THE CORRESPONDENCE OF CHARLES DARWIN

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THE CORRESPONDENCE OF CHARLES DARWIN

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Letters acquired after the publication of the first edition of the *Calendar*, in 1985, have been given numbers corresponding to the chronological ordering of the original *Calendar* listing with the addition of an alphabetical marker. Many of these letters are summarised in a 'Supplement' to a new edition of the *Calendar* (Cambridge University Press, 1994). The markers 'f' and 'g' denote letters acquired after the second edition of the *Calendar* went to press in 1994.

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10745. *[1877–81]. To be published in a future supplement.*
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INTRODUCTION

Ever since the publication of *Expression of the emotions*, Darwin's research had centred firmly on botany. The year 1877 was no exception. The spring and early summer were spent completing *Forms of flowers*, his fifth book on a botanical topic. He then turned to the mysterious role of the waxy coating (or 'bloom') on leaves and fruit, and to the movement of plants, focusing especially on the response of leaves to changing conditions. He also worked intermittently on earthworms, for the most part gathering observations made by others. With the exception of bloom, each of these projects would culminate in a major publication. Darwin's botany was increasingly a collaborative affair with his son Francis, who had moved back to Down House after the death of his wife, Amy, the previous year. He assisted his father's research on movement and bloom, and Darwin in turn encouraged his son's own work on plant sensitivity and digestion. William, who had contributed to some of the early research on heterostyly, provided further observations on this, as well as on bloom. He most pleased his father, however, by his engagement to Sara Sedgwick, an American from a family that the Darwins had befriended.

The year 1877 was more than usually full of honours. Darwin received two elaborate photograph albums for his birthday in February. These lavish gifts had been many months in preparation, and involved hundreds of contributors from Germany, Austria, and the Netherlands. Closer to home, Darwin received an honorary Doctorate of Laws from Cambridge University. He returned to his alma mater in November to hear a Latin oration composed specially for the occasion. He avoided dinner parties and used his spare time to scout sites for possible earthworm activity. Now in his 69th year, Darwin remained remarkably productive, and was happiest when at work on topics requiring careful observation and experiment, and little or no controversy.

In his autobiographical reflections, Darwin remarked: 'no little discovery of mine ever gave me so much pleasure as the making out the meaning of heterostyled flowers' ('Recollections', p. 419). During the winter and spring, Darwin was busy preparing the manuscript of *Forms of flowers*, an expansion and reworking of five papers on sexual dimorphism and trimorphism that he had written between 1861 and 1868 and presented to the Linnean Society of London. In the book, Darwin adopted the more recent term 'heterostyled' to describe the different flower forms, distinguished in part by the lengths of their pistils and stamens, that appeared in hermaphroditic species such as *Primula*, *Linum*, and *Lythrum*. 'I will rank no plant as dimorphic without comparing pollen-grains & stigmas', Darwin remarked to Joseph Dalton

Hooker on 25 January. He had been troubling Hooker and others at Kew gardens for more plants to aid his research, and he alluded here to the complexity of the work, namely that the length of the pistil or style was only one of many adaptations that had evolved to promote crossing between individuals of the same species, and even between flowers on the same plant. In effect, such forms were related to each other like males and females of unisexual animals. Through extensive crossing experiments, and painstaking measurements of the size and number of pollen-grains, Darwin compared the fertility of individual flowers and plants across a range of common species, such as the primrose and purple loosestrife. In the course of his work, Darwin found a number of other structures and behaviours that facilitated crossing, especially with the aid of insects: the size and shape of pollen-grains, the position of stigmatic surfaces, the bending of the styles after opening, and the differential maturation of male and female parts in hermaphrodite flowers.

