for cases judged to have a bad prognosis. If a very high and sustained pressure is made to fluctuate at a lower level the whole course of the illness may possibly be more benign. Too great a reduction of pressure may be associated with some risks, especially in those who have had raised pressures for years. The powerful remedies now at our disposal must be used with caution, and their effects, good and ill, must be carefully documented. The desire to find benefit for our patients and enthusiasm for "the latest" must be tempered with critical insight. The present mood, however, is one of quiet optimism.

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The tenth session of the W.H.O. Expert Committee on the International Pharmacopoeia met on April 23–30 in Geneva. For the tenth time Dr. C. H. Hampshire, of London, was elected chairman of the committee as a tribute to his outstanding contribution to the recently published *International Pharmacopoeia* (Vol. I). In the course of this session the Expert Committee have completed the preparation of Vol. II of the *International Pharmacopoeia*, which will include about 200 monographs, many of them describing new drugs, injections, etc., as well as a dozen important appendices indicating biological assays, tables of doses for children, and tables of usual and maximal doses for adults. When completed, this volume will be published simultaneously in English and French. A Spanish edition is to follow soon thereafter. This will complete the first edition of the *Pharmacopoeia*, which will be extended and kept up to date by an *Addendum* to be issued the following year, and a second edition in 1955, again in English, French, and Spanish. A meeting of the Subcommittee on Non-proprietary Names followed on May 1 and 2. This selects internationally approved non-proprietary names for drugs, to prevent the confusion which arises from the use in different countries of different names for the same drugs. So far 600 international names for drugs have been selected, and the subcommittee is to consider 200 other new names.

THE PERIOD OF GESTATION

BY

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AND

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In a recent communication 17,145 Birmingham births delivered during 1947 were distributed by duration of gestation, which was estimated from the first day of the last menstrual period preceding pregnancy to birth (Gibson and McKeown, 1950). We were asked whether the distribution could be used for medico-legal purposes to indicate the probable upper limit of the period of gestation. But although we had no reason to doubt the reliability of the material for the purposes for which it was collected, it was not possible to rely on individual observations, particularly in the later weeks, without a closer inspection than was then provided. We have therefore collected information on Birmingham births delivered in 1950 in order to examine more carefully the upper limits of the period of gestation.

For medico-legal purposes it would of course be desirable to record the period of gestation from the date of coitus or, alternatively, from the date of ovulation, since the interval between coitus and ovulation is shorter and less variable than between coitus and the preceding menstrual period. But in practice neither of these dates can be given for the large series of births needed (at least several thousands) to establish the range of the highly variable period of gestation. It is therefore necessary to estimate the period of amenorrhoea from the onset of the menstrual period preceding pregnancy to birth, and to make an adjustment for the probable interval between the onset of the menstrual period and coitus.

The Period of Amenorrhoea

The period of amenorrhoea was recorded in this way from health visitors' cards for 15,659 of the 18,819 births delivered in Birmingham during 1950. (Birmingham health visitors obtain the date of onset of the last menstrual period from antenatal documents and are asked to record the date only if it is definite.) The distribution is given in Table I. As we are here interested only in the longer intervals, births delivered before the 41st week are grouped. There were 247 births after the end of the 44th week, of which seven were born later than 48 weeks. The two longest periods were 356 and 359 days.

We cannot, of course, accept these estimates as reliable without consideration of certain obvious sources of error.

(a) *Uncertainty Regarding which Bleeding has been Followed by Coitus and Fertilization.*—Bleeding in the early months of pregnancy is not uncommon and may be confused with the preceding cycle. Thus the estimate may be too short if dated from bleeding during pregnancy, or too long if dated from the penultimate cycle, the last cycle being mistaken for post-ovulatory bleeding. These difficulties could of course be overcome by use of pregnancy diagnosis tests at the appropriate time (after the first missed cycle and before further bleeding), but such tests are not at present in general use.

