

A LIFE OF SIR FRANCIS GALTON

From African Exploration to the Birth of Eugenics

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Hereditary Talent and Character

I am inclined to agree with Francis Galton in believing that education and environment produce only a small effect on the mind of anyone, and that most of our qualities are innate.

—Charles Darwin¹

For Francis Galton, approaching middle age, the publication of Darwin's *On the Origin of Species* in 1859 "made a marked epoch in my own mental development, as it did in human thought generally."² He "devoured its contents and assimilated them as fast as they were devoured, a fact which may be ascribed to an hereditary bent of mind that both its illustrious author and myself have inherited from our common grandfather, Dr. Erasmus Darwin."³ Galton was encouraged to investigate topics that had long interested him, which "clustered round the central topics of Heredity and the possible improvement of the Human Race."⁴ From the outset Galton seemed to have been convinced that nature, and not nurture, determined human ability, but how was he to show it? He hit upon a fairly simple device, the pedigree, one that would remain an analytical mainstay for the rest of his life. He reasoned that if ability was determined by nature, a great man's closest male relatives were the most likely to exhibit exceptional qualities, with ability diluting out with hereditary distance. Women were omitted in his analysis because his Victorian mindset viewed notable achievement as principally a male prerogative. This had certainly been true in Great Britain and elsewhere until that time, largely because opportunities for female advancement beyond the home were virtually absent.

Galton's first statement on the subject, "Hereditary Talent and Character,"⁵ was a two-part article published in *Macmillan's Magazine* in 1865, which

opened a debate that continues to this day on the heritability of intelligence. In choosing *Macmillan's* Galton showed he intended to reach a wide, intellectually challenging audience.⁶ By the time his article was published in volume 12, the magazine had many distinguished contributors including Matthew Arnold and Herbert Spencer, and prominent scientists like Huxley and Lyell. Tennyson, Henry Wadsworth Longfellow, and Christina Rossetti, the “High Priestess of Pre-Raphaelitism,” published poetry in *Macmillan's*. Richard Blackmore, who would later write *Lorna Doone*, pleaded successfully with Macmillan to serialize *Craddock Nowell: A Tale of the New Forest*, while Henry Kingsley's second Australian novel, *The Hillyars and the Burtons: A Story of Two Families*, was appearing in monthly installments. The nonfiction articles published in *Macmillan's* ranged widely dealing with topics as diverse as Buddha and Buddhism, American humorous poetry, the Suez and de Lesseps, American protectionism, and the natural history of oysters. Thus *Macmillan's*, with its great breadth of coverage, would be an excellent vehicle for Galton's message.

He recognized he was proposing a heretical idea which would probably shock most of his readership. While most would agree that physical and some mental traits were inherited in animals, they were unprepared to acknowledge this to be true of human beings. The thesis Galton promoted was that human talent and character differed little from the more mundane traits discussed by Darwin to illustrate the selection and breeding of domestic animals and cultivated plants. They should therefore be subject to selection themselves. One imagines he would have noted this statement from Darwin's book. “We cannot suppose that all the breeds were suddenly produced as perfect and as useful as we now see them; indeed in many cases, we know that this has not been their history. The key is man's power of accumulative selection: nature gives successive variations; man adds them up in certain directions useful to him.”⁷

Galton's belief in the heritability of talent and character was reinforced not only by his own distinguished pedigree, but by Louisa's, and “by many obvious cases of heredity among the Cambridge men who were at the University about my own time.”⁸ To establish pedigrees for men of accomplishment, Galton examined works like *The Million of Facts* by Sir Thomas Phillips. From this he culled a select biography of 605 notable persons who lived between the years 1453 and 1853. He exulted because there were 102 notable relationships for a frequency of 1 in 6. He extended this analytical method to other lists and biographies, concluding that no less than eight out of every hundred sons of distinguished men were of equal eminence. Despite a strong prejudice in nature's favor, Galton acknowledged that nurture might also play a role, since the son of a great man “will be placed in a more favourable position for advancement, than if he had been the son of an ordinary person.”⁹ For comparison he tried estimating the frequency of men of ability in the population as a whole by rough determination of the number of students educated in Europe during the

four preceding centuries. He calculated that only 1 in 3,000 of these “randomly” selected individuals achieved eminence, concluding that “everywhere is the enormous power of hereditary influence forced on our attention.”¹⁰

The second part of Galton’s article was a discursive and rambling attempt to build upon his “demonstration” that talent is heritable. Here he began developing the notion that selective breeding could be used to enhance a “caste” having advantageous qualities, but to discourage propagation of a second caste with less desirable qualities. These notions were later to be embodied in the concepts of positive and negative eugenics. One of the most remarkable ideas elaborated in this paper, for which no scientific justification was presented, was that the embryos of the next generation sprang forth from the embryos of the preceding generation.^{11,12} This anticipated by almost 20 years August Weismann’s experimentally supported theory of the continuity of the germ line.¹³ This theory, central to modern biology, assumes that little passes between parent and child except that which is contained in the sperm and egg, leaving scant room for hereditary transmission of acquired characteristics unless, by some mysterious process, these congregate in the germ cells (see also chapter 13). Galton extended his view of the paramount role of heredity to racial differences having “collected numerous instances where children of low race have been separated at an early age from their parents, and reared as part of the settler’s family, quite apart from their own people. Yet, after years of civilized ways . . . they have abandoned their home, flung away their dress, and sought their countrymen in the bush, among whom they have subsequently been found living in contented barbarism without a vestige of their gentle nurture.”¹⁴

Galton thought highly of his own handiwork. Over 40 years later in his autobiography he wrote that “on re-reading these articles . . . considering the novel conditions under which they were composed . . . I am surprised at their justness and comprehensiveness.”¹⁵ Karl Pearson agreed. It “is really an epitome of the great bulk of Galton’s work for the rest of his life; in fact all his labours on heredity, anthropometry, psychology and statistical method seem to take their roots in the ideas of this paper. It might almost have been written as a résumé of his labours after they were completed, rather than as a prologue to the yet to be accomplished.”¹⁶ But the article evoked hardly a blip on the contemporary radar screen. He sent his friend Frank Buckland, a popular writer on natural history, an advance copy and Buckland thanked him profusely, saying his theory was “most excellent.”¹⁷ Galton was particularly pleased by one citation to “Hereditary Talent and Character,” as it came in Darwin’s book *The Variation of Animals and Plants under Domestication* (1868).¹⁸