The winter was spent gathering more evidence and renewing contact with correspondents such as Daniel Oliver, Friedrich Hildebrand, Fritz Müller, and John Scott who had provided initial observations. 'It is dreadful work making out anything about dried flowers', Darwin complained to Asa Gray on 8 March, 'I never look at one without feeling profound pity for all botanists, but I suppose you are used to it like eels to be skinned alive.' By this time he felt satisfied with his research: 'I now know on fairly good evidence of 39 genera, in 14 Families, which include heterstyled species. This pleases me.' Darwin dedicated the book to Gray, 'as a small tribute of respect and affection'. He hinted as much in his letter of 4 June: 'you will see I have done an audacious deed with respect to you.' Drawing his separate publications together into a larger whole enabled Darwin to advance more speculative views on the origin of different flower forms, such as the evolution of monoecious and dioecious plants from hermaphrodites whose male or female organs had become aborted. He touched on the origin of separate sexes in the conclusion, suggesting that it could have arisen as an energy-saving measure: 'it might then be highly beneficial to [a plant] that the same flower or the same individual should not have its vital powers taxed, under the struggle for life to which all organisms are subjected, by producing both pollen and seeds' (*Forms of flowers*, p. 344). Darwin was typically pessimistic about the popularity of his book, writing to Robert Cooke on 11 April, 'though I believe it is of value, it is not likely that more than a few hundred copies w^{d} be sold'. His publisher knew from previous experience that Darwin was a poor judge of sales, and printed 1250 copies. A second printing would be ordered the following year.

Soon after completing his manuscript of *Forms of flowers*, Darwin took up the problem of 'bloom' in plants. This waxy coating on the leaves and fruit was, like dimorphism, a well-known botanical characteristic whose purpose was little understood. Darwin had begun studying bloom in August 1873, but had broken off to concentrate on insectivorous plants. He resumed experiments in the spring, writing to Fritz Müller on 14 May, 'I have made many observations on the waxy secretion on leaves which throw off water … & I am now going to continue my observations.'

He requested a large number of plants from Hooker on 25 May, adding, 'I often wish that I could be content to give up all scientific work & then I sh^{d} bother no one, but I find that I cannot yet endure to be an idler.' Dozens of letters were exchanged between Down and Kew over the next six months. Darwin corresponded most often with the assistant director, William Turner Thiselton-Dyer, who wrote on 16 July, 'assisting you is a relief in the general monotony of routine. I am delighted to send you anything you want and would transfer the whole establishment to Down if it lay in my power and you thought it w^{d} help you.' 'I declare had it not been for your kindness, we sh^{d} have broken down', Darwin wrote back on 5 September. 'As it is we have made out clearly that with some plants (chiefly succulent) the bloom checks evaporation.— with some certainly prevents attacks of insects— with some sea-shore plants prevents injury from salt-water—& I believe with a few prevents injury from pure water resting on leaves'. In the end, Darwin did not publish on the subject, but Francis later reported some of the results of their experiments in his article 'On the relation between "bloom" on leaves and the distribution of the stomata' (F. Darwin 1886).

Alongside his work on bloom, Darwin resumed observations on the movement of leaves in response to different conditions, such as rain, wind, temperature, and light. While staying with William in Southampton he made notes on *Acacia* and *Robinia* following heavy rain, and asked his son to continue the observations. 'I got out within 2 minutes of a very heavy shower', William wrote on 24 August 1877. 'The leaves were not at all depressed; but were covered with drops of water looking like quicksilver so that the tree quite glistened. … The drops seemed to stick closely to the leaves and required a tolerable shake'. Darwin gained another valuable observer in the foreman of the propagating department at Kew, Richard Irwin Lynch, who sent specimens and detailed observations on leaf motion in *Averrhoa bilimbi* (cucumber tree) and *Desmodium gyrans* (telegraph plant). 'He is a good fellow but nurses a private ambition to be a "Professor"', warned Thiselton-Dyer, who seems to have shared Hooker's suspicion of ambitious gardeners (letter from W. T. Thiselton-Dyer, 25 August 1877).

At Down House, Darwin and Francis devised a method of recording leaf motion for extended periods. In a letter to Thiselton-Dyer of 11 October, Darwin described how the movements of the seed-leaves or cotyledons of red cabbage were traced over time: 'Bristle was gummed to 1 Cot. & beyond it a triangular bit of card was fixed & in front a vertical glass. A dot was made in glass every ¼ or ½ hour at point where end of bristle & apex of card coincided, & the dots were joined by straight lines.' This method effectively transferred the movement of leaflets to a piece of blotting paper; a pencil tracing captured the circumnutating motion at different times of day and night, and under different conditions of light and temperature. 'I expect to find such movements very general with cotyledons', he continued, '& I am inclined to look at them as the foundation for all the other *adaptive* movements of leaves…. I am all on fire at the work.' One of these adaptive movements was 'sleep', or the vertical position assumed by leaves at night to protect them from cold.

