Anthropology. — *"The Menarche in Dutch Women and its precipitated appearance in the youngest generation"*. By Prof. L. BOLK.

(Communicated at the meeting of September 29, 1923).

With the aid of several physicians I have collected a number of data with regard to the menarche in Dutch women, about which nothing was known so far. In collecting these data the greatest accuracy has been observed and in this communication we have only made use of the cases, in which not only the year, but also the month of the first menstruation has been noted. Besides this the colour of hair and eyes of the various subjects had been stated, as I also wished to ascertain through this examination, whether the degree of pigmentation is of influence in the commencement of sexual maturity in the young girl.

Although it is not easy to obtain accurate data, I have succeeded in collecting 1800 reports of non-Jewish women as well as 165 of Jewesses.

On working out this material, several unexpected and surprising results came to light, which I will relate in succession, leaving the data obtained from the Jewesses until the end.

The first question which could be answered with the aid of these reports concerned the age at which the menarche appears in Dutch

TABLE I.

Age	Number	Percentage	Age	Number	Percentage
8 years	2		16 years	121	6.7
9 „	2		17 „	54	3.—
10 „	31	1.7	18 „	25	1.4
11 „	131	7.3	19 „	3	
12 „	302	16.7	20 „	2	
13 „	464	25.7	21 „	2	
14 „	408	22.6	22 „		
15 „	251	13.9	23 „	2	

women in general. It is well known that this age shows great individual variations, and this is also seen in the Table I, in which the actual numbers, as well as the relative percentage, have been stated according to the age.

In fig. I curve *A* shows, in percentages, its appearance at each separate age.

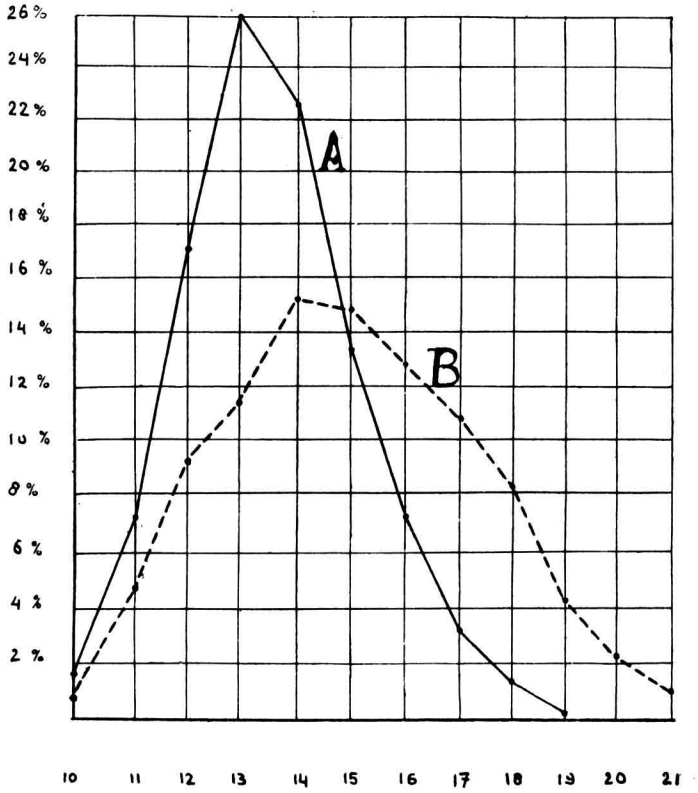

Fig. 1.

From this table and graph it appears that the beginning of the function of the sexual glands varies between the tenth and eighteenth year; it is true that in 4 cases the menses already appeared before the 10th year (8 years 2 mths; 8 y 12 m; 9 y 4 m; and 9 y 12 m), but these cases do not join regularly on to the variability-curve and may be regarded as abnormal precocity.

The varability-curve of the menarche begins as an unbroken line at the age of 10 years and 4 months, mounting continually after this. This mounting during the 10th and 11th year is to be seen in Table II, in which the number of cases per month during these years has been noted. I have inserted this table, as it shows that the earliest age at which the menarche, as a physiological pheno-

menon, begins, is actually the middle of the 10th year, so that when a girl has passed the age of ten-and-a-half years one cannot look upon the beginning of the menstrual process any more as a sign of pathological precocity, at most as a rapid development of the sexual glands.

