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TWIN RESEARCH 4 – Part A: Biology and Obstetrics
Proceedings of the Fourth International Congress on Twin Studies (London 1983)

Sir Francis Galton, 1822-1911*

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Francis Galton was born on 16th February 1822 (the same year as Mendel). His mother Violetta (1783-1874) was the daughter of Dr. Erasmus Darwin (1731-1802), a medical practitioner in Derby who had scientific interests, particularly in plants, and produced various mechanical inventions. He was also grandfather to Charles Darwin. Galton's father, Samuel Tertius Galton (1783-1844), was a Birmingham banker but possessed a number of scientific instruments. His father (Francis Galton's grandfather), Samuel Galton (1735-1832), also had scientific interests, including colour vision, and was elected a Fellow of the Royal Society.

Francis Galton became a medical student in Birmingham in 1838, subsequently attending King's College London, Cambridge and St. George's Hospital. However, he gave up his medical studies in 1844 after the death of his father [5,17]. Later he travelled in Egypt and South Africa about which he wrote various articles and books, including "The Art of Travel" (1855) [6] of which a total of eight editions were published. His scientific work from these expeditions won him his first medal, the gold medal of the Royal Geographical Society awarded in 1853. Subsequently he wrote further on scientific matters, mainly concerning geography, travel and meteorology. He worked on stereoscopic maps and problems associated with wind currents and sailing ships and introduced the word "anticyclone". He was elected a Fellow of the Royal Society in 1856 and later to the Council of the Royal Geographical Society, becoming Secretary of the British Association for the Advancement of Science in 1863 [4,19].

His interest in heredity seems to have begun about this time. The "Origin of Species" by his cousin Charles Darwin was published in 1859 [3]. This is said to have had a profound effect on Galton, leading to the loss of his religious faith. In 1865, he wrote a paper on "Hereditary Talent and Character" [7] and later expanded this into a book,

* Adapted from a leaflet prepared for the Galton exhibition held in University College London to coincide with the Fourth International Congress on Twin Studies.

QUESTIONS ABOUT TWINS.

By FRANCIS GALTON, F.R.S.

In the course of some inquiries upon which I am engaged, connected with the resemblance between twins, it has come to my knowledge that you are very probably able to afford me valuable information. I therefore take the liberty of sending this Circular to your address, in which my purpose is briefly stated, and the questions to which I seek replies are contained.

I propose to publish the result of my inquiry, with corroborative extracts from the communications I may receive; but the names of the individuals referred to, and of my correspondents generally, will be kept STRICTLY PRIVATE.

Object of the Inquiry.—My object is to collect data for estimating the respective shares that "Nature" and "Nurture" ordinarily contribute to the Body and Mind of adults; meaning by "nature," everything that is inborn, and by "nurture," every influence subsequent to birth.

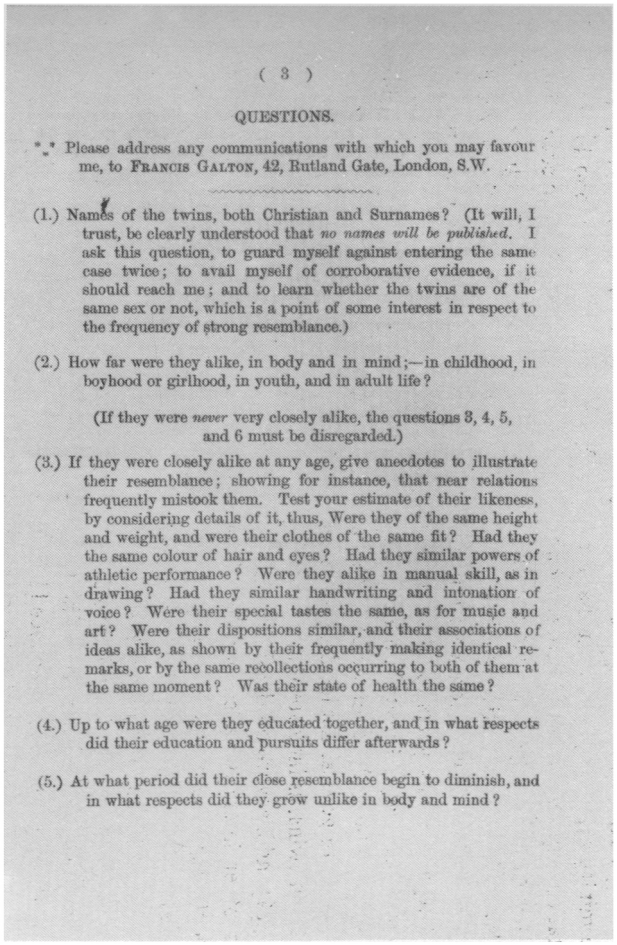
The effects of Nature are clearly seen in persons, originally unlike and who *continue to be* unlike, although they are reared as nearly as possible in the same way; so the effects of Nurture might be traced in the gradual *extinction* of resemblances among those who closely