Lynch carefully observed the phenomenon in a *Euphorbia* (spurge) plant at Kew. Darwin then asked him to disturb the plant while sleeping to see whether it was able to resume its nocturnal habit: 'will you be so good as to shake the shoot for a couple of minutes, or … tap one of the young leaves with a delicate twig' (letter to R. I. Lynch, 14 September 1877). Research on movement would continue over several years. Plants would be dragged from their hothouse homes at night, their leaves, bound so that they were unable to sleep, would shrivel and die in the cold. Observations would be extended to the roots of plants and involve more elaborate experimental designs and makeshift instruments with thread, card, and bits of glass.

Darwin greatly enjoyed working with Francis, and encouraged his son's independent research. Using the facilities at Down and Kew, Francis pursued questions that had been raised by his father on plant digestion and sensitivity. He measured the size and vigour of *Drosera* (sundews) that that been fed a steady diet of meat. His findings answered a number of Darwin's critics who had questioned whether plants actually derived benefit from insect matter. He also discovered tiny filaments protruding from glandular hairs in the cups formed by the leaves of fuller's teasel (*Dipsacus sylvestris*, a synonym of *D. fullonum*). He thought that the protrusion was analogous to the aggregation of protoplasm found in insectivorous plants like *Drosera*, enabling the plant to absorb nitrogenous matter. His work on teasel was sent to the Royal Society of London by Darwin, who confessed to Hooker on 25 January, 'I know that it will make you savage, but I think the great honour of its being printed in the R. Soc. Transactions, (sh^{d}. the referees so order) would stimulate his zeal & make him think better of his work'. Hooker replied on 2 March, 'I cannot tell you with what pride & satisfaction I heard Frank deliver his communication last night.— He spoke slowly, clearly, & at ease, & was perfectly heard & understood'. An abstract appeared in the society's *Proceedings*, but the council decided not to publish the full paper. A disgruntled Darwin reported to George John Romanes on 23 May, 'the Council have refused to print Frank's paper on the Teazle glands.… I have not been so much mortified for many a year; but he does not care much, all such things being mere trifles to him.' Darwin suspected that the referees were sceptical of the paper's conclusions regarding protoplasm, and consoled himself by sending the paper to the eminent German botanist Ferdinand Julius Cohn, who confirmed Francis's observations: 'the most curious appearance in those protuberances was a constant *waving undulation* along their extension, sometimes slower and difficultly perceivable, sometimes vigourous and quicker—but never ceasing; more delicate filaments appeared to me *very like to Vibrio*, or to the vibratory flagella of some Infusoria' (letter from F. J. Cohn, 5 August 1877). Francis's paper eventually appeared in the *Quarterly Journal of Microscopical Science* in July 1877 (F. Darwin 1877b), and Darwin sent Cohn's letter vindicating his son's research to *Nature* on 15 August.

A notable departure from botanical work came in April, when Darwin submitted his paper 'Biographical sketch of an infant' to the journal *Mind*. The journal had been founded the previous year, and it featured a number of articles on evolutionary psychology. Darwin was prompted to send his paper after reading an essay by the

French philosopher Hippolyte Taine, 'On the acquisition of language by children'. He wrote to the editor, George Croom Robertson, on 27 April 1877, 'I hope that you will be so good as to take the trouble to read the enclosed M. S.… I cannot judge whether it is worth publishing, from having been so so much interested in watching the dawn of the several faculties in my own infant.' Darwin's study of child development was based on a notebook of observations he had begun in 1839 with the birth of his first child, William. He had used some of this material in *Descent* and *Expression*, but its separate publication placed the work in the emerging field of child psychology, and the article attracted immediate attention from other researchers. William Preyer requested a copy and shared some of his own observations of newborn children and guinea pigs: newborns sucked a finger placed in their mouths when their heads were just out of the womb. Preyer went on to publish *Die Seele des Kindes* (The mind of the child; Preyer 1882), based partly on observations of his son Axel.