(b) *Misleading Information from the Mother.*—It is well known that premarital conception, particularly of first births, is not uncommon, and provides the mother with a motive for post-dating the last menstrual cycle. Alternatively, in

TABLE I.—Cases Delivered in Birmingham in 1950 Distributed According to the Period of Amenorrhoea (from Onset of the Last Menstrual Period to Birth)

Delivered in	Week:	Under 41	41	42	43	44	45	46	47	48	49	50	51	52	All Births for which Date of L.M.P. was Recorded	All Births for which Date of L.M.P. was Not Recorded	All 1950 Births
	Days:	280 and under	281–	288–	295–	302–	309–	316–	323–	330–	337–	344–	351–	358–364			
No. of births ..		5,342	4,947	3,220	1,406	497	144	62	23	11	5	—	1 (356 days)	1 (359 days)	15,659	3,160	18,819
%		34.12	31.59	20.56	8.98	3.17	0.92	0.39	0.15	0.07	0.03	—	0.01	0.01	100	—	—

cases of medico-legal interest, the mother may antedate the period in order to establish the identity of the father. In the first case the effect is to reduce the estimated period of amenorrhoea, and in the second case the effect is to prolong it.

(c) *Indefinite or Inaccurate Dates.*—Not infrequently only an approximate date can be given for the first day of the last menstrual period, or, with no intention to mislead, and in absence of any confusion about the relevant cycle, the mother may give a wrong date. Errors may also occur subsequently during transcription of the data to other documents or punch cards.

In the present context we are concerned only with errors which might increase the estimate of the period of amenorrhoea. These arise, first, from uncertainty regarding which bleeding has been followed by fertilization, and, secondly, from indefinite or inaccurate dates. Misleading information which would lengthen the period of amenorrhoea is only likely in the exceptional case coming to the courts.

TABLE II.—Cases Delivered After the End of the 44th Week in Which the Estimated Period of Amenorrhoea was Considered Reliable

Delivery in		Original No. of Births	No. of Births for which Period of Amenorrhoea was Considered Unreliable				No. of Births in which Period of Amenorrhoea was Considered Reliable
Week	Days		Mother not interviewed	Date of L.M.P. Unreliable	Bleeding in Early Months of Pregnancy	Total	
45	309–315	144	10	46	12	68	76
46	316–322	62	10	23	3	36	26
47	323–329	23	—	17	2	19	4
48	330–336	11	—	3	1	9	2
49	337–343	5	—	—	1	4	1 (339 days)
50	344–350	—	—	—	—	—	—
51	351–357	1	—	1	—	1	—
52	358–364	1	—	—	—	—	1 (359 days)
Totals		247	20	98	19	137	110

As a check on the reliability of information recorded for the 247 births delivered after the 44th week, all relevant antenatal documents were examined and the mothers were interviewed at home. Data recorded from the mother included details of all previous pregnancies and for the pregnancy under consideration; menstrual history in the preceding six

months; history of bleeding in the early months; and date of onset of the last menstrual period. In respect of the last question mothers were asked if they remembered or had a record of the date of the period or of the expected date of delivery, and, if not, whether the date given at the first antenatal examination was definite. Cases were then accepted as reliable only if (a) the date of onset of the last menstrual period was recorded unequivocally on the antenatal record and confirmed by the mother, and (b) there was no history of bleeding in the early months of pregnancy. Table II shows that of the 247 births, 137 were excluded—20 because the mother was not interviewed, 98 because the date of the last menstrual period was considered unreliable, and 19 because there was a history of bleeding in the early months of pregnancy. We are left with 110 births delivered after the end of the 44th week, in respect of which the period of amenorrhoea was thought reliable.

Table III gives details of the seven cases in which the period of amenorrhoea was originally given (in Table I) as longer than 48 weeks (336 days). On the criteria here used only two of them can be accepted (339 and 359 days).

The Period between Coitus and Birth

For medico-legal purposes the period of interest is that between coitus and birth. This can be obtained by adjusting our estimates of the period of amenorrhoea according to the probable minimum interval between the onset of the last menstrual period and coitus. If the menstrual cycle is regular and of approximately 28 days, a moderately accurate assessment of this interval can be made; but if the cycle is irregular or prolonged, considerable error may be introduced because of variation in the time between the onset of menstruation and the ovulation which follows. It has therefore been considered necessary to exclude all cases in which the mother stated that her menstrual cycle was irregular in the six months before pregnancy began (see Table IV). Of the 110 births delivered after the end of the 44th week in which the period of amenorrhoea was considered reliable, a further 35 are now eliminated for this reason. We are left with 75 births in respect of which the period of amenorrhoea was more than 44 weeks; three were born in the 47th week (324, 325, and 326 days) and two in the 48th (330 and 333 days). Table V gives further details of these five pregnancies, which we regard as the longest in which we can with fair confidence both (a) accept the period of amenor-

TABLE III.—Details of 7 Cases in Which the Period of Amenorrhoea was Stated to be 336 Days (48 Weeks) or Longer

