tumour. And *Mr. Doran's*[2] experience may here be quoted:

"When the base of the cyst burrowed and lay close against the uterus the ovarian ligament could rarely be distinguished. In one case, where

[1] Dr. Cullingworth, "Trans. Obstet. Soc.," vol. xxxiv., 1892, pp. 388, 389.

[2] A. Doran, "Trans, Obstet. Soc.," vol. xliv., 1902, p. 249.

Mr. Doran[1] was obliged to remove the uterus, with the burrowing adherent tumour, he found, on examining the specimen, that it would have been *practically impossible to leave the round ligament or part of a pedicle without leaving also ovarian tissue, morbid or healthy.* As it was with a cystic tumour, so it was with inflamed adherent appendages, and so it very often was with an ovary removed to check the growth of a uterine fibroid."

The following cases too, quoted by *Mr. Bland-Sutton*,[1] show the excessive difficulty in some cases of entirely removing both ovaries:

"*Dr. Angus Macdonald* attempted bilateral oöphorectomy on a young woman. He removed the **left** ovary and tube, but failed to find the **right** one. In March 1886, *Mr. Lawson Tait* tried to find the **right** ovary, but failed. He took away the fundus of the uterus. In spite of this menstruation continued. In 1890 *Dr. Keith* reopened the belly, found and removed the **right** ovary and its corresponding portion of tube. The patient recovered, and menstruation permanently ceased."

"*Mr. Martin* removed the uterus two years after removing both ovaries. He found that a piece of ovary had been left behind."

Pinesse concludes "that persistence of menstruation after the removal of both ovaries and tubes is due to portions of ovarian tissue left behind," and states that "in second operations corpora lutea were seen on the stumps of the pedicle left after the primary operations."

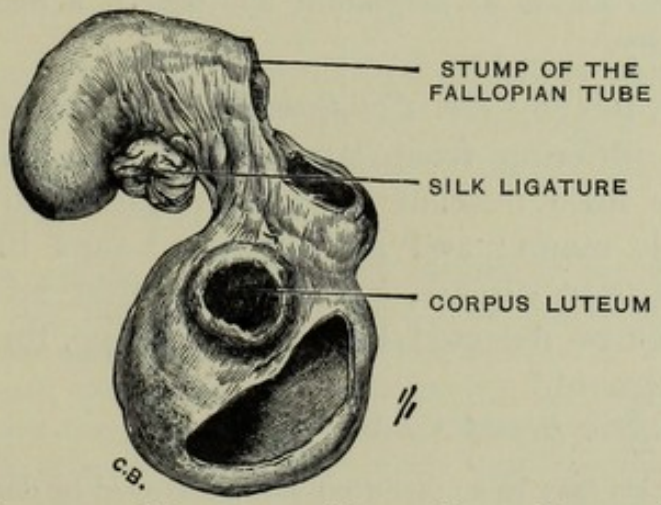

Fig. 21.—Fragment of Ovary containing a Corpus Luteum left after a supposed complete removal of both Ovaries, etc. (Bland-Sutton.)

Mr. Bland-Sutton[2] has the above drawing illustrating this completely, a portion of ovary with a corpus luteum in it

[1] Bland-Sutton, "Diseases of Ovaries," 1896, p. 416.

[2] "Diseases of Women," 1904, fig. 126, p. 495.

(evidence of ovulation) being shown. It was found at a second operation, and had been left after a supposed complete double oöphorectomy. He says:

"Such a retained portion of ovary is sufficient to maintain not only menstruation, but ovulation, and it will form corpora lutea."

Ovulation is *the* function of the ovaries; hence if all ovarian tissue be removed ovulation is arrested, the woman is absolutely sterile, and menstruation permanently ceases.

And here it will be well to inquire how much—or, rather, how little—ovarian tissue will be sufficient to ovulate, and thus lead to the birth of a child.

The ova being microscopic, we should expect from this that an exceedingly small portion only would be necessary, and this is what we find to be the case.

The following extracts prove it:

Dr. Galabin[1] showed tumours of both ovaries removed at the fourth month of pregnancy.

"The **right** tumour was a dermoid cyst containing gruel-like fluid, which solidified on cooling.

"The **left** tumour was an ordinary cystic adenoma, except that three small cysts in it were evidently dermoid. In the **left** tumour was seen a *large corpus luteum of pregnancy*, and near it a *small fragment of unaltered ovary*."

A paper, too, by *Dr. Condamin*,[2] of Lyons, on pregnancy in women suffering from large bilateral ovarian dermoids, shows how little ovarian tissue is requisite to give rise to a fertilisable ovum; and *Dr. Herman*[3] says that, "even in bilateral ovarian disease, so advanced that healthy ovarian tissue cannot be detected by the naked eye, the patient may become pregnant."