Translations of Darwin's paper were prepared in French and German even before it was published in English. In Germany, the article appeared in the journal *Kosmos*, where it formed part of an ongoing debate about the development of colour sense. Darwin had written to the editor Ernst Krause on 30 June 1877, 'I have been much interested by your able argument against the belief that the sense of colour has been recently acquired by man.… I attended carefully to the mental development of my young children … [and] was startled by observing that they seemed quite incapable of affixing the right names to the colours in coloured engravings, although I tried repeatedly to teach them. I distinctly remember declaring that they were colour blind'. Krause included these remarks, which did not appear in Darwin's original observation notebook, at the end of the translation of Darwin's article. Krause had argued, in keeping with Darwin's own views, that colour sense had developed in the animal kingdom at an early stage of evolutionary history, and that all human groups had the same physiology of colour perception, though this was not always expressed in language. The inability of young children to discriminate colours was thus a problem of language acquisition, not vision. The wider debate about colour perception included philologists and classical scholars, including the eminent politician William Ewart Gladstone. Darwin wrote to Gladstone on the subject and later sent his article and copies of *Kosmos* covering the German debate (letters to W. E. Gladstone, 2 October 1877 and 25 October [1877]). Gladstone was inspired to undertake further research on colour vocabulary in Homeric texts: 'I think the evidence is conclusive that Homers discrimination of colour was as defective as his sense of form and of motion was exact and lively' (letter from W. E. Gladstone, 23 October 1877).

When the first issue of *Kosmos* appeared in April 1877, its larger aim was announced in the subtitle: *Zeitschrift für einheitliche Weltanschauung auf Grund der Entwickelungslehre in Verbindung mit Charles Darwin und Ernst Haeckel* (Journal for uniform worldview based on the theory of development in connection with Charles Darwin and Ernst Haeckel). Writing to Darwin on 11 March 1877, Krause declared the journal 'an intellectual

tie realising your own live connexion with the exceedingly vast number of your admirers in Germany'. This connection had been amply demonstrated the previous month, when Darwin received a large album with photographs of German and Austrian scientists. Production of the album had been overseen by Emile Rade, a civil servant active in the Westphalian Provincial Society for Science and Art. In a letter to Darwin written before 16 February, he described the contributors as 'German representatives of free scientific research … united in the firm resolution: to hold high through all darkness the torch you, Sir, have lit, and to assist in letting it become a sun for present and future generations'. Bound in velvet with an ornate frontispiece and a dedicatory poem, the album contained 165 photographs, arranged by institution. The most prominent 'torchbearer' was Ernst Haeckel, whose portrait appeared first and was the only one full-page in size. Haeckel sent a personal letter of congratulation on 9 February, expressing some dissatisfaction that the album was 'not more splendid', and that a number of outstanding naturalists had not contributed. Darwin later received a few portraits from persons not included in the album, and a series of poems by the Austrian writer Friedrich Adler (see Appendix VI). One admirer did not send a photograph. The zoologist Carl Gottfried Semper wrote on 26 April to explain: 'I am of opinion that a man ought not to make a present with such bad portraits as photographs are. … The best photograph of a scientific man is to my understanding his scientific work.' Semper honoured Darwin by dedicating his latest publication, 'On visual organs of the vertebrate eye type on the backs of slugs' (Semper 1877b), to him.

