ON THE MEANS OF ASCERTAINING THE LENGTH OF GESTATION BY MEASUREMENTS OF THE FŒTUS AND GRAVID UTERUS DURING THE SECOND PERIOD OF PREGNANCY.

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Every objective symptom which serves to point out the period gestation has arrived at, is of great value, not only at the patient's bedside, but also from a medico-legal point of view. In spite, however, of the interest attached to such a subject, we have very few exact observations in regard to it, although in text-books on midwifery reference is made to the size of the fœtus during successive months of pregnancy, and also to the position of the fundus uteri in its relation to the symphysis

pubis and the umbilicus. The size of the fœtus, prior to Ahlfeld's essay,* was determined only after birth, while the height of the fundus uteri was measured either by the fingers or by a tape measure,—a procedure which, considering the difference of height of the umbilicus in different women, furnished extremely contradictory results. The determining, by means of a tape measure, of the distance between the symphysis pubis and the fundus uteri, even in cases where the children are of the same size, is also fallacious, partly owing to the unequal development of adipose tissue under the skin in different females, partly to the varying convexity of the uterus. Our conclusions will, of course, be still more contradictory when the children differ in size and position. Indeed fœtuses differ from each other both in length and weight during almost every period of gestation.

Elsaesser,† and after him Hermann,‡ have already drawn from the materials at their disposal the following conclusions:— "That frequently children born during the earlier periods of pregnancy surpass in length those brought into the world at a later date. Therefore it is impossible to judge at what period of gestation the fœtus was born by the length of the latter. The age of the infant and its size are far from standing in exact relation to each other; children arrived at their full time, and even those carried beyond it, may be born small in size and light in weight." "Neither the duration of pregnancy, nor the weight of the fœtus, nor its length, nor the relation between the upper and lower parts of the body, taken separately, can serve as indications of the age of the fœtus; the only trustworthy signs are the degree of its development, and proofs of its body having performed vital functions." While entirely agreeing with Elsaesser that there is no *single* certain sign of the fœtus having arrived at maturity, and that only all the signs taken together can demonstrate, with anything like exactitude, the age of the fœtus, we cannot accept such statements as final, without also taking into consideration the

* Ahlfield, "Archiv für Gynäk.," B. 2, pp. 352–373, "Bestimmungen der Grösse und des Alters der Frücht."

† Elsaesser, Henke's "Zeitschrift für Staadtsarzneikunde," 1858, Bd. 75, pp. 245–294.

‡ Hermann, "Monatsschrift für Geb. und Fr.-Kr.," B. 12, pp. 394, 395.

results arrived at by such observers as Hecker,* Schroeder,† and Ahlfeld, whose unanimous opinion it is that the length of the fœtus serves as the surest indication of its age. The above-mentioned authors' observations were carefully made, either by themselves or by trustworthy assistants; whereas Elsaesser says nothing of the method of investigation employed by himself. Perhaps the materials he made use of were collected by midwives, or by persons as little accustomed to strict observation. Now, every practising physician is well aware of the worth of observations made by such people,—although in certain exceptional cases Elsaesser's conclusions seem quite correct. Hence only accurate clinical records are valuable, and opinions founded thereon can be refuted only by a series of observations similarly made. I regret that I have been able to collect only a small number of facts in regard to infants born before the full time; but with the view of verifying, after birth, the measurements of these children taken before they were born, I consider the bringing forward of even such small data as not out of place,—data which I hope to extend as opportunity offers. In estimating the maturity of the fœtus, the period of gestation as determined by the last catamenia, the corresponding size of the womb, and the general development of the new-born infant, were taken into account. As nearly all my patients were unable to define the day of conception, but only their last menses, I cannot consider myself as fortunate in my cases as Ahlfeld was in his.

TABLE I.

Period of Pregnancy.	Weight of Child.	Length of Child.	Number of Cases.	Average Weight of Child.	Average Length.	Maximum Weight.	Maximum Length.	Number of Cases.	Minimum Weight.	Minimum Length.	Number of Cases.
Weeks.	Grm.	Ctm.		Grm.	Ctm.	Grm.	Ctm.		Grm.	Ctm.	
44	3520	51·5	1								
44	3200	48·5	1								
41·5	4300	54	1								
41	3145	45·75	1	3438·5	49·9	4300	54	1	3145	45·75	1
	3100	49	1								
	3575	50·75	1								
	3230	50	1								
40			108	3412	48·4	5250	55	1	2449	43	1

Longer than 40 weeks

* Hecker und Buhl, Klinik der Geburtsk, Leipzig, 1861, pp. 131–45; und Band 2, pp. 22–23.

† Schroeder, Geburtshülfe. Vierte Auflage. Bonn, 1874.