Further, *Mr. Bland-Sutton*[4] says:

"Both ovaries may be so distorted and destroyed by dermoids that the true ovarian tissue is unrecognisable to the naked eye; yet these organs are not only able to dominate menstruation, but to discharge their egg-bearing functions successfully."

[1] Galabin, "Trans. Obstet. Soc.," 1896, p. 101.
[2] Condamin, "Annals of Obstetrics and Gynæcology," March 1904, p. 188.
[3] Herman, "Diseases of Women," p. 763.
[4] Bland-Sutton, "Diseases of Ovaries," 1896, p. 61.

Again, he says, in a case where—

"*Bantock* performed double ovariotomy on a woman in the third month of pregnancy, both tumours were dermoid. He made a very careful microscopical investigation of them, but was unable to detect normal ovarian tissues."

Yet some normal tissue had provided the ovum, in both Dr. Bantock's and Dr. Galabin's cases, that was fertilised; so we see what an infinitesimally small portion of ovarian tissue, if left behind at an operation, or undamaged by tumour growth, is capable of yielding fertilisable ova—in fact, a single Graafian follicle is enough to accomplish the purpose.

In the following case *Lefas*[1] found:

"To one of the fimbriæ of the right tube was attached a little round tumour, *perfectly separate from any other structure*, besides the fimbriæ which formed its pedicle. Microscopically it was a true corpus luteum."

So this tiny piece of ovarian tissue, quite separate from the ovary, attached only to the abdominal end of the tube, had ovulated, so that pregnancy might have followed the removal of that ovary.

With what *Morgagni* said, "a woman may conceive if there remain as much of one ovary, sound, as belongs to one mature vesicle," we must therefore agree.

Confirmatory of the difficulty of affirming that no ovarian tissue had been left behind are the remarks by *Dr. Eden* in the discussion of a case at the Obstetrical Society of London, March 2, 1904. He said:

"It was impossible to be sure, by simple inspection at the time of operation, that the whole of the ovary or ovarian tissue had been removed. Only careful microscopical examination by serial section of every small mass, elevation, or nodule—possible only after a post-mortem—could negative the existence of unremoved ovarian tissue lying in the ovarian pedicle or between the layers of the broad ligament."

Having thus seen how infinitely small the piece of ovarian tissue left behind may be, we must next point out that there are reasons to believe that these unremoved portions may grow, in much the same manner as does a tonsil stump after the removal of a portion of the tonsil.

[1] "Journal of Obstetrics and Gynæcology," vol. i., Jan. 1902, p. 109.

Belief in the growth and development of these portions of ovary and their contained follicles was stated by *Dr. Amand Routh*.[1] He said :

"He thought it likely that a small piece of the hilum of one ovary might be left containing no Graafian follicles sufficiently developed to come immediately to maturity. He believed that such a piece of ovarian stroma, together with the follicles, became in a few months further developed, and ovulation and menstruation then recurred."

There are some specimens in the Royal College of Surgeons Museum showing the results of incomplete castration in cockerels, and they seem to strengthen the belief that portions of ovarian tissue may grow, for the glands in cockerels, if only partially removed, are reproduced, and the birds acquire the full male characters.

As a result of the appreciation of the fact that a portion of ovary is sufficient to ovulate, the operation of resection of an ovary has been introduced. This consists in cutting out the tumour or diseased part, and leaving the healthy remainder. This has been often done now, and with the best results, pregnancy having followed such an operation.

Besides pregnancy following as the result of ovarian tissue being left behind, either accidentally or intentionally as a result of resection of an ovary, we can also have tumours arise in the unremoved pieces.

Thus *Dr. Herbert Spencer*,[2] when discussing a case of pregnancy after incomplete bilateral ovariotomy, said he thought—

"that some portion of one of the tumours had probably been left behind in separating the adhesions. He had known an ovarian tumour develop after double ovariotomy from this cause."

This leaving a portion of ovarian tissue, due to adhesions round a tumour, is evidently what had happened to *Dr. Spencer* when, in vol. xlii., p. 396, he announced the birth of **boy** and **girl** twins after he had "removed a **left-sided** ovarian tumour completely"; but which he also stated was "bound down by adhesions," when he described the case. So that case does not negative my theory.

[1] Dr. A. Routh, "Trans. Obstet. Soc.," vol. xliv. 1902, p. 248.
[2] Dr. H. Spencer, "Trans. Obstet. Soc.," vol. xliv. 1902, p. 247.

Other operators have noted tumours arising in ovarian remnants. Thus *Doran* has seen "an ovarian cyst develop on the distal side of a ligatured stump."

Mr. J. D. Malcolm,[1] in the "Lancet," reported four cases: in three bilateral ovariotomy had been performed, and a tumour grew on one or other side; in the other case the tumour recurred on the side the ovarian tumour was removed from. *Mr. Malcolm* stated that—

"some portion of the ovary had been left, and it was most interesting and important to know that a small piece of an ovary remaining in this way could give rise to an ovarian tumour."