resembled each other in childhood, but were afterwards reared in a more or less different manner.

It is easy to obtain suitable instances for the first part of the inquiry, but it is only among twins that they exist for the second.

I have explained myself more at length, and drawn provisional conclusions, in a work just published, "English Men of Science; their Nature and Nurture" (Macmillan & Co.), page 12.

I take the opportunity of asking other questions, which relate to Heredity. The *strength* of the hereditary tendency to bear twins is not yet ascertained; neither is it known whether the tendency is transmitted *equally* by the male and female lines. If my correspondents will kindly reply to the questions about uncles, aunts, and cousins, they will give data to determine these matters.



(3)

QUESTIONS.

*** Please address any communications with which you may favour me, to FRANCIS GALTON, 42, Rutland Gate, London, S.W.

(1.) Names of the twins, both Christian and Surnames? (It will, I trust, be clearly understood that *no names will be published*. I ask this question, to guard myself against entering the same case twice; to avail myself of corroborative evidence, if it should reach me; and to learn whether the twins are of the same sex or not, which is a point of some interest in respect to the frequency of strong resemblance.)

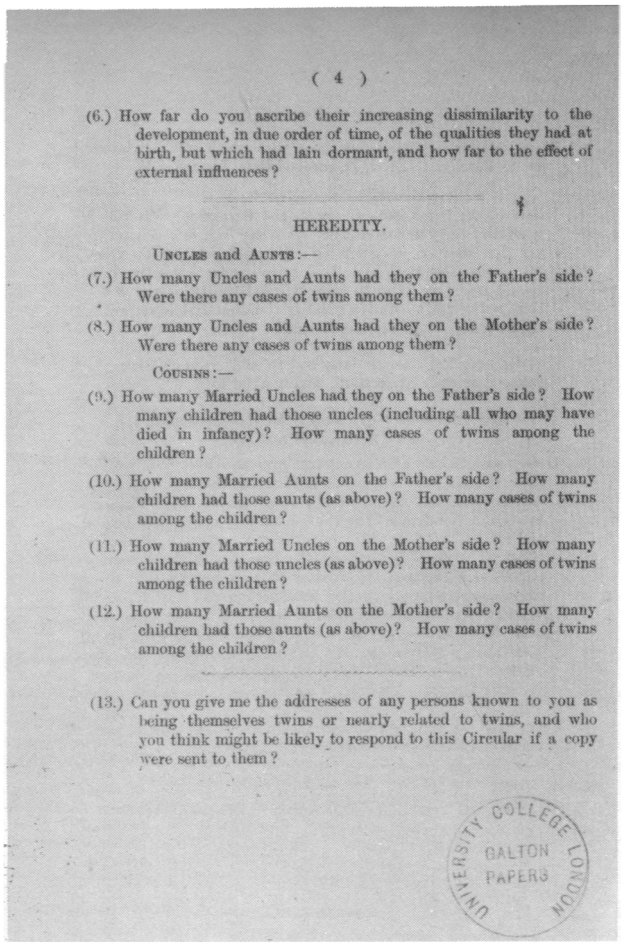
(2.) How far were they alike, in body and in mind;—in childhood, in boyhood or girlhood, in youth, and in adult life?

(If they were *never* very closely alike, the questions 3, 4, 5, and 6 must be disregarded.)

(3.) If they were closely alike at any age, give anecdotes to illustrate their resemblance; showing for instance, that near relations frequently mistook them. Test your estimate of their likeness, by considering details of it, thus, Were they of the same height and weight, and were their clothes of the same fit? Had they the same colour of hair and eyes? Had they similar powers of athletic performance? Were they alike in manual skill, as in drawing? Had they similar handwriting and intonation of voice? Were their special tastes the same, as for music and art? Were their dispositions similar, and their associations of ideas alike, as shown by their frequently making identical remarks, or by the same recollections occurring to both of them at the same moment? Was their state of health the same?