TABLE I.—*continued.*

Period of Pregnancy.	Weight of Child.	Length of Child.	Number of Cases.	Average Weight of Child.	Average Length.	Maximum Weight.	Maximum Length	Number of Cases.	Minimum Weight.	Minimum Length.	Number of Cases.
Weeks.	Grm.	Ctm.		Grm.	Ctm.	Grm.	Ctm.		Grm.	Ctm.	
39	2922	46	1								
	2390	44	1								
	3020	49	1								
	3230	46	1								
	3800	49·5	1								
	4230	49	1	3016	47·5	4230	52	1	2200	43·5	1
	2200	46·5	1								
	2535	45·5	1								
	2725	48·5	2								
	3170	49·5	1								
	2350	43·5	1								
	3100	49	1								
	3300	52	1								
	3132	48·5	1								
	3590	48·5	1								
	3545	48	1								
	2800	46·5	1								
	2500	46	1								
38	3430	45	1								
	3080	46	1								
	2950	47·5	2	2897·3	46·6	3600	48·5	1	2350	44·25	1
	3600	47	1								
	2350	45	1								
	2650	46	1								
	2950	48·5	1								
	2825	48·5	2								
	2559	44·25	2								
37	2650	46	1								
	2720	48	1								
	3035	46	2								
	2800	48·5	1	2770	46·5	3035	48·5	1	2250	45	1
	2900	46·5	1								
	2250	45	1								
36	2920	47·75	2								
	2780	45·85	3								
	2500	46·25	2								
	2750·5	47·75	2								
	2420	46·5	1	2622	46·5	3097	49·5	1	2030	42·5	1
	2301	49·5	1								
	3097	47·5	1								
	2030	42·5	1								
	2200	44·5	1								
	2620	47	2								
35	2500		1								
	2900	46·5	1	2700	46·25	2900	46·5	1	2500	46	1
	2700	46	1								
34	2280	44·5	1								
	2490	45·5	1	2440	45·3	2550	46	1	2280	44·5	1
	2550	46	1								
33	2270	41									
32	1850	41·5	2								
	2085	42·25	2	2064	43·1	2450	48	1	1850	41·5	2
	2450	48	1								

In regard to the earlier births there were only a few cases, and I have therefore omitted them. For children arrived at maturity, I shall simply give the average figures, as too many details would exhaust the reader; and, further, as such details are matters of secondary importance, in so far as this essay is concerned.

For the more complete support of my measurements of the fœtus, I shall cite the figures of Hecker, Ahlfeld, and Schroeder.

TABLE II.

	Period of Pregnancy.	Average Weight according to Hecker.	Average Weight according to Schroeder.	Average Weight according to Ahlfeld.	Average Length according to Hecker.	Average Length according to Schroeder.	Average Length according to Ahlfeld.
Months.	Weeks.	Grammes.	Grammes.	Grammes.	Ctm.	Ctm.	Ctm.
10	40	2450	2528	3168	45·47	46	50.5
	39			3321			50·6
	38			3016			49·9
	37			2878			48·3
9	36	1993	2240	2806	42·44	44·6	48·3
	35			2753			47·3
	34			2424			46·07
	33			2084			43·88
8	32	1609	1700	2017	39·41	41·3	43·4
	31			1972			43·7
	30			1868			42·0
	29			1576			39·6
7	28	1343		1142	35·38		36·3
	27						

On comparing Table II. with my own measurements of new-born children, it appears that my figures approach most closely to Ahlfeld's, although infants carried to the full time are shorter in proportion to their weight with us in St Petersburg than in Leipsic. Ahlfeld, as well as Hecker, has arrived at the conclusion that "the greater the length of the fœtus, the greater the probability of the head being large." The former gives us a table of the comparative length of the child, and of the breadth of its skull. The results obtained by myself bear a close resemblance to Ahlfeld's figures. I shall therefore confine myself to a citation of my own measurements, which will be found in Table III. In constructing the following Table, I have given measurements of the longer transverse diameter of the head (from the tuberosity of one parietal bone to that of

the other), and of the shorter one (between the zygomatic processes). All these measurements were made by myself.

TABLE III.

On the Relation of the Length of the Fœtus to its Breadth.