TABLE II.

Age	Number	Age	Number
10 years 1 month	0	11 years 1 month	3
" " 2 months	0	" " 2 months	5
" " 3 "	0	" " 3 "	6
" " 4 "	1	" " 4 "	7
" " 5 "	2	" " 5 "	6
" " 6 "	3	" " 6 "	6
" " 7 "	2	" " 7 "	9
" " 8 "	2	" " 8 "	11
" " 9 "	3	" " 9 "	14
" " 10 "	7	" " 10 "	19
" " 11 "	6	" " 11 "	24
" " 12 "	6	" " 12 "	21

The beginning of the variation-curve in the middle of the tenth year is a sign that sexual maturity in our country can begin at a comparatively early age and the further course of this line confirms this fact, for it mounts rapidly to reach its top in the 13th year.

Sexual maturity made its appearence before the 12th year in 9 °/₀ of the girls, before the 13th year in 26 °/₀, and in more than half before the 14th year. The average age of the menarche, taking the months into consideration as well, appears to be 13 years, 9 months and 15 days. If one compares this average with others mentioned in the literature, drawn from the population of Western Europe, then it appears that in our population of the present day the menarche, on an average, begins early.

This commencement, however, is dependent on so many external conditions, that if any conclusions are drawn from a comparison of these averages, this should be done with the greatest care.

As one of the internal influences determining the age of the menarche, the racial factor is usually mentioned. Several authors

deny this influence entirely, others attach great importance to it, which shows how difficult it is to determine whether the race is really of any influence on the menarche, as it also is influenced by other, external, factors, (social surroundings, temperature, soil, etc.).

I do not know of any investigation in which the influence of the race on the commencement of sexual maturity has been actually proved, and this induced me, while collecting the data, to inquire into the degree of pigmentation.

The material was sorted and divided into the women with light and those with dark eyes; these will in future be called "blondes" and "brunettes"; of the former my material contained 1130, of the latter 670.

The appearence of the menarche was worked out statistically for each of these groups separately, the result is seen in Table III and the graphs plotted out from this table have been sketched in fig. 2. in which curve A refers to the Jewesses, curve B to the "blondes", curve C to the "brunettes".

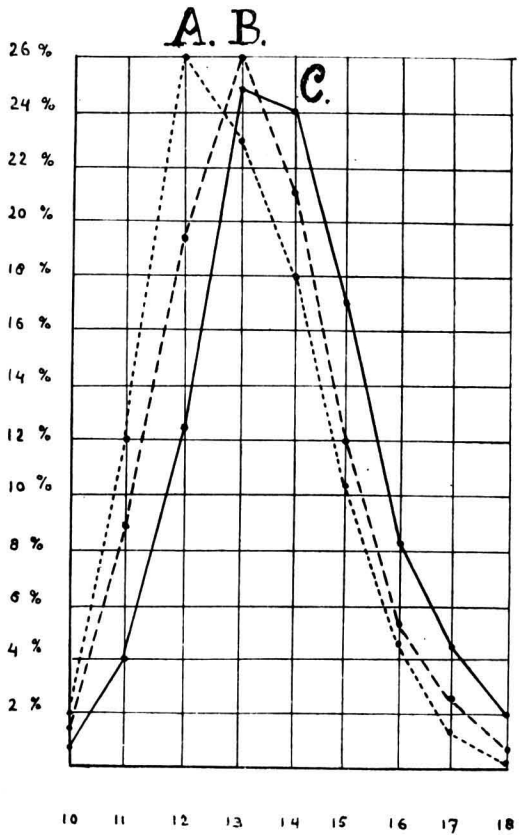

Fig. 2.

The result of this investigation into the relation between menarche and degree of pigmentation was surprising, as it was in contradiction with what one might expect. It is a well known phenomenon that the menarche appears at an earlier age in the dark-coloured races than in the fair ones. Most writers ascribe this to climatic influences, especially to the high temperatures in which the dark-skinned races live.

TABLE III.