The *Macmillan’s* papers were the precursors for Galton’s book *Hereditary Genius* (1869). There he used the same general method of gathering data on a much grander scale and applied the “bell curve” as an evaluative technique for the first time. He had been introduced to “the Gaussian Law of Probable Error”

by his old friend William Spottiswoode.¹⁹ In 1861 Spottiswoode published a paper in which he attempted to fit a normal curve to the distribution of direction of orientation of 11 mountain ranges to see whether they corresponded to a common "type."²⁰ Not unexpectedly, the fit was questionable, but the enthusiastic Spottiswoode concluded the agreement "although not perfect" was sufficient to conclude that the directions of the mountain ranges were "not accidental, and that the geologist and the physical philosopher will at least have good grounds for seeking some common agency which has caused their upheaval."²¹ Galton was undoubtedly aware of Spottiswoode's paper and, when Spottiswoode explained the normal curve to his friend, he was delighted by the "the far-reaching application of that extraordinarily beautiful law which I fully apprehended."²²

Galton now familiarized himself with the work of the Belgian scientist Adolph Quetelet who first applied the normal distribution to human measurements. Although Quetelet was the Astronomer Royal of Belgium, he gained international reputation not so much for astronomy, but as a statistician and population biologist.²³ In his first major attempt to fit the normal distribution to human data, Quetelet used published data on chest measurements taken from 5,738 Scottish soldiers to calculate the proportion of soldiers in each size class.²⁴ He estimated the expected probability for each size class using a symmetric binomial distribution. The agreement between the two distributions impressed Galton who, like Quetelet, was an incorrigible bean-counter always searching for the proper analytical tool with which to interpret his results.

In *Hereditary Genius* Galton used two systems of classification. The first categorized men by reputation, the method he had begun to develop in "Hereditary Talent and Character." He gathered data from the 1865 edition of *Dictionary of Men of the Time*, a biographical handbook. Since many of these individuals were past middle age, he decided to take as his baseline eminent men over 50 and compared them with men of similar age from the British population as a whole. He also employed the *Times* obituary list for 1868 to determine the number of eminent men who died during the previous year, choosing to exclude "old men who had earned distinction in years gone by, but had not shown themselves capable at later times to come again to the front."²⁵ Lastly, he consulted obituaries from many years back. Miraculously, each estimate gave approximately the same proportion of eminent men in the British population, 1 in 4,000. Thus, he had established a baseline against which he could compare his eminent men and their families.

Galton's second system classified men according to their performance on examinations. From a Cambridge mathematics examiner, he obtained sets of marks given over a period of two years for mathematical honors exams and compared their distributions. He found that mathematical ability was distributed over a wide range although the data showed a very distinct skew towards the low end. Next he introduced the normal curve (Fig. 12-1), citing Quetelet's

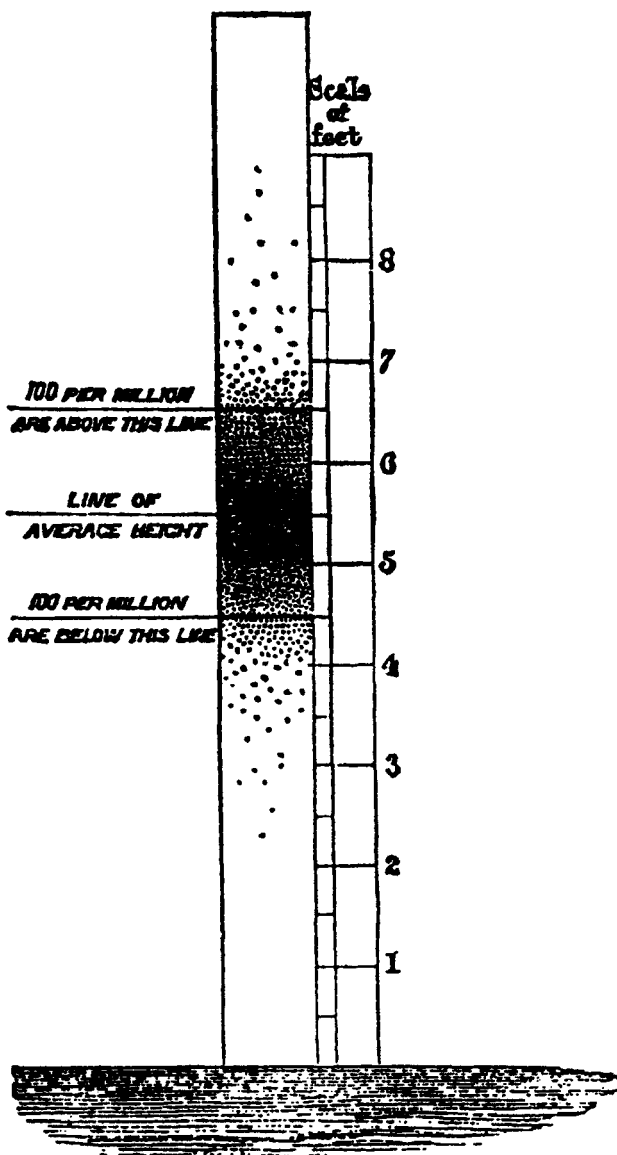


Fig. 12-1 Galton's first normal distribution. This is a hypothetical distribution in which Galton imagines that a million men have stood in turn with their backs to a board and that their heights have been dotted off on it. From Francis Galton, *Hereditary Genius*, second American edition. New York: Appleton, 1879, 28.

data on the Scottish soldiers and on the heights of French conscripts to show that observation fit expectation. But how could he apply the normal distribution to data for mental ability? There were no measurements of this faculty unless one believed in craniometry. As a proxy he used examination marks for admission to the Royal Military College at Sandhurst in 1868. Inspection of the data revealed a clear fit to the normal distribution at the upper tail of the curve and in its center, but for the dunces getting low scores there were no numbers as they had either eschewed competition or been "plucked." Assuming the male population of the United Kingdom to be 15 million, he next employed his earlier figure for the frequency of men of reputation (ca. 1 in 4,000) to establish both his highest and lowest (idiots and imbeciles) grades of natural ability and used a Gaussian distribution to calculate the expected number of individuals in each of twelve classes intermediate between the high and the low ends (Table 12-1).

CLASSIFICATION OF MEN ACCORDING TO THEIR NATURAL GIFTS.