We therefore see that complete removal of an ovarian tumour is not synonymous with the complete removal of all ovarian tissue, and my theory remains quite unshaken.

Although I have thus clearly shown that (*a*) portions of ovarian tissue may be left behind after operations; and further that (*b*) ovarian tissue in small detached pieces may occur some distance from the operation site, yet the general rule holds good that the removal of the anatomical ovary on one side removes all the ovarian tissue from that side.

And the result is the birth of only one-sexed children after such an operation.

The two or three cases brought forward to the contrary disprove not my theory, for in these few exceptional cases who shall say some true ovarian tissue had not been left behind? or that there was no accessory ovarian tissue?

[1] J. D. Malcolm, "Lancet," Oct. 31, 1903; "Trans. Obstet. Soc.," 1893, p. 37.

CHAPTER XXIV

THE ALTERNATE ACTION OF THE OVARIES

WE have seen that ovulation is a spontaneous, usually painless, unilateral process, and, I maintain, an alternate one.

To prove that ovulation takes place practically alternately from the two ovaries, besides referring the reader to Chapter III., where I quote Négrier and give other proofs, the following facts will suffice:

Négrier showed that if both halves of a double uterus are developed, menstruation (the outward sign of ovulation) occurred from each half every alternate month—*i.e.* ovulation occurred alternately. In the following case *Ballantyne*[1] quotes T. A. Emmet as recording a case of double uterus with one half imperforate: "There was a bi-monthly menstrual flow from one-half, while on the other side there is an imperforate condition of the horn," so that the ovary attached to the normal side ovulated every second month, as evidenced by the bi-monthly menstruation; for, as *Strassman* says: "Each menstruation is the expression of an ovulation."

The nearly equal birth-rate of **boys** and **girls**—viz. 106 to 100—proves that nearly an equal number of ova are provided by the two ovaries, so this further corroborates alternate ovulation, because we have seen that the two ovaries do not act at the same time. Bilateral ovulation is not normal, so they must act nearly alternately to insure a *nearly* equal number of children.

I have notes of several cases of alternate good and bad menstrual periods.

[1] Ballantyne in Allbutt, Playfair and Eden's "System of Gynæcology," 1906, p. 142.

Thus Miss U. M., age twenty-eight, for the last seven years at least has noticed that she has "alternately bad (*i.e.* painful) periods, followed by a good or painless one."

When she has a bad period she has "great" pains running down from the right iliac spine and down the right groin. The next period (the good or not markedly painful one) she "does not notice any of these right inguinal pains, though she has slight pain over the lower abdomen."

This case points to ovulation (which is admitted to occur at or about a menstrual period, and to have its "external sign in menstruation") being one month painless, but next month painful; and the pain being always over the right ovary points to the right ovary ovulating with pain, and the left ovary ovulating painlessly.

As the pain shows an alternate monthly periodicity, we must conclude that the **right** ovary ovulates every alternate month.

Again, Miss H. C., age twenty-six. The periods used to be "nearly painless."

The last eighteen months she has had pains in the left hip and dragging pains in the **left** iliac region. For the last two years the menstrual periods have been alternately easy, and the next very painful.

"The easy periods are like those she used to have at first. In the painful ones the pain is always in the left groin; the easy and painful periods are quite alternate."

Here the pain recurring every other month over the **left** ovary points to the fact that the **left** ovary ovulates every other month with pain, while the **right** ovulation is painless.

In the following case a married patient has a **left** inguinal hernia, whose sac probably contains the **left** ovary; it is not a true hernia of the ovary.

Mrs. H. L. has had two **boys** and no **girls.**

She has a **left** inguinal hernia, for which she wears a truss. When wearing it she has no pain in the lump "except when she is poorly." She then has to take off the truss "to ease the pain in the lump."

"I don't have the two months alike; one month the pain is worse than the next.

"The lump is tender to the touch when poorly."

"The pain makes me feel quite sick; it is worse one month than another."

Note, too, that both her children came from the **right**, or normal ovary, and so were **boys**.

The alternate monthly pain over the **left** ovary points to the **left** ovary ovulating every other month with pain, the **right** ovulation being painless.

I think I may rightly claim that these cases prove alternate monthly painless and painful ovulation evidenced by alternate monthly pain over one and always the same ovary.

It must be recalled that *Garrigues*[1] states that—

"In some patients I have observed that alternately *one or the other* ovary undergoes a considerable swelling at the time of every menstruation."

So that this corroborates the alternate ovulation of the ovaries.

Besides these cases of pain every alternate month over the same ovarian region, we must note the frequency of unilateral mammary pain in association with menstruation.

Pain in *one* breast during menstruation (the outward sign of ovulation) evidently points to unilateral and alternate ovulation, for the very intimate association of the breasts and the genitalia is universally known. *Temesvary*,[2] who has carefully studied the subject, has noted that in some cases menstruation causes extremely severe mammary pain, "so that the women in question cannot lie on the corresponding side."