(4.) Up to what age were they educated together, and in what respects did their education and pursuits differ afterwards?

(5.) At what period did their close resemblance begin to diminish, and in what respects did they grow unlike in body and mind?



(4)

(6.) How far do you ascribe their increasing dissimilarity to the development, in due order of time, of the qualities they had at birth, but which had lain dormant, and how far to the effect of external influences?

HEREDITY.

UNCLES and AUNTS:—

(7.) How many Uncles and Aunts had they on the Father's side? Were there any cases of twins among them?

(8.) How many Uncles and Aunts had they on the Mother's side? Were there any cases of twins among them?

COUSINS:—

(9.) How many Married Uncles had they on the Father's side? How many children had those uncles (including all who may have died in infancy)? How many cases of twins among the children?

(10.) How many Married Aunts on the Father's side? How many children had those aunts (as above)? How many cases of twins among the children?

(11.) How many Married Uncles on the Mother's side? How many children had those uncles (as above)? How many cases of twins among the children?

(12.) How many Married Aunts on the Mother's side? How many children had those aunts (as above)? How many cases of twins among the children?

(13.) Can you give me the addresses of any persons known to you as being themselves twins or nearly related to twins, and who you think might be likely to respond to this Circular if a copy were sent to them?

Fig. 1 - Questionnaire sent by Galton to various twins or their families.

"Hereditary Genius" (1869) [8]. These were both based on studies of families of distinguished persons, and he developed the theory that intellectual talent is inherited. These ideas were further put forward in "English Men of Science" (1874) [9]. In this book, he published detailed replies to a seven-page questionnaire which he sent to various members of the Royal Society, including Charles Darwin.

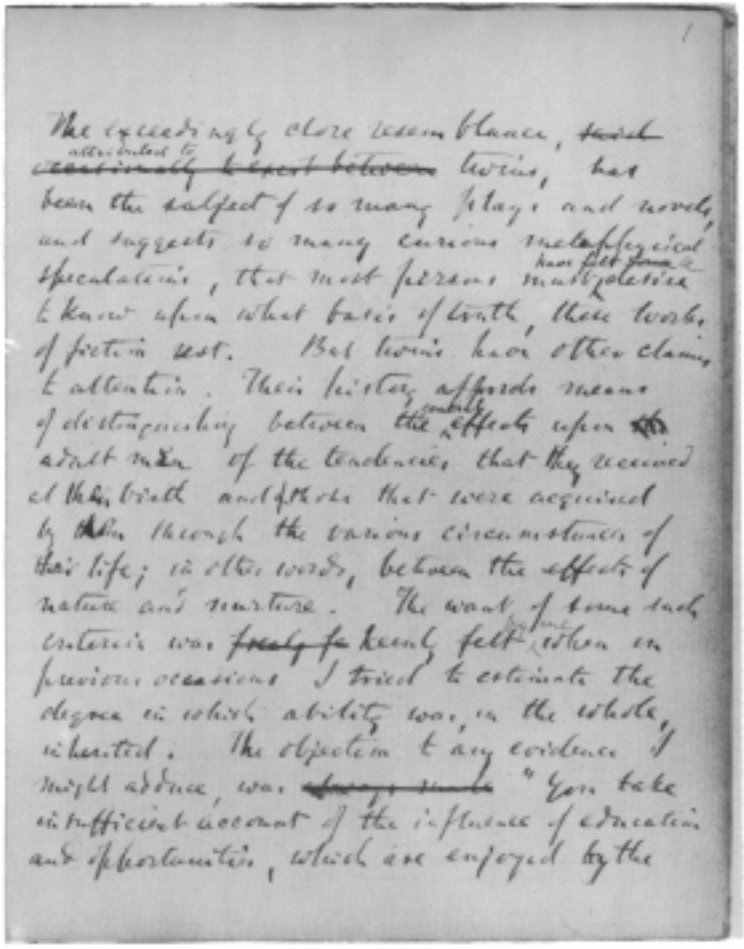
It was whilst working on these replies and writing this book that he began to be interested in twins. He had read a paper on "Studies Regarding Twins" by Professor Spaeth from Vienna (1860) [21,22], and also a monograph, "Die Lehre von den Zwillingen" (The Theory of Twins), by Ludwig Kleinwachter from Prague (1871) [18], which reviewed various aspects of the biology of twinning. Galton was at the time looking for some method for "weighing in just scales the respective effects of nature and nurture in framing disposition and intellectual ability". He suggested that twins might be used in scientific research into attempting to distinguish between the effects of "tendencies received at birth and of those that were imposed by the circumstances of their after lives: in other words, between the effects of nature and nurture" [13]. He sent a questionnaire (Fig. 1) to twins and relatives of twins known to him. These people were also asked to supply the names of other twins. He had replies from 80 sets of twins "of close similarity", details of which he published in 1875 in Fraser's Magazine [10] (Figs 2a and b), and this was then reprinted in the Journal of the Anthropological Institute of Great Britain and Ireland [13].