Grades of natural ability, separated by equal intervals.		Numbers of men comprised in the several grades of natural ability, whether in respect to their general powers, or to special aptitudes.							
Below average.	Above average.	Proportionate, viz. one in	In each million of the same age.	In total male population of the United Kingdom, viz. 15 millions, of the undermentioned ages:—					
				20—30	30—40	40—50	50—60	60—70	70—80
a	A	4	256,791	651,000	495,000	391,000	268,000	171,000	77,000
b	B	6	162,279	409,000	312,000	246,000	168,000	107,000	48,000
c	C	16	62,563	161,000	123,000	97,000	66,000	42,000	19,000
d	D	64	25,696	39,800	30,300	23,900	16,400	10,400	4,700
e	E	413	2,423	6,100	4,700	3,700	2,520	1,600	729
f	F	4,300	233	590	450	355	243	155	70
g	G	79,000	14	35	27	21	15	9	4
x	X								
all grades below g	all grades above G	1,000,000	1	3	2	2	2	—	—
On either side of average			500,000	1,268,000	964,000	761,000	521,000	332,000	141,000
Total, both sides			1,000,000	2,536,000	1,928,000	1,522,000	1,042,000	664,000	293,000

The proportions of men living at different ages are calculated from the proportions that are true for England and Wales. (Census 1861, Appendix, p. 107.)

Example.—The class F contains 1 in every 4,300 men. In other words, there are 233 of that class in each million of men. The same is true of class f. In the whole United Kingdom there are 590 men of class F (and the same number of f) between the ages of 20 and 30; 450 between the ages of 30 and 40; and so on.

Table 12-1 Classification of Men According to Their Natural Gifts

But other than the Sandhurst examination marks, Galton had no way to determine whether ability in the population actually fitted a normal distribution, so he returned to his first classification method using reputation to measure ability. This allowed him to investigate whether ability had a heritable component. He asked rhetorically whether reputation was “a fair test of natural ability? It is the only one I can employ—am I justified in using it? How much of a man’s success is due to his opportunities, how much to his natural power of intellect?”²⁶ To ward off the objection that “opportunity” (i.e., nurture) was a significant component, Galton made three points. First, a man of natural ability would succeed even if brought up under humble circumstances. Conversely, a man of moderate ability would be unlikely to achieve eminence even if raised with great social advantages. This argument was undergirded with a strong hereditarian assumption. Second, while culture was more widespread in America than in England and education of the lower and middle classes more advanced, “America most certainly does not beat us in first-class works of literature, philosophy, or art. The higher kind of books, even of the most modern date, read in America are principally the work of Englishmen. The Americans have an immense amount of the newspaper-article-writer, or of the member-of-congress stamp of ability; but the number of their really eminent authors is more limited even than with us.”²⁷ Third, Galton compared sons of eminent men with adopted sons of Popes and other dignitaries of the Roman Catholic Church and thus anticipated the future use of adoption studies to study the heritability of intelligence. He asked “are, then, the nephews, etc., of the Popes, on the whole as highly distinguished as are the sons of other equally eminent men? I answer decidedly not.”²⁸

Having argued that reputation is a measure of natural ability, Galton was ready to analyze pedigrees of well-known statesmen, peers, military commanders, etc. English judges led off. This was appropriate as Galton had a useful reference, the *Lives of the Judges* by Foss, which covered the Judges of England from the Restoration in 1660 to 1865. The section on Judges was also the place where Galton honed his analytical tools for picking the eminent man and determining which male relatives were also eminent. His key assumption was that those male relatives most closely related to the eminent man (i.e., fathers, sons, brothers) were the most likely to be eminent with the probability of eminence decreasing with hereditary distance (e.g., uncles, grandfathers, grandsons). Although the pedigrees also contained information on female relatives, women were largely excluded from the analysis because Galton felt he could not compare “relations in the first degree of kinship—namely, fathers with mothers, sons with daughters, or brothers with sisters, because there exists no criterion for a just comparison of the natural ability of the different sexes.”²⁹

Once Galton had collected his raw data he conformed the observations from different generations and groups so they could be compared. He did this

by taking the number of eminent men (column A, Table 12-2), in this case for 85 families, and multiplied each number by approximately 1.18 (there were some small arithmetical errors) to adjust his results to 100 families (column B, Table 12-2). But to calculate the percentage of eminent men among fathers, sons, brothers, etc., he needed a denominator that could be divided into the figures in column B. This was easy for fathers, grandfathers, and great-grandfathers since they form a geometric progression. A hundred eminent men have a hundred fathers, two-hundred grandfathers, and four hundred great-grandfathers (column C, Table 12-2). However, sons, brothers, uncles, and nephews vary in number. How was Galton going to solve this problem? Based on the data available to him he made a series of assumptions. For instance, he calculated that his families consisted "on average of no less than 2 1/2 sons and 2 1/2 daughters each consequently each judge has 1 1/2 brothers and 2 1/2 sisters."³⁰ That is, "100 judges are supposed to have 150 brothers and 250 sisters,

DEGREES OF KINSHIP.					A.	B.	C.	D.	E.	
Name of the degree.	Corresponding letter.									
1 degree	Father	22 F.	---	---	---	22	26	100	26'0	9'1
	Brother	30 B.	---	---	---	30	35	150	23'3	8'2
	Son	31 S.	---	---	---	31	36	100	36'0	12'6
2 degrees	Grandfather . . .	7 G.	6 g.	---	---	13	15	200	7'5	2'6
	Uncle	9 U.	6 u.	---	---	15	18	400	4'5	1'6
	Nephew	14 N.	2 n.	---	---	16	19	400	4'75	1'7
	Grandson	11 P.	5 p.	---	---	16	19	200	9'5	3'7
3 degrees	Great-grandfather	1 GF.	1 gF.	0 GF.	0 gF.	2	2	400	0'5	0'2
	Great-uncle . . .	1 GB.	2 gB.	0 GB.	0 gB.	3	4	800	0'5	0'2
	First-cousin . . .	5 US.	2 uS.	1 US.	1 uS.	9	11	800	1'4	0'5
	Great-nephew . . .	7 NS.	1 nS.	7 NS.	0 nS.	15	17	800	2'1	0'7
	Great-grandson . .	2 PS.	2 pS.	1 PS.	0 pS.	5	6	400	1'5	0'5
All more remote .	---	---	---	---	12	14	?	0'0	0'0	

- A. Number of eminent men in each degree of kinship to the most eminent man of the family (85 families).
- B. The preceding column raised in proportion to 100 families.
- C. Number of individuals in each degree of kinship to 100 men.
- D. Percentage of eminent men in each degree of kinship to the most eminent member of distinguished families; it was obtained by dividing B by C and multiplying by 100.
- E. Percentages of the previous column reduced in the proportion of (286 - 24,¹ or) 242 to 85, in order to apply to families generally.

¹ That is to say, 286 Judges, less 24, who are included as subordinate members of the 85 families.