Length of Child's Body.	Number of Measurements.	Maximum Length of Biparietal Diameter.	Minimum Length of Bizygomatic Diameter.	Number of Cases.	Average Length of Biparietal Diameter.
Ctm.		Ctm.	Ctm.		Ctm.
55	1	10·8	8	1	...
54	1	10	8·75	1	...
53	3	9·5	8·3	3	...
52	9	9·2	8	9	...
51	13	9·1	7·6	...	...
50	15	9·03	7·8	...	...
49·5	10	9·0	7·9	28	8·9 to 7·7
49	18	8·8	7·6		
48·5	16	9·1	7·6	37	9 ,, 7·6
48	21	8·9	7·6		
47·5	5	9·1	7·8	16	8·9 ,, 7·7
47	11	8·8	7·5		
46·5	12	8·5	7·1	27	8·6 ,, 7·1
46	15	8·7	7·2		
45·5	4	8·8	7·3	8	8·6 ,, 7·3
45	4	8·5	7·4		
44·5	4	8·4	7·1	7	8·4 ,, 7·3
44	3	8·5	7·5		
43·5	1	8·75	7·5	...	...
43	...	...	...	...	...
42·5	1	9	7·5	2	8·2 ,, 7
42	1	7·5	6·5		
41·5	1	7·5	7	2	7·7 ,, 7
41	1	8	7		

As will be seen from the above cited figures, there is no strict mathematical relation between the length of the child and the breadth of its head; but, in the majority of cases, the most correct conclusion is, that the longer infants have the broader heads. To ascertain the size of the head, however, it is not sufficient to measure the short diameter, but other measurements should be taken as well.

Thus, Pfannkuch found that the circumference of the fœtal head is equal to the sum-total of three diameters—the transverse, the antero-posterior, and the oblique*—and he therefore considered the circumference of the head as the expression of the degree of its development. On the basis of his measure-

* Ueber die Koerperform der Neugeborenen; Arch. für Gyn., B. 4, pp. 297–310.

ments, he arrived at the conclusion that the weight and length of the body, and the size of the head, keep pace in growth until the child arrives at its medium weight, while afterwards, during the gradual increase in weight, the increase in length first lags behind, and then the increase in the size of the head. The more rapid development of the weight goes towards enlarging the circumference of the child's body. I have myself made 167 such measurements, and 50 more my friend Dr Stoll was so obliging as to make for me, so that my table consists of 217 measurements in all. In this table, live-born children, carried to the full time, and delivered without any extraneous aid, in cases of normally developed pelves, are taken into account. In order to strengthen the limited number of my observations, I shall take the liberty of also quoting Pfannkuch's figures.

TABLE IV.

The Relations of the Circumference of the Head and the Length of the Body to the Weight of the latter in Newly-Born Children.

Weight of Child in grammes.	Circumference of Head (my measurements) in centimetres.	Circumference of Head according to Pfannkuch in centimetres.	For each kilogramme of weight a circumference (in centimetres) of	Length of Child in centimetres (my measurements).	Length of Child according to Pfannkuch (in centimetres).	For each kilogramme of weight a circumference (in centimetres) of	No. of Children measured by me (in centimetres).	No. of Children measured by Pfannkuch (in centimetres).
1500 to 2000	29·6	30·37	...	40·2	42·59	...	5	23
2000 ,, 2250	31·6	30·75	14·8	43·2	44·02	20·32	8	36
2250 ,, 2500	32·0	31·33	13·4	45·3	45·46	19·07	12	52
2500 ,, 2750	32·3	32·28	12·3	47·2	46·81	17·98	25	90
2750 ,, 3000	33·1	22·79	11·13	47·5	47·76	16·52	35	110
3000 ,, 3250	33·75	33·62	10·8	47·9	48·76	15·32	48	150
3250 ,, 3500	34·1	34·62	10·01	49·1	49·53	14·54	35	115
3500 ,, 3750	34·5	34·27	9·51	49·3	50·33	13·60	36	79
3750 ,, 4000	34·7	34·84	8·95	48·9	51·05	12·61	11	46
4000 ,, 4500	35·9	35·4	...	52·1	52·46	...	11	13

My measurements coincide with Pfannkuch's, viz., that, at the commencement of each kilogramme of the child's weight, there is a circumference of the head of 14·8 centimetres, and a length of the body of 20·3 centimetres. Afterwards, however, when the child reaches a weight of $3\frac{3}{4}$ of a kilogramme, there is a circumference of only 8·95 ctm., and a length of 12·61 ctm., for every kilogramme. Consequently, Pfannkuch's