Of the 80 sets, 35 gave "many instructive details", particularly with regard to physical appearance, and 9 showed similar susceptibility to illness. A greater proportion were alike in taste, disposition, and association of their ideas. Of 20 sets considered unlike because of contrasts in physical appearance or disposition, "there was not a single case in which it was considered that originally dissimilar characters became assimilated through identity of nurture". This was the first attempt to use twins to solve what was subsequently to become the nature/nurture controversy.

It is of interest that Galton was unaware that placentation is not an infallible method of determining zygosity [11-13]. At that time (1875), it was thought that monochorionic placentation implied (as it still does) monozygosity, but that dichorionic placentation always meant dizygosity. Although the discrepancy between the calculated proportions of DZ/MZ twins (from relative numbers of pairs of like and unlike sex) and the observed proportions of dichorionic/monochorionic placentae was beginning to be noted, proof of this had to wait many years for the discovery of bloodgroups [20,24]. He did not find any evidence of freemartinism in humans, as he found "many instances" in which twins both of the same and of unlike sex had had children. He thought, however, that by comparison with general family data, twins were less fertile [11,23]. He continued to be interested in twins, as indicated for example by his book "Inquiries into Human Faculty" (1883) [14] and his work on the fingerprints of twins [16].

His other interests varied widely. These included studies on physical appearance, using photography and anthropometry, particularly measurement of height. These investigations led to various mathematical studies and he introduced the concept of a coefficient of correlation. Much of this work was summarised by him in "Natural Inheritance", published in 1889 [15]. He maintained an interest in behaviour and the influence of heredity on mental characteristics. The term "eugenics" was coined by him to describe his ideas for improving the human race [1,2,4,19].

In the later years of his life, he gained many awards and medals and was knighted in



The exceedingly close resemblance attributed to twins has been the subject of many novels and plays, and most persons have felt a desire to know upon what basis of truth those works of fiction may rest. But twins have many other claims to attention, one of which will be discussed in the present memoir. It is, that their history affords means of distinguishing between the effects of tendencies received at birth, and of those that were imposed by the circumstances of their after lives; in other words, between the effects of nature and of nurture. The want of some such criterion was keenly felt by me on previous occasions. I tried to estimate the degree in which ability was, in the whole, inherited. The objection to any evidence I might adduce, was, "You take insufficient account of the influence of education and opportunities, which are enjoyed by the

THE HISTORY OF TWINS, AS A CRITERION OF THE RELATIVE POWERS OF NATURE AND NURTURE.[1]

By Francis Galton, F.R.S.

THE exceedingly close resemblance attributed to twins has been the subject of many novels and plays, and most persons have felt a desire to know upon what basis of truth those works of fiction may rest. But twins have many other claims to attention, one of which will be discussed in the present memoir. It is, that their history affords means of distinguishing between the effects of tendencies received at birth, and of those that were imposed by the circumstances of their after lives; in other words, between the effects of nature and of nurture. This is a subject of especial importance in its bearings on investigations into mental heredity, and I, for my part, have keenly felt the difficulty of drawing the necessary distinction whenever I tried to estimate the degree in which mental ability was, on the average, inherited. The objection to statistical evidence in proof of its inheritance has always been: 'The persons whom you compare may have lived under similar social conditions and have had similar advantages of education, but such prominent conditions are only a small part of those that determine the future of each man's life. It is to trifling accidental circumstances that the best of his disposition and his success are mainly due, and these you leave wholly out of account—in fact, they do not admit of being tabulated, and therefore your statistics, however plausible at first sight, are really of very little use.' No method of enquiry which I have been able to carry out—and I have tried many methods—is wholly free from this objection. I have therefore attacked the problem from the opposite side, seeking for some new method by which it would be possible to weigh in just scales the respective effects of nature and nurture, and to ascertain their several shares in framing the disposition and intellectual ability of men. The life history of twins supplies what I wanted. We might begin by enquiring about twins who were closely alike in boyhood and youth, and who were educated together for many years, and learn whether they subsequently grew unlike, and, if so, what the main causes were which, in the opinion of the family, produced the dissimilarity. In this way we may obtain much direct evidence of the kind we want; but we can also obtain yet more valuable evidence by a converse method. We can enquire into the history of twins who were exceedingly unlike in childhood, and learn how far they became assimilated under the influence of their identical nurtures; having the same home, the same teachers, the same associates, and in every other respect the same surroundings.