As the breasts are usually affected alternately, we get proof of alternate ovulation. In some cases one breast only is painful every alternate month, so we are justified in saying that if the **right** breast is painful, then the **right** ovary has ovulated.

Leguen[3] reported a case proving the intimate association of the ovary with the breast of the corresponding side. He performed ovariotomy for a tumour in the **right** ovary.

"The **right** breast at once underwent atrophy."

[1] Garrigues, "Diseases of Women," 1900, p. 122.

[2] Temesvary, "Journal of Obstetrics and Gynæcology," vol. iii. 1903, p. 513.

[3] "Brit. Med. Journ.," Feb. 1904, p. 388.

Dr. T. G. Drennan[1] has noticed cases of alternate **right** and **left** mammary pain, and deduces alternate ovulation therefrom.

Whether in a pregnant woman the first breast to have any fluid or milk corresponds always to the ovary which has supplied the fertilised ovum—*i.e.* whether the **left** breast always secretes first when the child is **female**, and *vice versa*—is a very difficult question to prove.

It is necessary to observe only primiparous women, for milk very early and easily appears in the breasts of multiparæ. In primiparæ I find that milk is usually present before they inform their doctor they are pregnant even; but in two cases I have proved that the **right** breast had milk in it first, and the child born was a **boy**.

I have been unable to obtain more cases owing chiefly to the reserve of the early pregnant woman, and her not coming under observation soon enough.

Confirmatory of this, *Mr. Bland-Sutton*[2] and *Dr. Lewers*[3] have both recorded cases of milk in *one* breast *only* in cases of tubal pregnancy. In each case the breast corresponded in its side to the gravid tube, and therefore to the oösperm-supplying ovary. Dr. Lewers' case was on the **right** side; Mr. Bland-Sutton does not specify which side.

I have seen several cases of abscess in the breast which corresponded to the sex of the child: thus, child born **female**, breast affected the **left**, and *vice versa*. Be it noted that bilateral mammary abscess is distinctly rare—about 8 per cent. of all cases only.

These cases, then, all go to prove alternate action of the ovaries in ovulating, for we have had—

pain over the same ovary in alternate monthly menstrual periods;

pain in the same breast in alternate monthly menstrual periods;

and the intimate association of the breast and ovary of the same side are proved by

[1] "American Journal of Obstetrics," Oct. 1902, p. 502.
[2] "Diseases of Ovaries," 1896, p. 296.
[3] "Trans. Obstet. Soc.," 1900, vol. xlii. p. 326.

milk first appearing in the breast corresponding to the side of the pregnancy (normal or extra-uterine);

abscess in the breast corresponding to the sex of the pregnancy.

While *Emmett's* case of bi-monthly menstruation from the normal half of a bicornute uterus is convincing.

If fertilisation invariably followed ovulation, we might expect the children would be more often born alternately **male** and **female**. This does occur sometimes, as we have seen in Chap. XVII.

Owing, however, to the uncertainty of fertilisation in the human species, and to the fact of insemination occurring at any time, and so not happening to fertilise the ovum from the opposite ovary, such regular alternation in the sexes does not often happen.

It is otherwise, however, in the monotocous animals, who permit insemination (from which fertilisation practically always follows) *only* when an ovum is provided—*i.e.* when on heat—(see Chap. XII. for the remarks by *Farre*) which *Heape*[1] thus confirms:

"In many, possibly most of the lower mammals, though not in all of them, ovulation and heat are indissolubly connected."

In cows and mares especially we find that **male** and **female** offspring appear alternately, provided the **female** is allowed access to the **male** when instinct or "nature" prompts her—that is to say, if the **female** is covered when the mother first ovulates and shows sexual desire—*i.e.* the first rutting after the birth of her recently born foal or calf.

This fact is well known to many veterinary surgeons in the country. A friend of mine, a doctor, "by acting on this has made his cow give him three heifers (or **females**) in succession by preventing the bull getting at her for a month after calving, thus missing the first rut or ovulation, which would give a **male**."

The fact is made use of by stockbreeders—*e.g.* in South Africa, where, when "ordering cows from England to calve there, they stipulate for a bull calf to be born, relying on its being so if the last calf was a heifer."

[1] Heape, "Trans. Obstet. Soc.," 1898, p. 171.

Dr. L. M. Snow[1] recently thus confirmed this :

"Suppose a mare has a filly foal, and goes to the horse on the ninth day after foaling and becomes pregnant, the foal will be a colt, for at her last rutting time she became pregnant with the recently born filly. I may say he has correctly foretold me the sexes of his foals for the last five years."

Because a woman's children are not alternately **male** and **female** it is no proof that ovulation was not alternately from the **right** or **male** and **left** or **female** ovary ; it signifies only that fertilisation did not happen to occur in an ovum from the opposite ovary to the one which yielded the last child.

