lines would meet at the section between 18, 19, and 20 years of female, and 24, 25, and 26 of male life.

Therefore we dare pronounce, though, in consequence of the importance of the question, not without some hesitation—the conclusion, *that the best chances of prolification are offered by the wedding of 18—20 years-aged females with 24—26 years-aged males.* But this statement needs not only to be justified by still more and numerous observations in other countries, but requires also to be corrected for the circumstance that the greatest fecundity is not coincident with the greatest health of the children. As to this latter point I have had occasion elsewhere to make observations on the influence of the parental age on the mortality of children. The results which I obtained in that inquiry seem to advocate the procrastination of the time of wedding for one year later than the limits mentioned before.

[The above is only a brief abstract of the first portion of Herr Körösi's article in the *Philosophical Transactions of the Royal Society.* The remainder of the paper is chiefly a discussion on *isogens* (see Mr. F. Galton's paper below), and contains further remarks as to the uses to which the tables and isogens can be applied, and on the corrections which the results should undergo. Amongst these purposes are what may be called "birth-insurance," a system which could perhaps be extended so as to insure a sum to cover the cost, or part of the cost, of education, &c. We regret that space does not permit of our dealing at greater length with the isogens; the same reason has also prevented us from noticing many of the extremely interesting points raised in the course of the first portion, notably Herr Körösi's endeavour to discriminate between the "actual" and the "physiological" natality, and thus to calculate statistically the amount of the "moral restraint."]

II.—*"Results derived from the Natality Table of Körösi by employ-ing the Method of Contours or Isogens."* By FRANCIS GALTON, F.R.S.[5]

THERE are three variables in the statistics of natality. The age of the father is one, and that of the mother is another, and the percental offspring of parents of those ages is the third. These three variables may be coordinated in the same way as that which is daily followed at meteorological offices in dealing with (1) the longitudes of the various stations, (2) their latitudes, and (3) the barometric height at each. After these data have been entered on

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[5] Revised by the author.

a chart in their proper places, contours, known by the name of isobars, are drawn to show the lines of equal barometric pressure. In natality tables, the ages of the father and the mother take the place of the longitudes and latitudes in weather charts, and lines of equal birth-rates, or, as I would call them, "isogens," take the place of isobars.

Table I contains the means of each set of four adjacent entries in Körösi's tables, as shown by the arrangement below, the left-hand diagram containing the four entries, and the right-hand one

Father's Age.
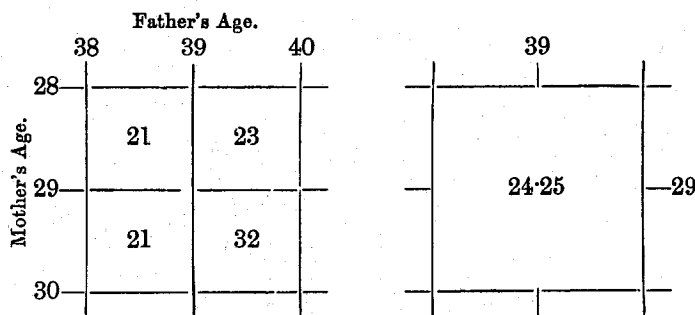
giving their mean. The entries themselves were copied to the nearest integer from Körösi's tables. The means are recorded in Table I to the nearest integer only, subject to an allowance of correction not exceeding 0·30, made for the sake of slight smoothing; thus 24·25, which would otherwise have been entered as 24, might be treated as if it were 24·25 + 0·30 = 24·55, and be entered as 25. Similarly, 24·75 might be entered either as 25 or as 24. It will be seen by the right-hand diagram that the position of the mean corresponds to the first moment of the years shown at the side and top; therefore the interval to which the annual birth-rate refers is made up of the half-year before and after the above-mentioned epoch.

The means that are enclosed in brackets are those in which one or more of the four squares from which they were derived were blank. They are, of course, less trustworthy than the rest; moreover, they may depend on less than 100 families.

The ages of married couples are distributed over only about one-half of the squares of Table I, as there are too few examples of other ages to be statistically available. This partial distribution is well seen in the accompanying diagram of isogens, where a dotted outline encloses all the material that can be used with safety. The broken line AB corresponds to the instances in which both parents are of the same age. The chart is practically limited to marriages in which the wife is less than 5 years older, and less than 17 years younger, than her husband.

It will be noticed that the isogens run in nearly straight, diagonal, and equidistant lines across the greater part of the chart. If we omit six squares in the upper left-hand corner, where there

TABLE I.—*Annual Percentage of Births according to the Ages of the Father and Mother, derived from Kőrösi's Table of Natality at Budapest.*

[The tabular values refer to the half-year before and after the beginning of the year entered at the top and side.]