Age	Blondes		Brunettes	
8 years	1		1	
9 „	1		1	
10 „	22	1.8 %	9	1.3 %
11 „	104	9.1 „	27	4 „
12 „	220	19.5 „	82	12.3 „
13 „	294	26 „	170	25.2 „
14 „	244	21.5 „	164	24.6 „
15 „	136	12.1 „	115	17.2 „
16 „	65	5.7 „	56	8.5 „
17 „	26	2.3 „	28	4.3 „
18 „	12	1 „	13	2 „
19 „	1		2	
20 „	2		—	
21 „	1		1	
23 „	1		1	

I myself, however, conjectured that the racial factor would be of importance here and that an earlier appearance of the menarche would be a biological characteristic of the more pigmented races.

It appears, however, from the data given in Table III that for the Dutch population the contrary holds good; it is just the fair types which, in comparison to the dark ones, are characterized by an earlier maturity.

The difference is even considerable, for while 56.4 % of the girls of the fair type have come to maturity before their 14th year, this is only the case in 42.8 % of the dark type. As one can, however,

see from the graph and from Table III, the beginning of the variability-curve lies for both types in the 10th year; in the "brunettes" this begins at 10 years 5 months, in the "blondes" at 10 years 4 months; so for both groups what one can designate as the threshold-age of sexual maturity, is the same. After this beginning the curve for the fair type mounts more rapidly than for the "brunettes"; the end of the normal variability, however, is the same for both types, and lies in the 18th year.

The exact difference between both groups appears from the following average figures, which have again been calculated including the months:

Average age of menarche in "blondes": 13 years, 5 months, 17 days; in "brunettes": 14 years, 4 months, 5 days. So this makes a difference of full 10 months between both types.

A difference of this sort, and in a contrary direction to what I had expected, is very remarkable. As we have to do here with two groups of people living in the same circumstances, which excludes external factors which might influence the menarche, this difference must be entirely regarded as the result of an internal factor, and it is only the racial factor which can be taken into consideration here.

The light-eyed component of our population belongs, in general, to the race which peoples the North of Europe, the "Homo nordicus", while the brown-eyed, which constitutes about a third part of the Dutch people, as is proved by a former investigation of mine, belongs to the race inhabiting the centre of Europe, the "Homo alpinus".

It appears, therefore, that a lesser development of the pigment is accompanied by an acceleration of the sexual development. The relation between both phenomena is, however, not so simple; which can be seen from the fact that the average age of the menarche in the more strongly pigmented Jewesses, is earlier than in the "blondes".

The activation of the sexual sphere of the developing individual is dependent on very many factors; and, in considering the difference which has come to light, we must not forget the possibility that the racial factor which is here at work, could be of a psychological instead of a physiological nature. The blonde as well as the brunette girl has reached the threshold-age of maturity on arriving at the age of 10-and-a-half years. (Later on it will appear that this also holds good for the Jewish girl). The time which passes for each individual between this age and the activation of the sexual functions, is determined by a number of external and internal factors, and among the latter we leave room for the special psyche of each race.

Thus far on the average age of the menarche in the Dutch

population in general; I will now proceed to another result of my investigation, which was as surprising as it was unexpected.

It had attracted my notice, while working out my material, that the older people mentioned therein were often characterized by a late appearance of the menarche. This observation gave rise to the question whether the menarche could have undergone some change during the last decades, in such a manner that sexual maturity in the youngest generation begins, on an average, at an earlier age than in the former generations. I have tried to find an answer to this question in two ways. In the first place I collected from my material data referring to persons born before 1880, and calculated from these the average age of the menarche. Secondly I tried to obtain data relating to the menarche in mother and daughters. Especially this last is difficult, considering the fact that only a very few of the women can actually mention the year of the menarche, much less the month. Yet I have succeeded in collecting a number of such data.

Both ways led to the same result, viz. that the menarche in what we may call the youngest generation, as regards sexual maturity, arrives at a considerably earlier period than formerly. I will return to the cause and significance of this phenomenon after communicating the pure facts.

Let us begin with the menarche in women born before 1880. In my material concerning them there were 98 data of the menarche according to year and month, and furthermore I possessed 104 cases in which only the age was mentioned. These 232 cases have been systematically arranged in Table IV, and curve *B* in fig. I gives the direction in percentages for each age.

If one compares Table IV with Table I, the following will be seen: the beginning of the variability-curve lies, for women of the

TABLE IV.