Table 12-2

PERCENTAGE OF EMINENT MEN IN EACH DEGREE OF KINSHIP TO THE MOST GIFTED MEMBER OF DISTINGUISHED FAMILIES.

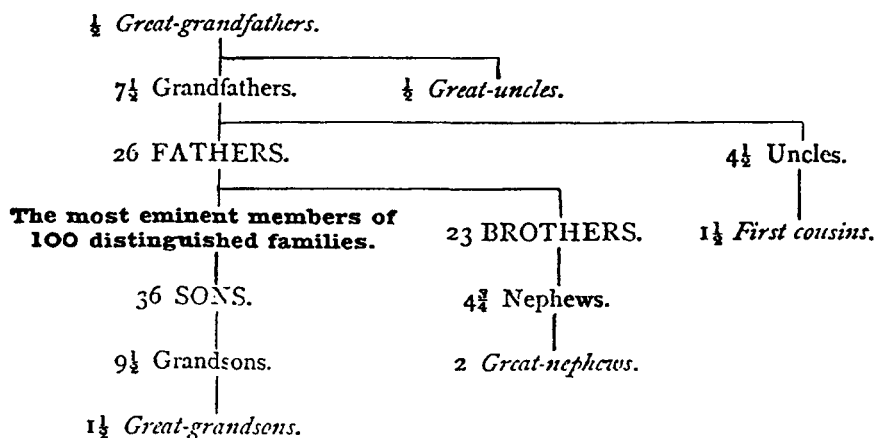


Fig. 12-2 Combined pedigrees for judges showing the percentage of eminent men in each degree of kinship to the most gifted member of these distinguished families. From Francis Galton, *Hereditary Genius*, second American edition. New York: Appleton, 1879, 83.

and each brother and each sister to have, on the average, only one son; consequently the 100 judges will have (150+250, or) 400 nephews."³¹ He divided the numbers he got (column C, Table 12-2) into the corrected number of eminent persons in each category (column B, Table 12-2) and multiplied by 100 to get the percentages shown in column D.

Galton's results seemed consistent with his hypothesis (Fig 12-2). He concluded that a close relative of the eminent man had a much higher probability of being eminent than one who was remote. "Speaking roughly, the percentages are quartered at each successive remove, whether by descent or collaterally."³² This meant that there was an "average increase of ability in the generations that precede its culmination, and as regular a decrease in those that succeed it."³³ So after "three successive dilutions of the blood, the descendants of judges appear incapable of rising to eminence."³⁴ His explanation was that an able man had to "inherit three qualities that are separate and independent of one another: he must inherit capacity, zeal, and vigour; for unless these three, or, at the very least, two of them, are combined, he cannot hope to make a figure in the world. The probability against inheriting a combination of three qualities not correlated together is necessarily in a triplicate proportion greater than it is against inheriting any one of them."³⁵ So Galton had made a novel prediction arguing that "capacity, zeal and vigour" segregate like genetically independent traits. This may help to explain why he became so infatu-

ated with Darwin's "Provisional Hypothesis of Pangenesis" (chapter 13). Pangenesis, in contrast to the popular blending or "paint pot" hypotheses of the day, supposed that particulate elements determined the inheritance of different traits. Ability, Galton believed, was a complex trait dependent on several hereditary elements whose behavior was not correlated.

Galton knew he must dispose of the conundrum of parental influence before he could proceed further. That is, a father aids his son in garnering a plum position and Galton scores the boy as eminent although his opportunities are enhanced by his environment and not necessarily because of a sterling hereditary endowment. To counter this objection Galton told a complex story about the Norths and the Montagues where the tendrils of influence intertwined around the pillar of ability so all encompassingly that one was difficult to separate from the other. However, Galton, pedigree and notes in hand, attempted the delicate job of disentangling the two. His second argument was that heredity must play the dominant role since ability was more frequent in near than distant kin of an eminent man.

Most other categories of eminent men were analyzed similarly. The pedigrees were not confined to Englishmen. Among commanders, for instance, one finds Caesar, Charlemagne, Bonaparte, and Hannibal. In one chapter Galton warned of the hazards of being made a peer to one's fecundity.³⁶ Lord Campbell in his *Lives of the Chancellors*, the Lord Chancellors being the highest judicial officers in Great Britain, observed that when he was first acquainted with the English Bar, half of the judges had married their mistresses, since when a barrister was elevated to the Bench he was expected either to marry his mistress or give her up. Hence, half the judges had no legitimate offspring and either married their girlfriends when both were getting on in age or discarded them. What puzzled Galton was that Lord Campbell's observation implied that judges should have small families while his own research indicated just the opposite. As he dug through his data he stumbled on something surprising. Being elevated to a peerage was a mixed blessing for a judge, as 12 of 31 peerages he examined had become extinct. Why had they? Galton examined his notes and "found a very simple, adequate, and novel explanation . . . stare me in the face."³⁷ Many new peers married heiresses. Although they were titled and perhaps had "a sufficient fortune to transmit to their eldest son" they needed additional funds "for the endowment of their younger sons and their daughters. On the other hand, an heiress has a fortune, but wants a title. Thus the peer and heiress are urged by the same issue of marriage by different impulses."³⁸ The reason why such marriages were peculiarly unproductive of children was "that an heiress, who is the sole issue of a marriage, would not be so fertile as a woman who has many brothers and sisters. Comparative infertility must be hereditary in the same way as other physical attributes, and I am assured it is so in the case of domestic animals."³⁹

So marriage to an heiress, while financially advantageous, brought with it the potential incubus of a barren union. In the Additional Notes to his epic poem, "The Temple of Nature," Galton's grandfather Erasmus Darwin made a similar point using somewhat different reasoning. "As many families become gradually extinct by hereditary diseases, as by scrofula, consumption, epilepsy, mania, it is often hazardous to marry an heiress, as she is not unfrequently the last of a diseased family."⁴⁰

The religious press was critical of *Hereditary Genius* and it is easy to understand why. He concluded that most Divines

are not founders of families who have exercised a notable influence on our history, whether that influence be derived from abilities, wealth, or social position of any of their members. That they are a moderately prolific race, rather under, than above the average. That their average age at death is a trifle less than that of the eminent men comprised in my other groups. That they commonly suffer from over-work. That they have usually wretched constitutions. That those whose constitutions are vigorous, were mostly wild in their youth; and conversely, that most of those who had been wild in their youth and did not become pious till later in life, were men of vigorous constitutions. That a pious disposition is decidedly hereditary. That there are also frequent cases of sons of pious parents who turned out very badly.⁴¹