above-cited conclusion is confirmed in so far as the average of the cases is concerned; but in many individual instances, the circumference of the head presents almost as great variations in regard to the weight as it does to the length of the body, so that for the present I am bound to agree with Hecker, Schroeder, and Ahlfeld, and regard the length of the child as the more certain indication of the degree of its development. After the infant's birth, there are within our reach a great many other signs which afford us the opportunity of judging of its development, and thus of the period of pregnancy at which labour had arrived. I have touched upon this question but slightly, as I intend passing over to the chief subject of this essay, viz., the possibility of defining the size of the fœtus during pregnancy. Ahlfeld, in making a newly-born infant assume the position it occupied *in utero* (*i.e.*, bending its head, and crossing its arms over its breast, while its bended knees were brought up towards the abdomen, so that it presented an egg-shaped outline), found that the length between the opposite poles of the oval form was exactly one-half the length of the fœtus. In proof of the correctness of his statement, Ahlfeld brought forward a whole series of measurements (250 in all) of newly-born infants. In three cases, in particular, these children were covered with vernix caseosa, and it was thus easy to place them in the position they had occupied before birth. As a further proof of the correctness of his conclusions, Ahlfeld measured the frozen body of a woman in the last stage of pregnancy (case published by Braune*), and found that the length of the oval position of the fœtus equalled one-half its whole length. Ahlfeld further remarks that the bending of the child to make it assume the same position it had *in utero* demands the use of considerable force. He measured a number of children *in utero*, and found his aphorism, that *the length of the child in the womb almost equals half its length when straightened out*, confirmed. In measuring the fœtus before birth, Ahlfeld proceeded as follows:—He placed the pregnant female on an even, and somewhat hard, bed, so that the pelvis might be on a level with the upper part of the body, made her draw her

* W. Braune, Die Lage des Uterus und Fœtus, Leipzig, 1872.

knees (which were held apart) up to the abdomen; after which, he firstly exactly defined the position of the fœtus, and then proceeded to measure its size. In normal presentations, *i.e.*, with the head or breech presenting, the highest point of the fundus uteri is defined by means of palpation and percussion; in very corpulent females, by percussion alone. The most superior point of the fundus uteri, where the head or breech is situated, generally presents one of the poles of the oval (the outline, as already mentioned, of the position of the fœtus), the other pole may be felt either outwardly through the abdominal walls, just above the inlet of the pelvis, or else directly through the vaginal pouch, which is effected much more easily and with greater exactitude. After defining the upper pole of the oval, the point corresponding to it on the linea alba is marked off with ink. After ascertaining the position of the two poles of the fœtal "oval," the points of Baudelocque's pelvimeter are placed over them respectively, and the length of the child is thus measured. The thickness of the uterine walls is insignificant, as was shown by Braune's measurements on the dead body of a woman in the last stage of pregnancy.

TABLE V.

The Average Length of the Fœtus during successive Weeks of Pregnancy.

Week of Pregnancy.	Length of Fœtus.	Number of Cases.	Length of Child after Birth (my Measurements).	Length of Child before Birth according to Ahlfeld's Measurements.	Length of Child after Birth according to Ahlfeld's Measurements.
	Centimetres.		Centimetres.	Centimetres.	Centimetres.
40	24·4	99	48·4	25·6	50·5
39	24·4	77	47·5	25·6	50·6
38	23·9	70	46·6	24·9	49·9
37	23·4	49	46·5	24·1	48·3
36	23·3	40	46·5	23·9	48·3
35	23·1	26	47·5	22·5	47·3
34	22·7	19	45·3	23·0	46·07
33	22·7	13	...	22·3	43·88
32	21·9	9	43·1	21·5	43·4
31	21·9	8	...	21·7	43·7
30	19·8	7	..	20·9	42
29	20·0	4	38·0	20·2	39·6
28	20·0	2	38·5	19·4	40·4
27	19·0	2	...	18·9	36·3
26	19·0	1	35	17·7	...
25	...	...	...	18·3	...
24	18·0	1	...	13	...
23	18·0	1	...	...	...
22	17·0	1	...	...	...

In oblique presentations, Ahlfeld advises the straightening out of the fœtus's position before proceeding to measurement. In cases where this would be difficult of accomplishment, or in transverse presentations, he counsels the direct definition of the most prominent parts of the oval, viz., the head and breech, and, placing the two extremities of the pelvimeter thereon, measures their distance from each other. In carrying out these measurements, Ahlfeld very wisely cautions us to endeavour to avoid exciting uterine contraction, which is very easily produced by the manipulation necessary for a correct examination. His advice is to make our measurements only when the uterus is at rest. In measuring the fœtus in utero, I followed Ahlfeld's above-mentioned rules, with this difference only, that I did not mark the situation of the upper part of the fundus uteri with china ink, but at once placed one extremity of the pelvimeter over its most superior point detectable by palpation, as I discovered that the spot marked on the skin used, during the movements of the fœtus, not unfrequently to change its position in regard to the lower portion of the oval. I have myself made 409 measurements, and these were taken during various periods of pregnancy, and from once to twice weekly. In the above table (No. V.) only those measurements are taken into account where there was either a natural head-presentation, or an oblique one in which the fœtus could be straightened out.