	Period of Amenorrhoea (Days)						
	336	338	339	339	342	356	359
Menstrual cycle: Regularity ..	Irregular (months) (1–2)	Regular (35 days)	Irregular (6–10 weeks)	Regular (28 days)	Data	Irregular	Irregular (1–3 months)
Flow (days) ..	4–5	3–4	7	7	not	Irregular	3–6
Date of L.M.P. ..	Indefinite	Definite	Definite	Indefinite	not	Indefinite	Definite
Bleeding in early pregnancy ..	None	Slight show at 2 months	None	Slight bleeding at beginning	available	None	None
Maternal age ..	24	17	29	23	24	22	38
Birth rank of child ..	1	1	2	2	2	2	8
Onset of labour ..	Spontaneous	Spontaneous	Surgical induction	Spontaneous	Spontaneous	Spontaneous	Caesarean section
Birth weight ..	7 lb. 4 oz. (3.3 kg.)	8 lb. 8 oz. (4 kg.)	7 lb. 12 oz. (3.5 kg.)	6 lb. 2 oz. (2.8 kg.)	7 lb. 9 oz. (3.4 kg.)	8 lb. 8 oz. (4 kg.)	10 lb. (4.5 kg.)
Sex of child ..	Male	Female	Male	Female	Male	Male	Male
Condition of child*	Live-born	Live-born	Live-born; no evidence of post-maturity	Live-born; normal	Live-born; normal	Live-born; normal	Live-born; no evidence of post-maturity

* Condition is given as recorded in delivery notes. In only two cases was there a specific reference to maturity.

TABLE IV.—*Cases Delivered After the End of the 44th Week of Amenorrhoea in Which (a) the Period of Amenorrhoea was Considered Reliable and (b) Regular Menstrual Cycles Preceded Pregnancy*

Delivery in		No. of Births in which		
Week	Days	Period of Amenorrhoea was Considered Reliable	Irregular Menstrual Cycles Preceded Pregnancy	Regular Menstrual Cycles Preceded Pregnancy
45	309–315	76	22	54
46	316–322	26	10	16
47	323–329	4	1	3
48	330–336	2	—	2
49	337–343	1	1	—
50	344–350	—	—	—
51	351–357	—	—	—
52	358–364	1	1	—
Totals		110	35	75

TABLE V.—*Details of Five Cases Delivered After the End of the 46th Week of Amenorrhoea in Which (a) the Period of Amenorrhoea was Considered Reliable and (b) Regular Menstrual Cycles Preceded Pregnancy*

	Period of Amenorrhoea (Days)				
	324	325	326	330	333
Menstrual cycle: Interval (days)	28	28	28	28	30–1
Flow (days)	3	4	3	5–6	5
Bleeding in early pregnancy	None	None	None	None	None
Maternal age	23	26	21	27	19
Birth rank of child	4	6	1	1	2
Onset of labour	Surgical induction	Spontaneous	Spontaneous	Spontaneous	Spontaneous
Birth weight	5 lb. 13 oz. (2.7 kg.) Female	7 lb. (3.2 kg.) Male	7 lb. 6 oz. (3.3 kg.) Female	6 lb. 8 oz. (2.9 kg.) Female	8 lb. (3.6 kg.) Male
Sex of child	Female	Male	Female	Female	Male
Condition of child*	Live-born; normal	Live-born	Live-born; normal	Live-born; normal	Live-born

* Condition is given as recorded in delivery notes. In no case was there a specific reference to maturity.

rhoea as reasonably reliable, and (b) adjust the period of amenorrhoea to give an estimate of the period between coitus and birth.

The interval between the onset of menstruation and coitus which may result in pregnancy is determined (a) by the time of ovulation, and (b) by the period before and after ovulation during which intercourse may lead to fertilization. Most endocrinologists are agreed that ovulation occurs at about the middle of a regular 28-day cycle (Allen *et al.*, 1930; Knaus, 1934; Shaw, 1934; Latz and Reiner, 1942; Rock and Hertig, 1944), and that intercourse is likely to be fertile only within a few days of that time (for it is thought that spermatozoa are viable for at most a few days after coitus, and that ova must be fertilized within a few hours of ovulation). It would therefore be consistent with these views if we regarded 10 days as the probable minimum interval between the onset of menstruation and coitus which may result in pregnancy. But experience of artificial insemination has shown that some women become pregnant only when inseminated within a few days of the beginning of the cycle (Seymour, 1939), and, while such cases are probably explained by cycles of short duration, we cannot exclude the possibility that fertilization occasionally follows coitus earlier than the 10th day in a 28-day cycle. We shall therefore take five days as the probable minimum interval between the onset of menstruation and intercourse which may result in pregnancy. It should be said at once that our only justification for accepting this figure is that we are anxious to use the most conservative—that is, the shortest—estimate of the interval, and it would probably be generally agreed that pregnancy is most unlikely to follow intercourse earlier than the fifth day of a regular 28-day cycle.