When one ovary has been completely removed, ovulation from the remaining ovary soon ceases to be only every alternate month ; for both menstruation and ovulation then occur every month with great regularity, as usual. We all know how vision, hearing, and manual dexterity become keener and greater when the fellow eye, ear, or hand become useless or are removed. In the same manner the single ovary becomes equal to all demands upon it, rising to the occasion and fulfilling the function of the two, somewhat like the single kidney does after the removal of its fellow.

[1] "Brit. Med. Journ.," May 16, 1903.

CHAPTER XXV

THE FORECASTING OR PREDICTION OF THE SEX OF THE COMING CHILD

FROM the contention of ovulation occurring alternately from the **male** or **right** ovary, and the **female** or **left** ovary, I have been able to correctly forecast the sex of the forthcoming child of my pregnant patients, as well as of some others whom I had not even seen.

I claim to have had 97 per cent. of successes ; the 3 per cent. of failures are due to inability of the mother to correctly state in which month her confinement is to be expected. Thus, if a patient states she is to be confined in June, for example, and I have predicted a **female** child, but she is delivered of a full-time **male** child in May or July, my prophecy is thrown wrong ; but she would have been told to expect a **male** in either of those months had the mother said she expected in one or other of them.

Forecasts of a child's sex must be made for full-time children, for premature children may or may not make the prediction wrong, since if born two months too soon the sex would be correctly foretold because it would be the same as in the full-term month ; if born a few days to a month too soon the forecast will be wrong.

Such immature children and all abortions and miscarriages interfere with the rhythm in calculating later pregnancies.

Failure in other cases is due to an irregular type of ovulation ; that is, instead of being of the normal 28-day type, so that four weeks elapse between each ovulation, the patient goes perhaps only 21 days or even 30 days.

Errors arise in other cases because the ovulation rhythm has been disturbed by both ovaries ovulating at once, as evidenced by the birth of twins of different sex. Also, if

pregnancy occur during lactation, when menstruation is usually absent, it would be difficult to know exactly which ovulation had been fertilised.

Allowing 28 days or four weeks for the average menstrual periodicity (the external sign that ovulation has occurred), we get 13 ovulations during the 52 weeks of the year. Of course, if it recur every 21 days, we get an increased number of ovulations, if only every 30 days we can only allow 12 ovulation periods, with a thirteenth every sixth year.

All these peculiarities in different women have to be allowed for when forecasting the sex ; but with the following rules and examples the medical attendant of any pregnant woman should be able with care to correctly foretell the sex of the child with which she is pregnant, and further to tell other women in which months to avoid getting pregnant if a certain sex child be desired.

This can roughly be done with the aid of the usual obstetric tables, for, given the sex and the birthday of the patient's last child, the ovulation month (and naturally the sex of that ovum) can be readily found from the tables. I have, however, found it more reliable to work it out by means of the forty weeks plan here given.

It is necessary to obtain from the patient the following particulars before it is possible to forecast the sex of the coming child :

How often do your menstrual periods occur?

How many days do they last?

Are they always quite regular?

What was the date when your last child was born? (Year, month, and day must be known.)

Was the child a **boy** or **girl**?

How long did you suckle the child, if at all?

When did the menstrual period reappear after the confinement?

Have there been any miscarriages since baby was born?

A woman's normal period of gestation—that is, her pregnancy, lasts for 280 days, or ten months of four weeks each—that is, forty weeks of seven days, making 280 days in all. The expression "nine months of pregnancy" should be abandoned, because inaccurate.

Given therefore the child's birthday, we go backwards forty weeks to find the ovulation month, or month in which the ovum was fertilised which yielded the child. The sex of this child being known, we then proceed alternately from this ovulation month until we come down to the tenth ovulation period prior to the expected month of birth of the coming child, allowing an extra or thirteenth ovulation between each December and January of the year following.

We can therefore find the sex of the ovulation which has just been fertilised and with which the patient is now pregnant; so we are able to correctly foretell the sex of the coming child.

Because of the thirteen ovulations per annum, it follows that if the October ovulation of one year is fertilised the next October ovulation will be of the opposite sex, because of the odd or thirteenth month or ovulation period which has to come between the two Octobers; so that if a patient has a child in one month of one year and another child in the same month of the next year, the **sex would be the opposite.**

Examples of this are to be found in the family of her late Majesty Queen Victoria, thus: first child, Princess Victoria, the Princess Royal, born November 21, 1840; second child, King Edward VII., born November 9, 1841; also in the Duke of Edinburgh's family: first child a **boy**, born October 1874; second a **girl**, born October 1875; and again in the Duke of Connaught's family: first child a **girl**, born January 1882; second a **boy**, born January 1883.

The following few instances are from actual cases in my own practice (they do not exhaust my lists), thus:

Mrs. C. S. G. had a **boy** born July 2, 1899, and she had a **girl** born July 4, 1900.

Mrs. T. P. C. had a **boy** born August 10, 1901, and she had a **girl** born August 13, 1902.