Age of the Mother.	Age of the Father (the even years are omitted).																
	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
19	(49)	46	(42)														
21	44	44	42	33													
23	43	42	41	35	34	(36)											
25	32	36	38	32	35	32	30	(26)									
27	31	32	36	33	31	30	29	28	(25)								
29		34	35	31	31	26	27	25	19	(21)							
31		24	26	22	32	27	27	24	21	23	(17)						
33			28	25	24	26	24	21	20	18	17	16					
35			24	19	22	22	23	22	18	17	16	15	(12)				
37				(13)	21	19	21	17	16	15	13	13	12	(9)			
39					(17)	16	17	17	18	15	14	13	12	9	(13)		
41						(11)	16	15	15	15	14	10	9	9	9	(5)	
43							(12)	12	10	11	10	10	6	6	5	(3)	(5)
45							(6)	(7)	6	6	5	5	4	4	4	(3)	3

is no room for an isogen, we shall find these diagonal lines to cross 89 of the total number of 118 entries, or between eight- and nine-tenths of them. These peculiarities indicate the existence of a very unexpected law of natality, one that is well brought out by Table II, which shows the values measured from the dots marked on the isogens. The dots have been taken at convenient places

<div align="center">

DIAGRAM OF ISOGENS.

Father's Age.

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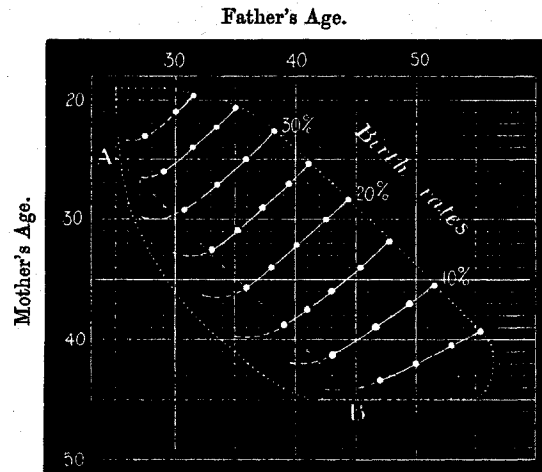
to serve as examples, one at the beginning, one at the end of the straight portion of each isogen, and others at intervening places.

The curious law referred to above is a consequence of the straightness and diagonal course of the isogens, namely, that the *sums of the ages* of the parents, to which each point in the straight portion of the same isogen refers, are *constant*. In other words, the birth-rate is determined here by the *joint ages* of the father and the mother. The difference between the ages of the two parents is of no account whatever in eight- or nine-tenths of the total number of marriages. It is only when the wife is (1) older than the husband, or (2) when she approaches the limit of the child-bearing age that this curious law ceases to hold true. The connection between it and the straightness of the isobar is easily understood from the equation to a straight line of $x + y =$ constant, for if x represent the age of the father, f, and if y represent that of the mother, m, then $f + m =$ constant. That this alleged law is a fact is conspicuously evident from the successive groups in the two columns headed B + C in Table II.

A second curious result depends on a coincidence between the increasing age of either parent and the decrease of fertility, owing to which it happens that the sum of the three elements of (1) father's age, (2) mother's age, (3) percental birth-rate in a year, has a value that is itself approximately constant, as is seen in the column headed A + B + C. Its lowest limit is $90\frac{1}{2}$, and its

TABLE II.—*Values of the Isogens at the Dots in the Diagram.*

Percentage of Births in the Year. A	Examples of the Corresponding Ages of the		B + C.	Accepted Mean of B + C.	A + B + C.
	Mother. B	Father. C			
40	23	27½	50½	51	91
	21	30	51		
	19¼	31¼	51		
35	26	29	55	55¼	90½
	24	31½	55¼		
	22	33¼	55¼		
	20¼	35	55¼		
30	29¼	30¼	60	60¼	90¼
	27	33¼	60¼		
	25	35¼	60¼		
	22¼	38	60¼		
25	32¼	33	65¼	66¼	91¼
	31	35¼	66¼		
	29	37¼	66¼		
	27	39¼	66¼		
	25¼	41	66¼		
20	35¾	35¾	71¼	72	92
	34	38	72		
	32	40	72		
	30	42¼	72¼		
	28¼	44¼	72¼		
15	39	39	78	79	94
	37½	41	78¼		
	36	43	79		
	34	45¼	79¼		
	31¾	47¾	79¼		
10	41¼	43	84¼	86	96
	39	46¼	85¼		
	37	49¼	86¼		
	35½	51¼	87		
5	43½	47	90½	93	98
	42	50	92		
	40½	53	93½		
	39¼	55¼	95		

highest, up to the isogen of 10 per cent., is 96, but it increases to 98 at the isogen of 5 per cent. If we accept a constant value of 93 or 94 for this sum, we shall never be far wrong in the larger part of the chart. It follows from this that if we wish to ascertain the percentual birth-rate per annum for a married couple, within the limits of the chart where the isogens run straight and parallel, we have simply to add the ages of the father and mother together, and to subtract the total from 93 or 94. This gives the required

result with considerable precision. The approximate limits within
which this curious rule obtains are : (1) the wife is not to be older
than her husband; (2) she is not to be less than 23 years of age,
nor (3) more than 40.