Estimates of the period between coitus and birth can now be obtained by subtracting five days from the period of amenorrhoea given in Table IV for each of the 75 cases considered suitable for the examination. The longest esti-

mates for the period of gestation (coitus to birth) which can be accepted with fair confidence are thus 319, 320, 321, 325, and 328 days.

Analysis of the Longest Cases of Gestation

But for legal purposes it is also necessary to inquire whether still longer periods of gestation are possible. This question is difficult to answer, but can be considered after more detailed examination of the two longest periods of amenorrhoea accepted as reliable (339 and 359 days). Both these cases were excluded from Table IV.

Case 1.—339 days. The mother was referred from the fertility clinic when 16 weeks pregnant. At 291 days the membranes were thought to have ruptured and she was admitted for medical induction, which was unsuccessful. She was readmitted at 312 days for a further medical induction, which was also unsuccessful, and again at 334 days, when oestrogen was injected. At 339 days labour was brought on by surgical induction. Labour and puerperium were normal. The child was a live-born male, weighed 7 lb. 12 oz. (3.5 kg.), and showed no evidence of post-maturity. The mother had had one previous pregnancy, which resulted in a live-born child delivered spontaneously at 294 days. She has since had another live-born child, which weighed 8 lb. (3.6 kg.) at birth, and was delivered spontaneously at 310 days.

Case 2.—359 days. The mother was seen at hospital at 329 days because delivery was thought to be overdue: the foetus was quite small, and she was asked to return in three to four weeks. At 358 days she was admitted because of obstructed labour (for which no cause was given), and the child was delivered by lower segment caesarean section. The infant was a live-born male, weighed 10 lb. (4.5 kg.), and showed no evidence of post-maturity. The mother had had seven previous live births, of which six were delivered spontaneously and one after surgical induction. Because of menstrual irregularities the period of gestation cannot be given in these cases, but all deliveries are believed by the mother to have been about two to three weeks late.

These two deliveries were conducted by senior obstetricians of the Birmingham Maternity Hospital, and we have therefore no reason to doubt the accuracy of the observations. But the period between coitus and birth cannot be estimated reliably in either case, because menstrual cycles were irregular in the six months before pregnancy began (see Table III), and hence the probable interval between onset of menstruation and coitus cannot be assessed. On the assumption previously made (that the probable minimum interval between onset of menstruation and coitus is five days) the periods of gestation (coitus to birth) would be 334 and 354 days. But in the six months before pregnancy began menstrual cycles occurred at intervals of six to ten weeks in one case and one to three months in the other, and it is very much more likely that the intervals between onset of menstruation and coitus were 28–56 and 14–77 days respectively. The corresponding periods of gestation are 311–283 days and 345–282 days.

Even if we accept 354 days as the longest period of gestation, there was only one such case among 15,659 births. We conclude that on this evidence a period of gestation (coitus to birth) as long as 354 days cannot be said to be impossible.

Discussion

It has not been the purpose of this communication to assess the present medico-legal interpretation of the period of gestation, but a few words on that subject may not be out of place. The law has for its end not justice but peace, and judicial practice in this as in other matters is to accept the last agreed ruling, and inquire whether it seems reasonable to go beyond it. On this principle there is no limit to the acceptable period of gestation, which, unlike most natural phenomena, can go up but not down.

Nevertheless it must be admitted that medical evidence has been of little assistance to the courts, for the obvious reasons that no reliable large-scale data have been available, and the experience of any single witness can provide no clear evidence. For no obstetrician, however active, can expect to see many very long periods of gestation during his working life, and those which he does see provide no basis for assessment of their frequency. In these circumstances it is not surprising that judges have preferred to rely on their own interpretation of common opinion.