If instead of the next year it be the same month of the next year but one, then the **sexes will be the same,** thus:

Mrs. S. P. had a **boy** September 1899, and she had a second **boy** September 1901, because September 1900 would have given a **girl.**

Mrs. T. S. had a **boy** June 1901, and a second **boy** June 1903, because June 1902 would have given a **girl.**

Mrs. R. R. D. had a **girl** July 1895, and a second **girl** July 1897, because July 1896 would have given a **boy.**

If instead of being the same month two years running the child is born the next month of the following year, **the sex will be the same,** thus :

Mrs. C. R. R. had a **girl** May 5, 1901, and another **girl** June 5, 1902, because May 1902 would have been a **boy,** so the next month (June) gave the **girl** it was.

Mrs. C. M. had a **boy** July 13, 1901, and another **boy** August 22, 1902, because July 1902 would had given a **girl,** so the next month (August) gave the **boy.**

Her third child, born August 17, 1905, was a **girl,** because we have just seen August 1902 was a **boy,** so August 1903 would have been a **girl,** August 1904 would have been a **boy,** and thus August 1905 was the **girl**—*i.e.* three years after the last **boy.**

Hence, if children are born in the same month an odd number of years apart they are of opposite sex ; if an even number of years intervene they are of the same sex, thus :

Mrs. K. C. P. had twin **boys** on March 25, 1888, and four years later to the actual day, viz. March 25, 1892, she was again delivered of twin **boys** ; so that because the births occurred in the same month an even number of years afterwards, she had the same sex children again. That she would have twins could not of course be foretold (See also the examples in the case of the Empress of Russia's three last daughters, detailed in the next chapter.)

We therefore get the general rule to proceed alternately from the known date and month of a child's birth down to the month the coming child is expected to be born in. We can then foretell its sex, though this method is not so invariably correct as is calculating from the ovulation periods. Thus :

Mrs. K. M. had a **girl** May 1896, and a **boy** July 1897, for May 1897 would have been a **boy,** June 1897 would have been a **girl,** and so July 1897 was a **boy.**

Mrs. S. C. D. had a **girl** April 1902, and a **boy** October 1903 ;

for April 1903 would have been a **boy**, May 1903 would have been a **girl**, June a **boy**, July a **girl**, August a **boy**, September a **girl**; and so October was a **boy**.

Mrs. C. had a **girl** July 1900, and a **boy** November 19, 1905; for July 1901 would have been a **boy**, July 1902 a **girl**, July 1903 a **boy**, July 1904 a **girl**, July 1905 a **boy**; so August 1905 would be a **girl**, September 1905 a **boy**, October 1905 a **girl**, and thus November 1905 was a **boy**.

Mrs. S. W. had a **girl** October 1896, and another **girl** May 1901; for October 1897 would have been a **boy**, October 1898 a **girl**, October 1899 a **boy**, October 1900 a **girl**, October 1901 a **boy**; therefore if October 1901 would have been a **boy**, September 1901 would have been a **girl**, August a **boy**, July a **girl**, June a **boy**, and May 1901 a **girl**, which it was.

Mrs. R. W. D. had a **girl** September 1895, and another **girl** May 1897; for September 1896 would give a **boy**, September 1897 a **girl**; therefore August 1897 would have been a **boy**, July a **girl**, June a **boy**; and so May 1897 was a **girl**.

Mrs. R. had a **girl** June 1888, and another **girl** November 1893; for June 1889 would give a **boy**, June 1890 a **girl**, June 1891 a **boy**, June 1892 a **girl**, and June 1893 a **boy**; so July 1893 would be a **girl**, August a **boy**, September a **girl**, October a **boy**, and November 1893 a **girl**, which it was.

Mrs. M. B. had a **boy** April 1901, and a **girl** September 1903; for April 1902 would give a **girl**, April 1903 a **boy**, May a **girl**, June a **boy**, July a **girl**, August a **boy**, September a **girl**, which it was.

Mrs. G. P. H. had a **boy** February 1900, and a **girl** May 1902; for February 1901 would have been a **girl**, February 1902 a **boy**; so March would have been a **girl**, April would have been a **boy**, and May was a **girl**.

Mrs. F. G. had a **boy** July 1898, a **girl** June 1902; for July 1899 would have been a **girl**, July 1900 a **boy**, July 1901 a **girl**, July 1902 a **boy**; therefore June 1902 gave a **girl**, which it was.

Mrs. L. M. had a **boy** April 1899, and another **boy** February 1903; for April 1900 would have been a **girl**, April 1901 a

boy, April 1902 a **girl**, April 1903 a **boy**, If therefore the child was expected in February 1903, we know March 1903 would have been a **girl**, and February 1903 would give the **boy**, which it was.