The reason why the children of Divines often turned out poorly was that, while the parents were "naturally gifted with high moral characters combined with instability of disposition," "these peculiarities" were not correlated. Therefore, a child would often "inherit the one and not the other. If his heritage consist of the moral gifts without great instability, he will not feel the need of extreme piety; if he inherits great instability without morality, he will be very likely to disgrace the name."⁴² Galton dismissed Divines, concluding that they were not "an exceptionally favoured race in any respect; but rather, that they are less fortunate than other men."⁴³

While completing *Hereditary Genius*, Galton used his data on Divines for an article entitled "Statistical Inquiries into the Efficacy of Prayer,"⁴⁴ which he shipped off to the *Fortnightly Review*. This periodical, established in 1865, was, according Anthony Trollope, one of its founders, a forum that would allow any man "who had a thing to say and knew how to say it, speak freely. But he should always speak with the responsibility of his name attached."⁴⁵ In the arena of science the *Fortnightly* contained popular articles on topics as diverse as the nature of rainbows, atoms, and force. It also presented advances in medicine and meteorology. Darwin's theory of natural selection also held a prominent place in scientific discussions in the *Fortnightly*. Despite its reputation for openness, George Lewes, the well-respected critic, writer, and first

editor of the *Fortnightly*, found Galton's article too hot to handle. He wrote Galton that if he owned the *Fortnightly* he would not hesitate to publish the paper, but it would so offend his Christian proprietors that he had to turn it down as the manuscript was "too terribly conclusive and offensive not to raise a hornet's nest."⁴⁶ After a couple of more rejections Galton set his paper aside to gather dust until 1872 when he resubmitted his manuscript to the *Fortnightly*, whose new editor, John Morley, accepted it.

Galton began by trying to demolish the argument that prayer must be efficacious because it is so generally used. "The argument of universality either proves too much, or else it is suicidal. It either compels us to admit that the prayers of Pagans, of Fetish worshippers, and of Buddhists who turn praying-wheels, are recompensed in the same way as those of orthodox believers; or else the general consensus proves that it has no better foundation than the universal tendency of man to gross credulity."⁴⁷ Having washed his hands of universality Galton addressed the efficacy of prayer directly: "Are prayers answered or are they not?"⁴⁸ Stripped of its Victorian gentility, Galton's article took an in-your-face approach beginning with the ill. Did they recover more rapidly on average if they prayed or were prayed for? "There is not a single instance, to my knowledge, in which papers read before statistical societies have recognised the agency of prayer either on disease or anything else."⁴⁹ He hammered his point home, observing that medical men failed to use prayer in trying to cure people. "Had prayers for the sick any notable effect . . . doctors, who are always on the watch for such things, should have observed it, and added their influence to that of the priests towards obtaining them for every sick man."⁵⁰ What about life insurance? Insurers make lots of pointed inquiries, but do they ever ask how much the prospective client prays? You bet they don't. What about kings and queens? Did public prayer for the royals really help increase their longevity? This time Galton produced real data from an article in the *Journal of the Statistical Society* demonstrating that "sovereigns are literally the shortest-lived of all who have the advantage of affluence."⁵¹ So it went for case after case.

Galton wrote that many articles "of ancient faith have been successively abandoned by the Christian world to the domain of recognised superstition."⁵² Witches were one example. But he raised a cautionary finger. He had not argued that praying would fail to make a person feel better, nor had he said anything about the degree to which a man can communicate with his God. For scientists like himself he sketched a silver lining to the clouds of doubt hanging over God's existence. They were not excluded from the "confident sense of communion" and well-being a believer could muster, since the beauty of understanding the physical laws, among which Galton included hereditary influence, "may not equally rejoice the heart, but it is quite as powerful in ennobling the resolves, and it is found to give serenity during the trials of life and in the shadow of approaching death."⁵³

The article might have engendered little commentary had not an anonymous writer for the *Spectator* quickly penned a withering critique published on August 3. Evidently confusing Francis Galton with his cousin Captain Douglas Galton, the author pointed to the hidden agenda he suspected scientists like Galton harbored, who argued “that if prayer is not answered, and cannot be answered, then there is in the Christian, or rather the religious, sense of the word no God.”⁵⁴ But “we are not bound to submit patiently to arguments such as those by which Captain Francis Galton . . . thinks he has disposed of the efficacy of Prayer.”⁵⁵ He quickly summarized Galton’s evidence “which we will not dispute” referring to Galton’s argument as “a direct attempt to weight mental consequences in a pair of brass scales.”⁵⁶ Then he pitched in with his own counterarguments, ending his attack by recognizing the enduring power of the cross. “If the absence of protection for churches from lightning and of kings from early death are proofs that prayer is useless, then the victory of Christianity and durability of the Popedom are greater, because more certain and visible proofs that prayer is useful.”⁵⁷

The *Spectator* article provoked such a torrent of correspondence that only a selection of letters could be printed. On August 17 the magazine felt compelled to publish another piece that acknowledged “a heap of letters, all about prayer, sent us for publication in two days, which would fill, as nearly as we can calculate, sixteen pages of this journal.”⁵⁸ But there was a curious thread in many letters. While most were “written, as was natural, from the supernatural side” a great many bore “a trace of feeling we had scarcely expected to find, a strong desire on the part of many persons who believe in a sentient God, and some of who are apparently Christians, to get rid of the difficulties of the subject by reducing without denying the efficacy of prayer.”⁵⁹ Darwin, hugely entertained by the row his cousin’s article caused, congratulated Galton on the “tremendous stir-up your excellent article on ‘Prayer’ has made in England and America.”⁶⁰ Louisa was probably not amused, as she failed to mention her husband’s paper in her *Record*.

Overall, Galton’s results in *Hereditary Genius* seemed to support his thesis that talent and character were largely determined by nature as the approximately 300 families he had studied contained nearly 1,000 eminent men compared to the frequency of 1 in 4,000 he estimated for the population as a whole. Furthermore, the closer the kinship to the eminent man the higher the probability of distinction. To check whether he had weighted his results toward cases favorable to his hypothesis, he sought a set of eminent names gathered by an independent method embracing the list of the French philosopher Auguste Comte, the founder of the school of positivism. This was a clever idea for Comte, desirous of forming a “Religion of Humanity,” selected a series of names he thought represented those to whom human progress was most indebted and incorporated them into the Comtist Calendar. The elite

were assigned months, the next lower class weeks, and the third class days. Comte's calendar contained 13 months with each having four weeks. Galton was highly pleased with the degree of overlap between his list and Comte's, as Comte's list depended on perceived merit independent of heredity.