Example.—In any large number of husbands and wives living
under like conditions to the inhabitants of Budapest, whose re-
spective ages at their nearest birthdays, to 21st June, 1892, were,
that of the father, 35, that of the mother, 27, we should calculate
that the number of children born to them during the year 1892
would be at the rate of 93 — (35 + 27) per cent. = 31 per cent.;
the isogen makes it about 32 per cent.[6]

It will be observed in the lower part of the diagram that the
isogens tend to become more and more horizontal. This is due to
the fertility of the male enduring to an age considerably beyond
that at which it ceases in the female.

I shall not now enter into the other salient peculiarities of the
isogens further than to allude to the curious change in their course
which occurs when the wife is older than the husband. When
she is from 30 to 38 she certainly seems to be appreciably more
fertile with a husband of her own age or somewhat older, than she
is with one who is younger. I should hesitate to ascribe this to
physiological causes without corroborative evidence derived from
breeders of stock. It is very possible that a growing indifference
on the part of young husbands to ageing wives may have some-
thing to do with it.

It is almost needless to say that if it be desired to obtain the
observed birth-rates for a mother of any specified age, and for
fathers of various ages, the corresponding line of Table I will give
the information; while, if the smoothed values are wanted, a
similar line in the chart of isogens will give them, after being
smoothed, not in one dimension only, *but in two dimensions.*
Similarly, as regards the birth-rates for a father of any specified
age and for mothers of various ages, by following the vertical
columns instead of the horizontal lines.

In conclusion, I would call attention to the fact that, though
Körösi's tables give fully sufficient material for the discussion of
percental birth-rates, they do not afford the required data whereby
to determine the second postulate of paramount importance, namely,
the degree of conformity of individual cases to the means of many
cases. We can deduce nothing, or next to nothing, from these
tables in reference to the Facility of Error at the various positions
in the chart, whether or no it conforms to the normal law of
frequency; still less, what the Modulus of Error may be, and
whether it is constant throughout the chart, or whether it varies
in accordance with some definite law.

The answer to these questions admits, as I conceive, of being
obtained by bestowing a moderate amount of work on the original

[6] A rough mechanical arrangement was exhibited by which isogens may be
drawn. It consists of three sliding pieces connected by a string of constant
length. A coloured patch is pasted on the board on which they slide, to show
the limits within which the isogens drawn by it are trustworthy.

observations, selecting at first a few squares for exploratory pur-
poses, such as are (1) distributed evenly about the chart, and
(2) contain each of them not less than some 300 observations, and
(3) whose means accord with the smoothed isogens that pass over
the squares, thereby affording satisfactory centres of reference.

III.—*Proceedings of Section F of the British Association.*

THE meeting of the British Association at Oxford this year,
under the Presidency of the Marquess of Salisbury, was of an
unusually brilliant character, and was especially remarkable for
the large number of distinguished foreigners present. Much of
the success of the meeting was due to the hospitality extended by
the university to the members of the Association.

The Section (F) devoted to Economics and Statistics did not
fail to obtain its share of a most successful gathering, attracting
many more well known economists than usual, among whom may
be mentioned Dr. Edward Atkinson (Boston), Dr. Stephan Bauer
(Brünn), Monsieur E. Castelot (Paris), Dr. Irving Fisher (Yale),
Professor E. J. James (Philadelphia), Professor M. Kovalewsky
(Moscow), Dr. Julius Mandello (Buda-Pesth), Professor J. Mavor
(Toronto), M. P. Otlet (Brussels), Dr. Joseph Redlich (Vienna),
and President F. A. Walker, Hon. F.S.S. (Boston). These and
the large number of prominent British economists who were
present contributed greatly to the general excellence of the dis-
cussions on the various papers read.

On the present occasion there were also two special features in
connection with the Section which would of themselves render the
Oxford meeting memorable. One of these was the fact that for
the first time on record one of the two evening lectures was
devoted to a subject connected with economics. On the Monday
(13th August), Professor J. S. Nicholson, of Edinburgh, read a
paper on "Historical Progress and Ideal Socialism,"[1] in which he
combated socialism as being opposed to all the teachings of history.
Excessive taxation was, he pointed out, the cause of the ruin and
decay of many nations, and socialism, which presupposed com-
munity of property, simply meant a tax of 20s. in the pound on
all property. Socialism also meant the suppression of liberty and a
return to slavery. Extremes meet, and the extreme met by socialism
was anarchy. The other feature of the Oxford meeting which did
much to render the meeting of economists of a sociable character,
was a dinner, held in the hall of Oriel College, at which the
foreign economists were entertained by the English.

Professor C. F. Bastable, M.A., F.S.S., Professor of Political
Economy in the University of Dublin, presided over the Section, and
the other Officers were as follows : *Vice-Presidents*—Rev. Professor
W. Cunningham, D.D., F.S.S.; Professor F. Y. Edgeworth, M.A.,

[1] Since published by A. and C. Black.