Mrs. W. L. had a **boy** August 1896, and another **boy** November 1901 ; for August 1897 would give a **girl**, August 1898 a **boy**, August 1899 a **girl**, August 1900 a **boy**, and August 1901, a **girl** ; so September 1901 would be a **boy**, October 1901 a **girl**, and November 1901 a **boy**, which it was.

Mrs. G. W. G. had a **boy** May 1901, and another **boy** August 1904 ; for May 1902 would have been a **girl**, May 1903 a **boy**, May 1904 a **girl**, June 1904 a **boy**, July 1904 a **girl**, and August a **boy**, which it was.

I have here given three examples of each kind of succession —viz. **girl** followed by **boy**, **girl** by **girl**, **boy** followed by **girl**, and lastly **boy** by **boy**—to show that the order of birth makes no difference to the plan.

The following interesting cases, correctly foretold, show that the birth of a premature, not fully developed child must be taken as having occurred in the month in which it was expected, and not in the month wherein birth actually took place ; thus :

Mrs. L. C. G., who expected on January 24, 1902, was delivered on January 21 of a **boy**. On November 10 she engaged me to attend her with her next, which she expected the middle of February 1903. I foretold a **boy**. She was delivered prematurely on January 21, 1903, of another **boy**, so both children had the same birthday a year apart! It was a **boy**, because due in February ; thus : January 1902 gave a **boy**, January 1903 should give a **girl**, and February a **boy**, which the child was, though born prematurely and not fully developed in January.

Mrs. B. T., who expected about the middle of March, was confined on March 23, 1904, of a **girl** ; she expected again May 25, 1906. I foretold a **girl** again. She was prematurely confined on March 19, 1906, of twin **girls**. As March 1904 was a **girl**, March 1905 would be a **boy**, and March 1906 a **girl** ; so, too, April being a **boy**, May would give the **girl** as foretold. Of course the twins were not

predicted. So, though born two months prematurely, and properly being due in May, this forecast was actually correct, as it would have been had the twins arrived in May.

In the following cases an error in the month in which the child was expected to be born led to my forecast being wrong. Had the month been correctly told me by the mother the prophecy would have been correct; thus:

Mrs. W. H. had a **girl** born August 24, 1898. She expected to be confined, she said, the third week of July 1903. I therefore foretold on April 15, 1903, that she would have a **girl** in July 1903; instead she was delivered of a fully developed **boy** at 1 a.m. on June 28. Had she told me to expect in June, I should have of course correctly foretold her a **boy**; thus: August 1898 gave a **girl**; August 1899 would be a **boy**, August 1900 a **girl**, August 1901 a **boy**, August 1902 a **girl**, August 1903 a **boy**, hence July would give the **girl** I foretold, while June 1903 would give the **boy**, which was born.

Mrs. M. G. had a **boy** born May 19, 1902. She expected, she said, to be confined in the middle of August 1903. I therefore predicted she would have another **boy**. She was delivered on July 27 of a fully grown **girl**. I should have predicted a **girl** for July had that month been given to me; thus: May 1902 was a **boy**; May 1903 would be a **girl**, therefore June would give a **boy**, and July 1903 a **girl**, which it was, the first four children having all been boys.

Therefore, from the experience of these and other cases, I soon learned to prophesy like this: You will have a **boy** if the child is born in August, and a **girl** if it be born fully developed in July.

Thus Mrs. R. S. said she expected to be confined at the end of August 1902; I, however, calculated the probable date of her confinement as July 20, 1902; I therefore predicted, when she engaged my services on May 9, 1902, that she would have a **boy** if the child was born in August, but a **girl** if born in July. She was delivered of a **girl** at 3.30 a.m., July 11, 1902.

Mrs. T. R. expected in July; I calculated her date as August, so prophesied she would have a **boy** in July, or **girl** if born in August 1902. It was a **boy**, born 7 a.m., July 23, 1902.

Mrs. B. expected, she said, in October 1903 ; I calculated her date as September 26, 1903, and told her on July 24, 1903, when she engaged me to attend her, that she would have a **girl** if born in September, a **boy** if born in October. She was delivered of a **girl,** midday, September 26, 1903.

These, then, are some only of the cases from my own practice, in which I have correctly foretold the sex ; in some several hours before the birth, in others weeks and months even, ranging from two to six months, prior to birth. And for several of them I have written certificates, signed not only by the laity, that I did correctly forecast the sex of their children.

Probably, after testing my plan for forecasting the sex of a child, by the data of members of his own family, the reader will be sufficiently interested to test it by the Royal and aristocratic families, the dates of whose children's births he can readily find recorded in books.

He will find that in nearly all cases the sex of a subsequent child could have been correctly foretold, owing to the previous child's sex and birthday being known.

In some few cases errors may appear, owing chiefly to premature births, miscarriages, etc., of which naturally he will find no record ; and it is suggestive that in some of the errors he will find an unusually long interval has occurred between the two births, the inference being that a miscarriage or premature birth had taken place in between.