From an average of the figures brought forward, it will be observed that the measurements of the fœtus before birth very closely approach the measurements taken after birth. To elucidate the matter still further, I have cited Ahlfeld's figures, from which it will be perceived that he had to deal with children greater in length than those that came under my notice, which entirely coincides with the measurements made of children in St Petersburg immediately after their birth. During the earlier months of pregnancy, Ahlfeld's measurements bear a close resemblance to mine. The measurement of the fœtus *in utero* can only be undertaken when the projecting parts of the child are easily felt, and when the womb keeps its solid contents fixed, *i.e.*, from the seventh month of pregnancy. The mistakes amounted to about 18 per cent. of

the measurements hitherto made; the errors arising chiefly from an excess of liquor amnii, and a puny fœtus which floats freely in the fluid, and is not doubled up in the manner it would have been, with the ordinary amount of waters, in the womb.

Moreover, strict attention should be paid to the state of the uterus, *i.e.*, whether it is contracted, as the contractions of the womb produced by examination lengthen the fœtus, according to my observations, some 4 centimetres during the last three weeks of pregnancy, and from ½ to 2 centimetres from the thirty-fifth to the thirty-seventh week of pregnancy. At the commencement of labour the lengthening of the fœtus is still more marked. Ahlfeld found the difference as great as 5 centimetres sometimes. The contractions of the uterus which take place before actual labour commences, produce a change in the length of the fœtus, so that most of the errors in measurements arise from these measurements having been made from one to five days prior to parturition. In proof of this, I shall bring forward measurements made during labour pains, at the height of uterine contraction, and also in the intervals thereof.

TABLE VI.

Measurements of the Fœtus during Parturition.

Order of Measurements.	Length of Fœtus without Uterine Contractions.	Length of Fœtus during Uterine Contractions.	Length of Child after Birth.	Order of Measurements.	Length of Fœtus without Uterine Contractions.	Length of Fœtus during Uterine Contractions.	Length of Child after Birth.
	Ctm.	Ctm.	Ctm.		Ctm.	Ctm.	Ctm.
1	26	29	26·5	11	26	28	24·5
2	26	29	24·25	12	25·5	28	25
3	24	26	22	13–14	24·5	27	24·5
4	25·5	28	24	15	25	26·5	23·25
5	25·5	27·5	23·5	16	26	28	23·25
6	25·5	27	23	17	26	28	25
7	25	27·5	25·5	18	24	25	22
8	25·5	29	25	19	26·5	28	25
9	26·5	29·5	24	20	27	29	24·0
10	26	28	25				

Out of thirty similar observations, I found the greatest length of the fœtus to be 35 centimetres, *i.e.*, an increase of 1½ centimetres. Generally those measurements made during labour can alone be taken into account in which the womb remains but very slightly contracted during the intervals of pain. All

the measurements above referred to were made when the cervix uteri was smooth, and the os dilated from 1 to 2 finger-breadths, and before the escape of the waters. The results of these measurements agree with Ahlfeld's. The length of the fœtus in oblique presentations I have placed in Table VII.

TABLE VII.

Measurements of the Fœtus in Oblique and Transverse Presentations.

Week of Pregnancy.	Length of Fœtus (my measurements).	Number of Cases measured by myself.	Length of Fœtus according to Ahlfeld.	Week of Pregnancy.	Length of Fœtus (my measurements).	Number of Cases.	Length of Fœtus according to Ahlfeld.
	Ctm.		Ctm.		Ctm.		Ctm.
40	24·5	9	25·5	31	19	4	22·1
39	24·2	9	25·37	30	19	2	20·5
38	24	10	24·6	29	18	2	20·3
37	23·6	6	23·7	28	...	...	20·7
36	22·7	8	24·4	27	19	1	20·0
35	23·25	2	24·3	26	19	1	19·0
34	23	6	23·9	25	...	...	17·0
33	22·5	2	22·8	24	19	1	...
32	21·2	2	22·2				

In these cases I did not obtain, as Ahlfeld seems to have done, invariably high figures (*i.e.*, high when compared to the measurements made in natural presentations), but, on the contrary, observed very considerable differences in the length of the fœtus. Ahlfeld very justly remarks that, in consequence of the excess of liquor amnii, the child is not so much bent as where the waters are in moderate quantity, and that these children are often ill developed. My own observations have brought me to the conclusion—

1*stly*, That the definition of the length of the fœtus before birth is possible in the majority of cases.

2*dly*, That the size of the fœtus serves as a test for determining the period of pregnancy, combined, of course, with other objective symptoms.

3*dly*, That by the length of the child, an approximate opinion may be formed of the size of its head.

4*thly*, That, in measuring the length of the fœtus *in utero*, Pfannkuch's observation is correct, viz., that the length of the child at first keeps pace with its weight, but towards the latter

part of pregnancy the progress in length is slower, so that up to the thirty-fourth week the length increases by nearly 1 centimetre weekly, whereas after the thirty-fourth week it barely reaches ½ a centimetre. In some cases this law is even more strikingly illustrated, but I shall abstain from citing figures, not to prove tedious.