He also tried ascertaining the relative contributions of male and female lineages to the transmission of ability, reporting that the male line contributed 70 percent and the female line 30 percent except, of course, in the case of Divines where the reverse was true. He suggested that the explanation for this strong male bias was that "the aunts, sisters and daughters of eminent men do not marry, on the average, so frequently as other women."⁶¹ He theorized that the underlying reasons were that these privileged ladies were "accustomed to a higher form of culture and intellectual and moral tone in their family circle, than they could easily find elsewhere" especially since "one portion of them would certainly be of a dogmatic and self-asserting type, and therefore unattractive to men" while "others would fail to attract, owing to their having shy, odd manners, often met with in young persons of genius."⁶² This logic is, perhaps, more revealing of Galton and prevailing Victorian views about women than of his peculiar findings.

Galton tried generalizing from individuals to races but, lacking data, attempted logic. He compared "the negro race with the Anglo-Saxon, with respect to those qualities alone which are capable of producing judges, statesmen, commanders, men of literature and science, poets, artists, and divines."⁶³ He had earlier calculated a theoretical normal distribution that classified Englishmen according to their natural gifts and now stated that the curves for blacks and Anglo Saxons do not superimpose, but that the curve for blacks is shifted downward by "not less than two (of Galton's) grades . . . and it may be more."⁶⁴ One can't help but be reminded of two similar normal distributions of IQ for blacks and whites in *The Bell Curve*⁶⁵ (1994). They fail to superimpose because of a perceived 15 point mean IQ differential favoring whites. Furthermore, wrote Galton, an explorer "has to confront native chiefs in every inhabited place. The result is familiar enough—the white traveller almost invariably holds his own in their presence. It is seldom that we hear of a white traveller meeting with a black chief whom he feels to be the better man."⁶⁶ And he again restated his observation that the proportion of half-witted blacks is very large. Thus did Galton extrapolate his results from individuals to races. This temptation to leap from trying to understand and explain actual data to the grand and sweeping generalization whose basis derives only from personal observation and prejudice has often been a hallmark of studies on genes, intelligence, and behavior.

In what would probably have been the book's last chapter, were it not for the publication of Charles Darwin's "Provisional Hypothesis of Pangenesis" (chapter 13), Galton marched grandly onwards to the natural abilities of na-

tions. His theme was straightforward. The average age of marriage has a threefold effect on a population. Since those marrying young have larger families, produce more generations in a given period of time, and more generations are alive at the same time, the wisest policy is one that retards “the average age of marriage among the weak, and . . . hastens . . . it among the vigorous classes; whereas most unhappily for us, the influence of numerous social agencies has been strongly and banefully exerted in the precisely opposite direction.”⁶⁷ In this statement Galton encapsulated an argument he would return to later in his own writings about eugenics and one which would be repeatedly voiced by eugenicists in the early twentieth century. He also excoriated the church once more, blaming it for the twin evils of the dark ages and for blighting the hereditary endowment of future generations because of celibacy requirements. These meant that men and women inclined to charity, meditation, literature, or the arts would often be childless, ensuring that “the rudest portion of the community” would be “the parents of future generations.”⁶⁸ Equally serious for Europe’s intellectual stunting were the religious persecutions that had brought thousands of the most able to the scaffold, to lengthy imprisonment depriving them of the opportunity to have children, or to attempt escape via emigration to more tolerant lands.

What was the contemporary reaction to Galton’s book? “Frank’s book not well received, but liked by Darwin and men of note”⁶⁹ was Louisa Galton’s laconic comment to her diary. Indeed Darwin did like it, for on December 3, 1869 he wrote that he had

only read about 50 pages of your book (to Judges), but I must exhale myself, else something will go wrong with my inside. I do not think I ever in all my life read anything more interesting and original—and how well and clearly you put every point! George [Darwin’s son George Charles Darwin], who has finished the book, and who expressed himself in just the same terms, tells me that the earlier chapters are nothing in interest to the later ones! It will take me some time to get to these latter chapters, as it is read aloud to me by my wife, who is also much interested. You have made a convert of an opponent in one sense, for I have always maintained that, excepting fools, men did not differ much in intellect, only in zeal and hard work; and I still think this is an *eminently* important difference. I congratulate you on producing what I am convinced will prove a memorable work. I look forward with intense interest to each reading, but it sets me thinking so much that I find it very hard work; but that is wholly the fault of my brain and not of your beautifully clear style—Yours most sincerely, (signed) Ch. Darwin.⁷⁰

Among the letters Galton received were two from Miss Emily Shirreff who, with her sister Maria Grey, was a pioneer in the cause of women’s educa-

tion in Great Britain.⁷¹ She wrote fervently of the miserable social system existing in Victorian England that drove “women to marry for subsistence or position.”⁷² Fathers supposed that most of their daughters were willing to live in idleness “till a husband takes them off their hands . . . while the abler, the more energetic, the most fit to be the mothers of a better generation will revolt against the injustice of our social arrangements, and struggle singly for an independent position; thereby sacrificing at once the interests of society and some of the highest cravings of their own nature.” Emily Shirreff had made a key point that recurs repeatedly in the eugenics literature. Because they were ambitious, the fittest women eschewed marriage in favor of a career, thereby leaving production of the next generation to women less well endowed intellectually.

Hereditary Genius was widely reviewed in British newspapers and periodicals. The *Daily News* commented that “Mr. Galton undertakes to show, and to a large extent undoubtedly succeeds in showing, that genius is equally transmissible, and that ability goes by descent.”⁷³ The *Times* was more critical, observing that “Darwinian theories are capable of infinite expansion” and Galton asserted that “mental and moral, as well as physical, phenomena may be controlled by their application.”⁷⁴ The paper differed strongly with his view that heredity predominated in determining genius. “Mr. Galton is a little too anxious to array all things in the wedding garment of his theory, and will scarcely allow them a stitch of other clothing.”⁷⁵ The long review in *Chambers’s Journal* began flatteringly that “whoever likes a ‘book with a purpose’ will welcome Mr. Galton’s work on *Hereditary Genius*.”⁷⁶ But, as Galton later recognized, the writer correctly pointed out that genius was the wrong word, as he really meant talent. The reviewer also observed that ability appeared more frequently among descendants rather than progenitors of the eminent man, suggesting that he might “have stretched out to them a helping hand.”⁷⁷ The *Morning Post* began skeptically that “no proposition is so extravagant as to be without some portion of truth” and concluded that “the author’s statistics only recapitulate the numerous individuals who have distinguished themselves in every walk of life . . . but they fail altogether in attempting to confirm the continuous descent of genius.”⁷⁸ The *Saturday Review* took Galton to task for having “bestowed immense pains upon the empirical proof of a thesis which from its intrinsic nature can never be proved empirically.”⁷⁹ He had spread “his net so largely” that he succeeded in securing “evidence which we can but characterize as largely mediocre,” which pointed “with infinitely greater truth” to the influence of culture “than to anything of the nature of inherent genius following upon a strain of blood.”⁸⁰ One of the most perceptive reviews was by the political economist Herman Merivale.⁸¹ While acknowledging the role of heredity in determining ability, Merivale, writing in the *Edinburgh Review*, identified the central weakness in Galton’s thesis. Using judges as an example, Merivale observed that some 100 out of the 250 eminent relatives tabulated by

Galton were lawyers themselves. This had little to do with the inheritance of “a special talent of the lawyer, but much to do with the ability of a judge to influence his son to enter a legal career.”⁸² Overall most reviewers felt that Galton had overstated the case for heredity while insufficiently emphasizing the role of environment.