The position of a medical witness consulted on this question is on all fours with that of a demographer invited to express an opinion about the longest possible duration of life. He can give a period of gestation which would generally be accepted as impossible, by quoting a figure well outside his own and everyone else's experience. He can give the longest period of gestation for which he has reasonably reliable evidence, whether from his own experience or from the medical literature, and may even be able to state the frequency with which it has been observed in a population of births. What he cannot do, and cannot be expected to do, however full the information at his disposal, is to state a precise figure below which a period of gestation is possible, and above which it is impossible. The translation of medical probabilities into legal certainties is a matter for the courts.

In attempting to provide evidence which may assist the courts we have recorded the period of amenorrhoea from onset of menstruation to birth, and have estimated the period from coitus to birth by allowing for the probable minimum interval between onset of menstruation and coitus. This is the only procedure which lends itself to investigation of the large series of births needed to establish the range of the period of gestation, since dates of coitus, ovulation, and fertilization are usually unknown. Recent legal discussion of the possible interval between coitus and fertilization is indeed irrelevant, for this interval would be of interest only if medical evidence could establish accurately the range of the period between fertilization and birth. In fact, medical evidence is no more reliable on this point than on the period between coitus and birth.

Without recapitulation of reservations expressed earlier we may summarize experience of these 15,669 births as follows: the longest period of gestation which could be accepted with fair confidence is 328 days; the longest period which could not be regarded as impossible is 354 days.

Summary

The period of amenorrhoea from onset of the last menstrual period before pregnancy to birth was estimated for 15,659 of the 18,819 Birmingham births delivered in 1950. In 247 cases the period was longer than 44 weeks (308 days) and in 7 cases longer than 48 weeks (336 days). The two longest periods were 356 and 359 days.

Of the 247 births in which the period of amenorrhoea was longer than 44 weeks, 137 were subsequently excluded, either because the date of the last menstrual period was considered unreliable or because there was a history of bleeding in the early months of pregnancy. Of the 110 periods considered reliable the two longest were 339 and 359 days.

The period between coitus and birth was assessed by subtracting from the estimated period of amenorrhoea the probable minimum interval between the onset of the last menstrual period and coitus. Before making this adjustment it was considered necessary to exclude 35 cases (of the 110 judged reliable) in which the interval between menstruation and coitus could not be assessed accurately because the mother stated that her menstrual cycle was irregular or prolonged in the six months before pregnancy began.

For the remaining 75 cases in which (a) the estimate of the period of amenorrhoea was reliable and more than 44 weeks, and (b) regular cycles of approximately 28 days preceded pregnancy, the minimum interval between onset of menstruation and coitus which might result in fertilization was taken as five days. The longest estimates of the period of gestation (coitus to birth) which could be accepted with fair confidence were then 319, 320, 321, 325, and 328 days. The possibility of periods of gestation longer than these is discussed.

We are much indebted to Dr. Enid Charles for making available to us the distribution of Birmingham births in 1950, and to Mrs. M. Hopper, who interviewed mothers whose period of amenorrhoea was longer than 44 weeks. We are also grateful to the staffs of Birmingham hospitals and welfare centres for permitting us to use their records.

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OESOPHAGITIS*

BY

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You are no doubt aware that at the moment a great interest is being taken in inflammation and chronic ulcer of the lower oesophagus, and that in a sense they are new. In another sense they are not, for many of the things we are now considering have been described before. For instance, patients have always complained of their symptoms, though doctors may have misinterpreted them or brushed them aside because they did not recognize the pattern. Pathologists have described chronic ulcers from time to time for over a hundred years. Radiologists have been examining the lower oesophagus for forty years. Endoscopy is even older, having been first introduced eighty years ago, though it is the recent increase in its use that has contributed most to our present theme.

We are not, therefore, dealing with a brand-new discovery of which the profession has no previous knowledge. In such a case we would have no prejudices, and learning about it would be the relatively simple process of absorbing facts. But the lower oesophagus is ground that has been worked over many times before. Everyone knows something about it. In the last decade new facts have been contributed, but mostly we have been re-examining old evidence and looking at familiar things in a different way. This is a complicated process which people move through at different speeds. Some are apt to cling to the views they have held and found comfortable. Others delight in rearranging the counters of our knowledge without necessarily adding to them. At the moment we are in a period of considerable confusion. Old beliefs have been challenged. New ones have been offered but have not yet taken their place. No doubt all this will soon get stabilized in an orthodox opinion, but in the meantime an interim report may be

*A postgraduate lecture given at the Royal College of Physicians of London on December 11, 1951.