Ahlfeld's belief, founded upon his measurements of the fœtus, is, that the position of the child *in utero* does not depend upon the form of the womb, but that, on the contrary, the shape of the uterus depends upon the position of the fœtus. This is by no means a maxim; indeed, it is impossible to agree with Ahlfeld, or to understand how such a powerful muscular organ as the gravid uterus could, with the usual amount of liquor amnii within it, have no influence on the position of the fœtus within. How otherwise can we explain those breech presentations which occur in consecutive pregnancies commencing with the first? This brings us to a very important question, the consideration of which would prove out of place in this article. I shall therefore simply remark that three causes—the womb, the fœtus, and the waters—have a mutual influence on one another.

Ahlfeld was the first to apply the pelvimeter for measuring the height of the fundus uteri, with the view of obtaining more correct results than could be arrived at by the use of the tape measure—a measure which, owing, as has already been pointed out, to the varying convexity of the anterior wall of the womb produced by the position of the fœtus, and the unequal amount of subcutaneous adipose tissue, supplies very contradictory data when applied to different gravid women at the same period of pregnancy. Ahlfeld in his measurements places the patient on a flat bed, for the purpose of determining correctly the position of the soft parts above the symphysis pubis in their relation to the latter,—puts his index finger over the horizontal ramus of the pubes, so that the radial edge of the finger should be on a level with the upper border of the ramus, while the point of the finger just touched the symphysis pubis. Along the middle of the finger-nail a line is drawn with Indian ink, opposite which one extremity of the pelvimeter is placed, so that its point is applied ½ a centimetre below the upper border of the symphysis pubis.

TABLE VIII.

Measurements of the Height of the Fundus Uteri, and of its Breadth.

Week of Pregnancy.	Height of Fundus Uteri among Primiparæ.	Number of Cases.	Height of Fundus Uteri among Multiparæ.	Number of Cases.	Average Height.	Height of Fundus Uteri according to Ahlfeld.	Maximum Breadth of Uterus among Primiparæ.	Number of Cases.	Maximum Breadth of Uterus among Multiparæ.	Number of Cases.	Average Breadth.
Week.	Ctm.		Ctm.		Ctm.	Ctm.	Ctm.		Ctm.		Ctm.
40	25·2	53	25·6	48	25·4	26·1	20·1	47	20·8	46	20·4
39	25	37	24·8	32	24·9	25·7	19·9	32	20·9	31	20·4
38	24·4	41	24·6	32	24·5	25·0	19·4	30	20·1	33	19·8
37	24·0	32	24·3	21	24·15	24·48	19·7	25	20·1	17	19·8
36	24·0	24	23·9	19	24·0	24·0	19·5	21	19·8	16	19·6
35	23·6	17	24·0	13	23·8	23·5	18·6	15	19·3	11	18·9
34	23·5	12	22·0	4	23·2	23·4	19·1	12	19·2	5	19·1
33	22·3	9	21·5	2	22·1	22·3	18·5	8	18	2	18·3
32	22·2	9	21·7	4	22·0	21·7	18·2	7	17·2	4	17·9
31	22·1	6	21·5	4	21·9	21·6	18·2	5	16	3	17·4
30	23·2	5	19	2	22·4	21·5	18·5	4	15	2	17·1
29	23	2	20	2	21·5	20·2	18	3	15	2	16·8
28	21·3	3	19·2	4	20·1	20·3	18	2	15·7	4	16·0
27	21·0	2	17·3	3	19·0	19·1	16·5	2	15	4	15·5
26	21·0	2	21·0	1	21·0	19·0	16·5	2	...	...	16·5
25	21·0	1	...	...	21·0	16·9	...	...	...	...	...
24	19·0	1	...	...	19·0	15·0	15·5	2	...	...	15·5
23	19·0	2	...	...	19·0	...	15·5	2	...	...	15·5
22	19·0	2	...	...	19·0	...	15	1	...	...	15
21	19·0	1	..	...	19·0	...	14	1	...	...	14
20	...	...	...	...	...	...	...	...	...	...	...
19	...	...	17	1	17	...	...	...	13	1	13
18	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...
16	...	...	13	1	13	...	...	...	13	1	13

Should the highest part of the fundus uteri happen to be at the side of the linea alba, the point on a level with it in the mesial line is determined, and the measure taken by means of the pelvimeter from that point to the symphysis pubis. In my measurements I followed Ahlfeld's method, with this difference only, that instead of marking any line on my finger-nail with China ink, I simply fix my right thumb horizontally over the horizontal rami pubis, while with the right index finger (I stand to the patient's right) I make one point of the pelvimeter hook the fixed thumb, and press against its lower border. The thumb thus serves as an immovable point. With the left hand the other extremity of the instrument is placed over the base of the xyphoid cartilage. The space between these two points being measured, I next place that extremity of the pelvimeter which had first been upon the

xyphoid cartilage over the fundus uteri, and note the distance between it and the right thumb. For further proof that my thumb has been a steady and fixed point during the latter measurement, I again place one extremity of the pelvimeter over the xyphoid cartilage, and if I find my first and third measurements agree, it is proof of the correctness of my second. For the purpose, however, of observing to what extent the womb is enlarged, I have found it necessary to measure its greatest breadth. This was accomplished by means of the pelvimeter, the two extremities of which were placed at the sides of the uterus, and its greatest breadth noted. In head presentations, the maximum breadth of the uterus is at its fundus; in breech presentations, a little below the fundus.