Age	Number	Percentage	Age	Number	Percentage
10 years	2	0.8	17 years	27	11.2
11 „	12	5.—	18 „	19	8.1
12 „	21	9.—	19 „	10	4.3
13 „	27	11.2	20 „	5	2.2
14 „	37	15.9	21 „	4	1.3
15 „	35	15.1	22 „		
16 „	31	13.3	23 „	2	0.8

older generations, also in the 10th year. This fact confirms the opinion already mentioned above, that the middle of the 10th year is the physiological threshold-age of sexual maturity in woman.

Opposite to this very constant starting-point of the variability-curve stands the most changeable ending-point. This falls in the older generations in the 21st year, in contrast to the 18th in the younger generation. The top of the curve, which in the latter individuals lies in the 13th year, has been shifted to a higher age in the older generations and lies in the 14th and 15th year.

From this it already appears that formerly the phase of sexual latency, after crossing the threshold-age, lasted considerably longer in a great many girls than nowadays. This also follows from the fact that, as shown in Table I, more than 50 % of the youngest generation menstruates before the end of the 13th year, while of those born before 1880 this was only the case in 26 %.

During the last 40 years, therefore, the period of the menarche has gradually become earlier, and how much earlier can be learned from both the following averages. The average menarche of the persons worked out in Table I (fig. 1, curve *A*) of whom the greater quantity was born between 1897 and 1906, is 13 years, 9 months, 15 days; while the mean age of the first menstruation in the persons born before 1880 (fig. I, curve *B*) is 15 years, 3 months, and 20 days. From this it follows that in the last decades the menarche arrives a year and a half earlier than formerly.

I must point out, in passing, that the last mentioned average more resembles those found in literature regarding the West-European population, which depend on investigations of an older date.

A second manner in which the earlier appearance of the menarche has been proved, is the comparison of the age of the menarche in mothers and daughters. I arranged these data in two groups; in the first I collected the data in which the age of the menarche was accurately known, even up to the month, for both mothers and daughters. To this group belong 45 mothers and 71 daughters. The second group contains the data in which only the year could be mentioned; here there are 56 mothers and 82 daughters.

It seems to me of interest to discuss the data of the first group more extensively, as one or two remarks must still be made about them; they may be seen in Table V, in which the data have been arranged according to the menarche-age of the mother.

From this table follows, in the first place, that of 71 daughters the menstruation of 52 begins at a younger age than in the mother, though, as remarked already, also in the older generation

it was not a rare thing for the menses to begin at the early age of 11. The average age of the menarche of the mothers was 14 years, 9 months, and 25 days; and of the daughters 13 years, 7 months, and 1 day, which means that in one generation the menarche has precipitated with fourteen-and-a-half months. That the difference found here is not so great as what we find on comparing the menarche of women born before 1880 with those born about the beginning of this century (one-and-a-half years), can perhaps be explained by the fact that among the former there were persons of a much older age, and the process of precipitation of the menarche is presumably already longer at work.

The appearance of the menarche in the youngest generation, 14½ months earlier than formerly, as found in Table V, almost coincides with the results of the second group of mothers (56) and daughters (82), of which only the year of the menarche could be mentioned. Here the mothers were, on an average, 15 years, 1 month, and 3 days old, and the daughters 13 years, 10 months, and 15 days; that is again a difference of 14½ months.

These results undeniably prove the considerable precipitation of the function of the sexual glands during the last decades; for although the figures of this earlier appearance of the menstration may vary a little, one can fix the average at about 14 months.

This is a fact of great importance, highly interesting as physiological phenomenon, and of not less great significance from a social and paedagogic point of view. For the appearance of the menarche 14 months earlier, means to say a shortening of childhood with this period, an earlier activation of the sexual sphere in the present generation, compared to the former. Much of what the attentive observer and listener sees and hears in modern social life is explained by this earlier awakening of the consciousness of womanhood. This is, however, not the place to enter into this question further.

Extensive speculations as to the cause of this phenomenon will not be given here; I will restrict myself to a few general remarks. In the individual process of development of woman the first menstruation is an event of more than ordinary significance; with the commencement of sexual maturity far-reaching changes take place in the general physiology of her development. And if this process makes its appearance considerably earlier this must be looked upon as the expression of a hastened process in her development. Now in the first place the question arises: have we to do here with a symptom of an accelerated development in general, or is it an independent phenomenon? Without special investigations this question cannot be

answered. One would have to examine whether other signs of development are accelerated in the phase before the menarche, e.g. the growth, changing of teeth and such like. The developmental phenomena after the menarche cannot be counted of course, for

TABLE V.