Victorian scientists were the most receptive to Galton’s book.⁸³ The codiscoverer of the theory of natural selection, Alfred Russel Wallace, wrote in *Nature* that many “who read it without the care and attention it requires and deserves, will admit that it is ingenious, but declare that the question is incapable of proof. Such a verdict will, however, by no means do justice to Mr. Galton’s argument.”⁸⁴ The religious press was negative, as was to be expected since Galton was quite comfortable treading on the soul. One can imagine Galton, but perhaps not Louisa, chuckling at scathing, but anonymous reviews in the *Catholic World* and the *British Quarterly Review*, a Congregationalist/Baptist journal of criticism.⁸⁵ Another group of reviews fell in the middle, finding Galton’s work interesting and valuable, but criticizing the exclusiveness of Galtonian hereditarian views over social and educational factors.⁸⁶ How did Galton react to these criticisms? In the prefatory chapter to the 1892 reissue of the book, he commented that the “fault in the volume that I chiefly regret is the choice of its title of *Hereditary Genius*, but it cannot be remedied now. There was not the slightest intention on my part to use the word genius in any technical sense, but merely as expressing an ability that was exceptionally high, and at the same time inborn.”⁸⁷

Right or wrong, Galton had launched a revolutionary new theory into the public arena that propounded a strict hereditarian view of intellectual capacity, and with it a methodology that would become a mainstay in human genetics, pedigree analysis. When *Hereditary Genius* was reissued, unchanged except for a new preface, almost a quarter of century later in 1892, it was warmly praised in the popular press. As the *Nation* put it, when Galton first published *Hereditary Genius* “it was commonly believed that the human mind had something supernatural in it” and that “children were born similar in mental ability, subsequent differences being due to surroundings and training.”⁸⁸ But Galton had set out to show “that individuals inherit different intellectual capacities” and irrespective of environmental influences, “nature limits the powers of the mind as definitely as those of the body. On these points, among thinkers everywhere, the author’s opinions have prevailed.”⁸⁹ The *Blackburn Standard* echoed this view, sternly warning fathers that heredity was a science they “should know something of, to aid them in determining what pursuits and careers their sons are most likely fitted for.”⁹⁰ And the *National Reformer* approvingly chorused “what was a good book on its publication, is a good book still.”⁹¹ The *Daily Chronicle* wrote the epitaph for “the old notion of the ‘freedom of the will,’ which is still assumed in belated treatises,” but which now “in confor-

mity with the explanation of mental phenomena given by evolution, had been displaced by 'determinism,' or the doctrine that our actions are 'determined'; that fate, chance, and accident are as fully excluded from the operations of the mind as they are from those parts of the body and universe of which man is a part."⁹² So Galton, solid as a rock, had stuck unwaveringly to his hereditarian conviction for a quarter of a century and popular opinion had bent round so far that *Hereditary Genius* was recognized as a prophetic classic.

134. *DNB*, 23 (1901–1911): 166–68.

135. Mill, *The Record of the Royal Geographical Society, 1830–1930*, III.

Chapter 11: Weather Maps and the Anticyclone

1. Gisela Kutzbach, *The Thermal Theory of Cyclones: A History of Meteorological Thought in the Nineteenth Century* (Boston: American Meteorological Society, 1979), 58.

2. *Illustrated London News* 22 (October 29, 1853): 362.

3. *Life*, II: 21–22.

4. *Ibid.*, 22.

5. Francis Galton, “On Stereoscopic Maps, taken from Models of Mountainous Countries,” *J. of the Royal Geographical Society* 35 (1865): 99–104.

6. *Life*, II: 36–40.

7. Kutzbach, *The Thermal Theory of Cyclones*. The account of the evolution meteorological theory and the making of weather maps is taken largely from this source.

8. H. Landsberg, “Storm of Balaklava and the Daily Weather Forecast,” *The Scientific Monthly* 7 (1954): 347–52.

9. A. J. Barker, *The Vainglorious War 1854–56* (London: Weidenfeld & Nicolson, 1970), 196.

10. *Illustrated London News* 25 (Dec. 12, 1854): 576.

11. *Ibid.*

12. *Ibid.*

13. *Ibid.*

14. *Ibid.*, (Dec. 16, 1854): 606.

15. Roger Warren Prouty, *The Transformation of the Board of Trade 1830–1855* (London: William Heinemann Ltd., 1957). Chapter 3 discusses the role of the Board of Trade in regulating merchant shipping and the meteorological office.

16. This sketch of FitzRoy’s life is drawn from the book by H. E. I. Mellersh, *FitzRoy of the Beagle* (London: Rupert Hart-Davis, 1968) and from the *DNB*, 7, 207–9.

17. *Illustrated London News* 35 (Nov. 5, 1859): 448.

18. *Ibid.*, 441.

19. *Ibid.* (Nov. 12, 1859): 467.

20. *Memories*, 230–231.

21. H. Mellersh, *FitzRoy of the Beagle*.

22. *Times*, 18 June 1864.

23. *Ibid.*

24. *Ibid.*

25. *Daily News*, 2 May 1865.

26. *GA*, List No. 118/1.

27. *Ibid.*

28. *Ibid.*

29. *Ibid.*

30. *Ibid.*

31. *Ibid.*

32. *Ibid.*

33. *Ibid.*

34. *Ibid.*

35. *Life*, II: 53–58.

36. Francis Galton, “Barometric Predictions of Weather,” *British Association Report* 40 (1870): 31–33. Also in *Nature* 2 (1870): 501–3.

37. *Life*, II: 55.

38. *Ibid.*, 58.

39. *DNB*, 17:563–65; *DSB*, 12:49–53.

40. *Memories*, 227.