It will be observed that the results of my measurements closely resemble Ahlfeld's, with this difference only, that towards the end of pregnancy the height of the fundus uteri was somewhat less in my cases than in Ahlfeld's, which exactly corresponds with my measurements of the child's length, and which may also be accounted for by the fact that I excluded from my tables all cases of narrowed pelves, as well as breech presentations, in both of which the fundus uteri is raised higher than usual. It is evident, from the figures brought forward in Table VIII., as well as from Richelot's * and Ahlfeld's observations, that the fundus uteri keeps ascending to the very end of pregnancy, and that there is no descent of the fundus uteri during the tenth month. This rule is applicable, not only in regard to the majority of cases, but in regard to every case individually, whether in primiparæ or in multiparæ, always provided the patient is placed, during examination, in a horizontal posture. In determining the height of the fundus uteri in the erect posture, however, the descent of the womb is clearly noticeable. I have made several measurements which gave the following figures:— During the 40th week of pregnancy, the average height of the fundus uteri, on the patient assuming the vertical posture, was 22·5 centimetres; during the 39th week, 23·3 cent.;

* Richelot, Zur Diagnostik der Schwangerschaft. Königsberg, 1868. Inaugural Dissertation.

during the 38th week, 23·4 cent.; during the 37th week, 23·3 cent.; during the 36th week, 22·5 cent.; during the 35th week, 22. As I do not attach much value to this question, my measurements were somewhat limited in number; but the general results arrived at show that on the patient assuming the erect posture, during the last month of pregnancy, the fundus uteri generally stands two fingerbreadths lower than in the preceding month of pregnancy. On comparing primiparæ with multiparæ, we perceive that the difference in the height of the fundus uteri is almost inappreciable when the patient is placed in a horizontal position. In regard to the breadth of the womb, however, the difference is palpable, viz., in multiparæ the womb is somewhat broader, commencing with the 34th week of pregnancy. This coincides with Gassner's * observations, who discovered that a larger quantity of liquor amnii existed in multiparæ than in primiparæ. No conclusions can be arrived at in regard to the earlier periods of pregnancy, owing to the paucity of observations hitherto made. In constructing the following tables, only those cases were taken into account where there was no uterine contraction, and where the bladder was emptied. When the uterus contracts, the fundus ascends from 0·5 to 1 centimetre during pregnancy, and from 0·5 to 4 centimetres during labour.

TABLE IX.

The Height of the Fundus Uteri in Breech Presentations.

Period of Pregnancy.	Height of Fundus Uteri.	Number of Cases.	Maximum Breadth of Womb.
Week.	Centimetres.		Centimetres.
40	28	1	21·6
39	26·04	5	23·6
38	26·16	3	21
37	25·6	6	20·7
36	24·8	7	21
35	23·6	3	19·6
34	24·5	1	20·8
33	24·0	2	21·5
32	24	1	19
26	20	3	...

In comparing the above-cited figures to those representing the height of the fundus uteri in head presentations (Table

* Gassner, Ueber die Veränderungen des Koerpergewichts der Schwangeren, etc. Monatsschr. für Geb. und Fr.-Kr., xix. pp. 31, 32.

VIII.), it will be perceived that the highest ascent of the base of the womb in breech cases is 3 ctm. at the 40th week, and from 0·5 ctm. to 2 ctm. for earlier periods of pregnancy, although only normally developed pelves were included in our measurements. Consequently, in determining the height of the fundus uteri, it is necessary to pay strict attention to the presenting part, while it will only be after a much more extended number of observations in breech cases that strictly correct results can be arrived at. Moreover, one cannot ignore the considerable expansion in breadth of the womb—an expansion observed in primiparæ as well as multiparæ. In regard to slightly narrowed pelves, we have too few observations; these, however, going to prove that the fundus uteri is very little higher in position than in head presentations with normal pelves. For instance, at the 40th week the height is 25·2 ctm.; at the 39th, 25 ctm.; at the 38th, 24·6 ctm.; 37th, 24·5 ctm.; 36th, 24·1 ctm.; 35th, 24·5 ctm.; 34th, 24·5 ctm.; 33d, 24·1 ctm.; 32d, 28·8 ctm.; 31st, 23·7 ctm.; 30th, 23·5 ctm.