A doctor in actual attendance on patients whom he knows, will obtain a larger percentage of correct results, than would be obtained by looking up the recorded dates of births, in families of whose intimate medical history he is ignorant.

CHAPTER XXVI

THE DETERMINATION OR PRODUCTION OF SEX AT WILL

FROM what has been shown in the former chapter it is abundantly evident that the production of sex at will must consist in avoiding any attempt at fertilisation in the months during which an ovum is produced of the sex which is not desired.

Hence to secure a different sex child to the child last born, we must first find the ovulation month of the last child—*i.e.* the month during which the ovum shed was fertilised, according to the rules laid down in the last chapter.

The sex being already known, we then reckon alternately month by month and so find the months which correspond in sex to the one which provided the last ovum ; during these months, therefore, no intercourse must take place.

If fertilisation then ensues, during one of the other months, we shall certainly obtain a child of the opposite sex to that last born.

Much of the unhappiness in Royal and other houses is due to a certain amount of ill-luck or misfortune in always catching the same sex ovulation.

The Empress of Russia can certainly claim to have created the greatest, even international, interest as to the sex of her coming children. It was always reported, and never officially contradicted, that the Czarina, after consulting the late Professor Schenk, had adopted his directions with a view to ensure the birth of a son. Hopeless failure, however, attended these efforts, and on two occasions at least a daughter was born instead of the wished-for son.

Why the Czarina did have four daughters consecutively, and at last a son, is because on four occasions a female

ovulation was unfortunately fertilised; and on three of these occasions this could have been easily avoided by calculating on my method the sex of the ovulation month. The sex of the last three children was on each occasion foretold correctly by me.

The Czarina has had five living children, thus:

Princess Olga, born November 15, 1895.
Princess Tatiana, born June 10, 1897.
Princess Marie, born June 26, 1899.
Princess Anastasia, born June 18, 1901.
Prince Alexis, born August 12, 1904.

The Czarina gave birth, then, to a **girl** (Princess Olga) on November 15, 1895. Tracing back 280 days or 40 weeks, we find that the ovulation fertilised took place in the first week of February 1895; so, February 1895 being a **female** ovulation, gave rise on November 15, 1895, to the birth of a girl, Princess Olga.

The next child, a **girl**, Princess Tatiana, was born in June 1897. Now 40 weeks back make the ovulation in September 1896. As February 1895 was a **female** ovulation, February 1896 was a **male** ovulation; so March 1896 would be a **female**, April a **male**, May a **female**, June a **male**, July a **female**, August a **male**; and September 1896 was a **female** ovulation, therefore a **girl** was born in June 1897.

The third child, Princess Marie, was born in June 1899, that is, the same month two years later—the sex, as I have pointed out in the last chapter, being therefore the same. The ovulation month would again be September of 1898, and as September 1896 was a **female** ovulation, September 1897 would be a **male**, and September 1898 was the **female** ovulation which led to the birth of Princess Marie.

Similarly, Princess Anastasia was born in the same month, June, of 1901—*i.e.* two years after Princess Marie. Here again the ovulation month would be September of 1900; and as September 1898 was a **female** ovulation, September 1899 would be a **male**, and September 1900 a **female**; hence Princess Anastasia was born.

The birth, then, of these three princesses successively after the first is thus easily accounted for.

The long-wished-for heir, the Cesarewitch, was born in August 1904. Tracing back, we find that the ovulation month must have been November 1903. If, therefore, September 1900 was a **female** ovulation period, and produced the Princess Anastasia, we know that September 1901 would be a **male**, September 1902 a **female**, and September 1903 a **male** ovulation period; therefore October 1903 would be a **female** ovulation, and November 1903 was a **male** ovulation, which being fertilised, the long-looked-for son and heir was duly born in August 1904, his birth being by this plan correctly foretold by me.

We may possibly some day, by means of some modification of the Röntgen or other rays, be able to actually see an ovary ovulate. This should not sound so improbable when we recall how impossible the location of swallowed objects, bullets, and other foreign bodies, besides views of fractured bones, would have been thought before the discovery of the Röntgen rays.

Efforts are even now being made to show the action of the heart in situ; and who can say that an ovary ovulating will be an impossible view in the future?

If this ever comes to pass, the solving of the problem how a Royal house would be able to avoid the birth of a princess when a prince was wanted, would be rendered quite easy; it would allow even the *first* child to be a **boy** if so desired. Until the **right** or **male** ovary was seen to ovulate, sexual congress would be prohibited; then, if fertilisation followed, the desired prince would be born. There are still many houses awaiting such an event with anxiety.

Until such time, therefore, as we can see an ovary ovulate, we must be content to work out, from the data of a previous child's birth, which ovary is working during certain months.

This plan, I maintain, succeeds for births after the first; but I am quite unable to determine the sex of the firstborn.

But this matters only slightly; it is only after the birth of at least one child that the parents begin to wish for a child of different sex. This, my plan now teaches them how to achieve.

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