41. *Life*, II: 80.

42. *Memories*, 154–55.

43. *Victorian Genius*, 86.

44. *Ibid.*

45. *Ibid.*

46. *GA*, List No. 53, Louisa Galton’s diary.

47. *Ibid.*

48. *Memories*, 155.

Chapter 12: Hereditary Talent and Character

1. *Life*, I: 1

2. *Memories*, 287–88.

3. *Ibid.*, 287–88.

4. *Ibid.*, 287–88.

5. Francis Galton, “Hereditary Talent and Character,” *Macmillan’s Magazine* 12 (1865): 157–66, 318–27.

6. See *Macmillan’s Magazine* vols. 1, 2, 7, 10, and 12 for the articles mentioned. The discussion of the founding of *Macmillan’s Magazine* is taken from Charles Morgan, *The House of Macmillan (1843–1943)* (New York: The Macmillan Company, 1944), chap. 4 and 5.

7. Charles R. Darwin, *On The Origin of Species by Means of Natural Selection, or the Preservation of Favored Races in the Struggle for Life* (J. Murray: London, 1859), 29.

8. *Memories*, 288.

9. Galton, *Macmillan’s Magazine*, 12: 161.

10. *Ibid.*, 163.

11. *Ibid.*, 322.

12. Ruth Schwartz Cowan, *Sir Francis Galton and the Study of Heredity in the Nineteenth Century* (Ann Arbor, MI, 1969), 30–31.

13. *Ibid.*, 30.

14. Galton, *Macmillan’s Magazine*, 12: 326.

15. *Memories*: 289.

16. *Life*, II: 86.

17. *Ibid.*, 87.

18. Charles R. Darwin, *The Variation of Animals and Plants under Domestication*, Second Edition (London: John Murray & Sons, 1875), reprinted in the *Works of Charles Darwin*, ed. Paul H. Barrett and R. B. Freeman (London: William Pickering, 1988), 20.

19. *Memories*, 304.
20. William Spottiswoode, "On Typical Mountain Ranges: An Application of the Calculus of Probabilities to Physical Geography," *J. of the Royal Geographical Society*, 31 (1861): 149–54.
21. *Ibid.*
22. *Memories*, 304.
23. Stephen M. Stigler, *The History of Statistics: The Measurement of Uncertainty before 1900* (Cambridge: Belknap Press, Harvard University, 1986), 169.
24. *Ibid.*, 206–9.
25. Francis Galton, *Hereditary Genius: An Inquiry into its Laws and Consequences* Revised edition (Appleton: New York: 1879), 10.
26. *Ibid.*, 37.
27. *Ibid.*, 40.
28. *Ibid.*, 42.
29. *Ibid.*, 62.
30. *Ibid.*, 82.
31. *Ibid.*, 82.
32. *Ibid.*, 83.
33. *Ibid.*, 84.
34. *Ibid.*, 84.
35. *Ibid.*, 84.
36. *Ibid.*, chapter 8.
37. *Ibid.*, 131.
38. *Ibid.*, 132.
39. *Ibid.*, 132.
40. Desmond King-Hele, *Doctor of Revolution: The Life and Genius of Erasmus Darwin* (London: Faber & Faber, 1977), 296.
41. Galton, *Hereditary Genius*, 274.
42. *Ibid.*, 282.
43. *Ibid.*, 274.
44. Galton, "Statistical Inquiries into the Efficacy of Prayer," *Fortnightly Review* 12 (1872): 125–35.
45. Edwin Mallard Everett, *The Party of Humanity: The Fortnightly Review and its Contributors 1865–1874* (Chapel Hill: The University of North Carolina Press, 1939). The descriptive material included in the text is abstracted from the first four chapters of this interesting book. The quote from Anthony Trollope is on p. 18.
46. *GA*, List No. 120/4.
47. Galton, *Fortnightly Review* 12: 126.
48. *Ibid.*, 126.
49. *Ibid.*, 127.
50. *Ibid.*, 127.
51. *Ibid.*, 128.
52. *Ibid.*, 134.
53. *Ibid.*, 135.
54. *Spectator*, 3 August 1872, 974–75.
55. *Ibid.*
56. *Ibid.*
57. *Ibid.*
58. *Ibid.*, 17 August 1872, 1038–39.
59. *Ibid.*
60. *Life*, II: 175.
61. Galton, *Hereditary Genius*, 328.
62. *Ibid.*, 328.
63. *Ibid.*, 338.
64. *Ibid.*, 338.
65. Richard Herrnstein and Charles Murray, *The Bell Curve* (New York: Free Press, 1994).
66. Galton, *Hereditary Genius*, 339.
67. *Ibid.*, 352–53.
68. *Ibid.*, 357.
69. *GA*, List No. 53, Louisa Galton's diary.
70. *Memories*, 290.
71. *Life*, II: 132–33; *DNB*, 18: 144–45.
72. *Life*, II: 132.
73. *The Daily News*, 16 December 1869; *GA*, List No. 120/5.
74. *Times*, 7 January 1870; *GA*, List No. 120/5.
75. *Ibid.*
76. *Chambers's Journal* 7 (February 10, 1870): 118–22; *GA*, List No. 120/5.
77. *Ibid.*
78. *Morning Post*, *GA*, List No., 120/5. Date is missing from clipping.
79. *Saturday Review*, December 25, 1869, 832–833; *GA*, List No. 120/5.
80. *Ibid.*
81. Emel Aileen Gökyigit, "The Reception of Francis Galton's *Hereditary Genius* in the Victorian Periodical Press," *J. History of Biology* 27 (1994): 215–240.
82. *Ibid.*, 231.
83. *Ibid.*, 215–40.
84. *Ibid.*, 221.
85. *Ibid.*, 223–26.
86. *Ibid.*, 229.
87. Francis Galton, *Hereditary Genius: An Inquiry into its Laws and Consequences* (London: Macmillan & Co., reissue of 1892), viii.
88. *Nation*, 6 April 1893; *GA*, List No. 192.
89. *Ibid.*
90. *Blackburn Standard*, 3 December 1892; *GA*, List No. 192.
91. *National Observer*, 4 February 1893; *GA*, List No. 192.
92. *Daily Chronicle*, 28 October 1892; *GA*, List No. 192.

Chapter 13: Gemmules, Rabbits, Germs, and Stirps

1. *Memories*, 288.
2. Ruth Schwartz Cowan, *Sir Francis Galton and the Study of Heredity in the Nineteenth Century* (Ann Arbor, Michigan, 1969), 96–98; Galton's copy of Charles R. Darwin, *The Variations of Ani-*