In the earlier periods of pregnancy the measurements do not differ from those of normal pelves.

With regard to oblique and transverse presentations, my observations are too limited to tabulate.

If the size of the unborn fœtus be compared with the height of the fundus uteri, and with the measurement of the child after birth, it will be seen, as already pointed out by Ahlfeld, what a remarkably constant relation they bear to each other, if head presentations are alone taken into account.

TABLE X.

On the Height of the Fundus Uteri, as compared with the Length of the Fœtus, before and after Birth.

Period of Pregnancy.	Height of Fundus Uteri.	Length of Fœtus.	Length of Child after Birth.	Period of Pregnancy.	Height of Fundus Uteri.	Length of Fœtus.	Length of Child after Birth.
Week.	Ctm.	Ctm.	Ctm.	Week.	Ctm.	Ctm.	Ctm.
40	25·2	24·4	48·4	31	22·1	21·9	...
39	25	24·4	47·5	30	23·2	19·8	...
38	24·4	23·9	46·6	29	23	20·0	38·0
37	24·0	23·4	46·5	28	21·3	20·0	...
36	24·0	23·3	46·5	27	21·0	19·0	38·5
35	24·6	23·1	47·5	26	21·0	19·0	...
34	23·5	22·7	45·3	25	21·0	...	35
33	22·5	22·7	...	24	19·0	18·0	...
32	22·2	21·9	43·1				

In exceptional cases the height of the fundus uteri equals the length of the fœtus; in the great majority of instances, however, if we exclude all cases of an excess of liquor amnii, which, in proportion to its quantity, lifts up the fundus uteri, it will be found that the height of the base of the womb is equal to one-half the length of the fœtus. In determining, with a tape measure, the distance between the fundus uteri and the symphysis pubis, the average figures point to the gradual increase in size of the womb (Richelot, p. 16, *op. cit.*); but for that the differences in individual cases are too great, when compared with the slight variations in the measurements taken with the pelvimeter. Thus, according to my own observations, in 281 cases, measurements were made with the tape measure, and also with the pelvimeter, and the variations obtained with the tape measure extended from 2 to 13·5 centimetres, *i.e.*, in the seventh and eighth months there were differences from 2 to 11 centimetres; during the ninth month, from 3 to 11 centimetres; while during the tenth month, from 8 to 13·5 centimetres; whereas with the pelvimeter the variations were only from 2 to 5 centimetres, and that in a decided minority of cases; consequently three times less than in measurements taken with tape. It is impossible to take the navel as a fixed point from which to measure the fundus uteri, because the length between it and the symphysis pubis varies greatly in different individuals. According to measurements which I made, the distance between the umbilicus and the symphysis pubis in pregnant women varies from 15 to 22 centimetres, and it has therefore appeared strange to me how so cautious a practitioner as Hildebrandt of Königsberg could have advised his pupil Richelot in 1868 to resort to such measurements, while Schroeder, even in the last edition of his Text-book of Midwifery, published in 1874, measures the position of the fundus uteri by determining how many finger-breadths there are between it and the navel.* From measurements of the uterus made by myself, I have arrived at the following conclusions:—

(1.) The employment of the pelvimeter for measuring the

* Schroeder, Geburtshülfe, 1874, pp. 100, 101.

height of the gravid uterus gives more trustworthy results than the use of the tape measure.

(2.) The upper border of the symphysis pubis is the most correct and unchangeable fixed point from which to measure the height of the fundus uteri, beginning with that period of pregnancy when the womb can be distinctly felt above the pubes.

(3.) The height of the fundus uteri above the pubes is a trustworthy objective symptom of various periods of pregnancy in normal and in reducible oblique presentations, when the womb contains only one fœtus. In these cases it is necessary to note the presenting part of the fœtus and the size of the pelvis.

(4.) For plural pregnancies, a different scale of measurements should be adopted.

(5.) In non-reducible, oblique, and transverse presentations, the height of the womb cannot serve to indicate the period of pregnancy. In these cases the length of the fœtus, determined according to Ahlfeld's method, will serve to point out the corresponding height of the fundus uteri.

(6.) In slightly narrowed pelves, the distance between the fundus uteri and symphysis pubis is almost equal to the height in breech presentations. In cases of greater pelvic contraction, we have nothing to rely upon but the state of development of the fœtus, as determined by Ahlfeld's method.

Dr Duncan said the paper was so elaborate a one, that it would hardly admit of immediate discussion; but the Society would, he was sure, agree with him, that it was highly honoured in having had communicated to it a paper on which such a vast amount of patient labour and accurate investigation had been expended. He looked upon the paper as one of the highest value.

Dr Coghill moved a vote of thanks to the author, and the Secretary was ordered to communicate with him.