Mother	Daughter	Mother	Daughter	Mother	Daughter
9.12	10.3	13.7	13.4	15.6	14.2
	10.5		12.8		12.6
11.6	11.9	13.7	12.7	15.9	11.11
11.8	11.6	13.7	13.1		12.8
11.9	11.10		12.3	15.12	11.10
	11.11	13.8	14.11	16.2	13.11
	15.2	13.10	11.10	16.4	12.11
11.10	14.12		12.12	16.6	16.1
11.10	11.10		11.11	17.1	13.6
12.7	14.10	13.11	13.10		12.8
12.9	10.6	14.1	10.8	17.4	14.9
	12.7		11.11	17.7	16.3
13.1	12.8		15.9		16.6
13.1	15.11		16.11	18.1	13.8
13.2	12.5	14.2	13.11		13.3 (12.12) [1]
	14.9	14.3	12.6		13.9
	16.11	14.4	13.11	18.4	14.2
13.3	11.12	14.5	11.6		13.5
	11.7	15.1	15.2	18.10	16.6
13.4	13.2	15.2	13.3	18.11	15.3
	13.1	15.3	14.4		14.11
	13.12		15.12	19.4	17.8
13.5	11.3	15.6	14.10		17.9
13.6	11.11			19.8	15.4

[1]) Grandchild.

then the development also undergoes the influence of the ovarial function. That this latter should have a retarding influence on the growth of the girl is doubtful, considering the fact that the full-grown daughters of the youngest generation generally surpass their mothers in height.

A second question concerns the cause of the phenomenon; is this early appearance of the menarche a reaction on external stimuli, or is it a primary change in the developing process? That we should have to do with a primary biological phenomenon, with the effect of an internal cause, is doubtful. I cannot imagine that an internal factor could, as it were suddenly, so hasten a developmental phenomenon as appears to be the case in the menarche. If this was an individual phenomenon, an exception, this could be possible, but it is a general thing, which makes it necessary to accept some external influences as cause. I will not enter into speculations as to what these are, but will close this part of my communication with a last remark.

The question can be raised whether, in this considerable precipitation of the menarche, one has to do with a phenomenon which falls beyond the limits of normal physiology. I cannot ascribe such a significance to it, and may venture the following idea. I have on purpose often drawn the attention to the fact that in all the groups which I examined (brunettes, blondes, jewesses, older and younger generations), the variability curve of the menarche begins at 10½ years; that is the threshold-age of sexual maturity. In every girl who has passed this age the sexual sphere can be awakened, though in the one it remains latent longer than in the other. The duration of this period of latency is determined by hereditary factors and by external circumstances. While the part determined by the former is an unvariable one, that dependent on external circumstances is on the contrary very variable. It depends on and changes with the external conditions of life, with the mode of living, nature of food, temperature etc. Whether it is advantageous for the individual or not that the sexual sphere is awakened early under the influence of those circumstances, is a question difficult to answer; but its activation after having once crossed the threshold of maturity, falls within the limits of the physiological norm.

The time of activation of the sexual functions is, as just remarked, dependent on hereditary and external factors. The material I have collected enables me to furnish a proof for both influences.

The significance of the heriditary factor has already been shown by comparing the average age of the menarche in blondes (Homo

nordicus) and in brunettes (Homo alpinus). A still more convincing proof can be drawn from Table V, for this table shows that if the menarche appears at an early age in the mother, this is, on an average, also the case in the daughter. I have on purpose arranged the data in this table according to the age of the mother.

A simple calculation shows us the following: the average age of the menarche of those daughters, whose mothers began to menstruate in the 11th, 12th and 13th year, is 12 years and 10 months; of the mothers whose first menses appeared in the 14th, 15th and 16th year, the daughters were, on an average, 13 years 7 months old, and finally this mean age was 14 years and 11 months in those daughters whose mothers first menstruated in their 17th, 18th, or 19th year. These ages prove that a retarded menarche in the mother is inherited by the daughter.