My materials were obtained by sending circulars of enquiry to persons who were either twins themselves or the near relations of twins. The printed questions were in thirteen groups; the last of them asked for the addresses of other twins known to the recipient who might be likely to respond if I wrote to them. This happily led to a continually widening circle

[1] In my *English Men of Science*, 1874, p. 12, I treated this subject in a cursory way. It subsequently occurred to me that it deserved a more elaborate enquiry, which I made, and of which this paper is a result.

Fig. 2a - First page of Galton's draft manuscript for his paper discussing the results of his twin study.

Fig. 2b - First page of the paper when subsequently published in Fraser's Magazine.

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1909. He died on 17th January 1911. In his will, he bequeathed £45,000 to University College London to found the Galton Laboratory and Chair of Eugenics, later (1963) renamed the Chair of Human Genetics. His books and manuscripts were left to University College London and are kept in the Manuscripts Room of the Library there.

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REFERENCES

1. Cowan RS (1972): Francis Galton's statistical ideas: the influence of eugenics. Isis 63: 509-528.
2. Cowan RS (1972): Francis Galton's contribution to genetics. J Hist Biol 5: 389-412.
3. Darwin C (1859): On the Origin of Species by Means of Natural Selection. London: John Murray.
4. Forrest DW (1974): Francis Galton: The Life and Work of a Victorian Genius. London: Paul Elek.
5. Francis Galton as a medical student. Br Med J 1: 701-702 (1911).
6. Galton F (1855): The Art of Travel; or, Shifts and Contrivances Available in Wild Countries. London: John Murray.
7. Galton F (1865): Hereditary talent and character. Macmillan's Magazine 12: 157-166; 318-327.
8. Galton F (1869): Hereditary Genius. London: Macmillan.
9. Galton F (1874): English Men of Science: their Nature and Nurture. London: Macmillan, pp 12-16.
10. Galton F (1875): The History of Twins, as a Criterion of the Relative Powers of Nature and Nurture. Fraser's Magazine 12: 566-576.
11. Galton F (1875): Short Notes on Heredity, etc., in Twins. J. Anthropol Inst 5: 324-329.
12. Galton F (1875): A Theory of Heredity. J. Anthropol Inst 5: 329-348.
13. Galton F (1875): The History of Twins, as a Criterion of the Relative Powers of Nature and Nurture. J Anthropol Inst 5: 391-406.
14. Galton F (1883): Inquiries into Human Faculty and Its Development. London: Macmillan, pp 216-243.
15. Galton F (1889): Natural Inheritance. London: Macmillan.
16. Galton F (1892): Finger Prints. London: Macmillan, pp 185-187.
17. Galton F (1908): Memories of my Life. London: Methuen, pp 22-47.
18. Kleinwächter L (1871): Die Lehre von den Zwillingen. Prague: Haerpfer.
19. Pearson K (1914-1930): The Life, Letters and Labours of Francis Galton (3 vols). Cambridge University Press.
20. Price B (1950): Primary biases in twin studies: a review of prenatal and natal difference-producing factors in monozygotic pairs. Am J Hum Genet 2: 293-352.
21. Spaeth J (1860): Studien über Zwillinge. Zschr Gesell Aerzte Wien 16: 225-231, 241-244.
22. Spaeth J (1862): Studies regarding twins [*English translation*] Edinburgh Med J 7: 841-849.
23. Twins and Fertility (1876): Live Stock Journal and Fancier's Gazette 3: 148.
24. Verschuer O von (1939): Twin research from the time of Francis Galton to the present day. Proc R Soc London Ser B 128: 62-81.

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