Among the external factors which are of influence on the menarche, the temperature, as has been remarked already, is regarded as being of great significance. This opinion was, up till now, only grounded on the fact that the menarche arrives at an earlier age in the population of a warmer zone than in that of a colder climate. Now I can prove from my investigation that this external influence can be demonstrated even in the population of our country. I put the question whether the menarche appears with equal frequency in the different months of the year; and it became clear that this is not the case. The frequency-curve of the menarche, arranged according to the months of the year, has a most typical direction, as may be seen from Table VI. In this table the frequency for each month is expressed in percentages of the whole.

TABLE VI.

January. . . .	8.2 %	May	10.8 %	September . .	6.9 %
February . . .	5.— „	June	10.— „	October . . .	6.2 „
March	7.— „	July	9.5 „	November . .	7.8 „
April	8.8 „	August . . .	10.9 „	December . .	8.6 „

This table shows that a first menstruation appears more frequently during the warmer months (May, June, July, and Aug.) than during the rest of the year; for the total frequency during these 4 months is 41.3 % to 29.5 % during the first and 29.7 % during the last 4 months of the year.

The monthly course, however, is somewhat more complicated. Besides the greater frequency during the summer months there is

another rise in December and January. I should feel inclined to explain this monthly difference in the following way: Beginning with February I should like to regard the rapid and regular rise up to May as a reaction on the general climatological factor, the influence of awakening nature, and not so much as an influence of temperature, which seems to me in these months not capable of doubling the frequency in May, compared to what it was in February. I would then be inclined to see an influence of the temperature in the fact that during the actual summer months the frequency remains almost equal to what it was in May. The rise of frequency in December and January can perhaps be looked upon as the result of the artificial higher temperatures to which the organism is subjected.

As has been mentioned in the beginning of this communication, I have also been able to collect the data of 165 Jewesses, referring to the age of the menarche. Naturally these almost entirely relate to inhabitants of large towns. The following Table VII gives a survey of the frequency, according to the age of the individual, in absolute figures and in relative percentages, which are made clear by curve *A* in fig. 2.

TABLE VII.

Age	Number	Percentage	Age	Number	Percentage
9 year	1		14 year	30	18.1
10 „	3	1.8	15 „	17	10.3
11 „	20	12.1	16 „	9	5.4
12 „	43	26.—	17 „	2	1.2
13 „	39	23.6	18 „	1	

The following remark must be made with regard to this Table. In the 3 cases arranged under the 10th year, the first menses appeared in the second half of this age (10 years, 7 months; 10 years, 9 months; and 10 years, 11 months). The variation curve of the menarche begins, therefore, in the Jewish girls at the same age as in the non-Jewish. It is true there was one case in which the menarche already began at the age of 9 years, but this case (9 years 1 month), is separated by an interval of a year and a half from the following, and must therefore be regarded as a sign of abnormal precocity. For the Jewish race also, therefore, the middle of the 10th year counts as the threshold of sexual maturity. I would again

emphasize the fact that we have been able to demonstrate this age in different groups. In this manner a criterion has been given to determine in each separate case whether one has to do with a real premature development, or with a normal, though perhaps rapid one. A menarche after the age of ten and a half years is a normal event. As far as the threshold-age of maturity is concerned there is no difference between the Jewish and the non-Jewish girls. And yet there is a difference, viz. the greater frequency of the menarche immediately after the threshold has been crossed, so that before the age of 12 the sexual function has begun in 40 °/₀ of the Jewish girls compared to 30 °/₀ in the non-Jewish blondes, and 18 °/₀ in the brunettes.

It is very curious that after this rapid rise in the variability curve, through which the top is already reached at the age of 12, the variation line descends very slowly. Next to a group with accelerated sexual development comes a second with a retarded one. The result is, of course, that the average age of the menarche in Jewish girls is not much earlier than in non-Jewish individuals; for among the blondes I found a mean age of 13 years, 5 months, and 17 days, while for the Jewish girls the average was 13 years, 3 months, and 24 days.

The averred precocity of the Jewish girls compared with the rest of the population, seems, therefore, not to exist, for the slight difference which can be discerned by the above methods, is sufficiently explained by the fact, that the data of the Jewesses, with the exception of a few, refer to inhabitants of towns. I can, therefore, on the ground of my investigation, agree with FISHBERG's conclusion that precocity is not a characteristic of the Jewish race. [1])

[1]) M. FISHBERG. "Die Rassenmerkmale der Juden." München 1913.