The German album had been in the making for some months, and Darwin had learned about it in advance from Otto Zacharias. He was unaware, however, that another birthday present was being prepared by his admirers in the Netherlands. This one was also lavishly bound with red velvet and silver embossing. The arrangement of the photographs was quite different, however. All portraits were equal in size and arranged alphabetically. The contributors were much more diverse in background and profession, and included students, schoolteachers, and artists as well as scientific and medical professionals (see Appendix V). The album arrived with a long letter from the director and secretary of the Dutch Zoological Society, whose council had organised the production. Darwin thanked the director, Adriaan Anthoni van Bemmelen, on 12 February 1877: 'I suppose that every worker at science occasionally feels depressed, & doubts whether what he has published has been worth the labour which it has cost him; but for the few remaining years of my life, whenever I want cheering, I will look at the portraits of my distinguished co-workers in the field of science, & remember their generous sympathy.' Both albums received much publicity in the newspapers. It appears, however, that the Germans and Dutch had miscalculated Darwin's age. The Dutch album and the letters from Rade and Haeckel both refer to Darwin's 69th birthday, and it is likely that the albums were intended to commemorate the beginning of his 70th year. Darwin was in fact 68 on 12 February 1877.

Fame for Darwin continued to involve requests for autographs, photographs, and visits from distinguished persons. Gladstone came to Down on 11 March. 'I expected

a stern, overwhelming sort of man,' Darwin reported, 'but found him as soft & smooth as butter' (letter to C. E. Norton, 16 March 1877). Hooker was asked repeatedly by the emperor of Brazil, Pedro II, to arrange a meeting: 'he suggested that I should write to Owen & offer himself you & me to dejeuner!!!' (letter from J. D. Hooker, 14 June 1877). Darwin was staying in Southampton with William during the emperor's visit, and so could politely decline. In January, he was contacted by Christopher Columbus Graham, an American entrepreneur with a large natural history collection and other memorabilia in Kentucky. The request came with special instructions that he reply on a sheet of paper of particular size and on one side only: 'I aim to get five letters … from yourself, Tyndall, Huxley, Spencer and Draper … inclosed in a large spledid frame, for our Musium and cabinet of Natural History, where I hope it may remain for centuries to come' (letter from C. C. Graham, 30 January 1877). Graham then gave a lengthy account of his adventurous life. Orphaned at an early age, he had soldiered in three wars, been imprisoned and nearly burned at the stake, collected fossils, amassed a fortune in property, and was now in his 94th year still battling superstition and ignorance in the name of science: 'I am not John the baptist from the wilderness of locusts and wild honey and girdled about with leather, but one from the far wilderness … of coons, opossums, wild beasts and savage forms'.

Revered by some, Darwin continued to arouse ire in others. 'Your system is the negation of God,' a French writer complained, 'your school … flows to the brim in materialism…. I oppose you in the interests of truth, of man and of societies' (letter from Marcellin de Bonnal, [1877]). A similar complaint came from the island of Chios, where Darwin was called 'that wretched monkey's descendant', and rebuked along with 'the scoundrel Voltaire' in a sermon by the Archimandrite Gregorios. 'It is as great an honour to be abused by an archimandrite', Darwin quipped, 'as according to the old story to be horsewhipped by a duke!' (letter to J. M. Rodwell, 3 June 1877). Back home, he learned from his brother that he had been slighted by the famous Victorian sage Thomas Carlyle, who had visited Down on several occasions in 1875. Carlyle had apparently remarked to an American visitor, 'A good sort of man is this Darwin, and well meaning, but with very little intellect…. And this is what we have got to. All things from frog spawn; the gospel of dirt the order of the day' (letter from E. A. Darwin, 27 January [1877]). Carlyle's remarks were reported in a letter to a Scottish newspaper, and were allegedly verified by witnesses, though he insisted it was an 'infernal lie', and sent Darwin his compliments. More worryingly, Darwin was accused of giving credence to racist prejudice in *Descent of man*. In a letter from an unknown correspondent on 13 June 1877, he was criticised for having quoted from an article by William Rathbone Greg on the 'careless, squalid, unaspiring Irishman [who] multiplies like rabbits'. The passage had been cited in *Descent* 1: 174 as an example of the possible failure of natural selection as applied to humans, and Darwin in fact removed some of Greg's most inflammatory statements from the quotation. To his correspondent, who identified himself only as 'an Irishman', such a passage, appearing in 'a great Scientific work destined to go to all Time and into all languages', was unworthy of the book and of its author.

Apart from his study of children and emotional expression, Darwin had done very little research on 'man'. As the author of *Descent*, however, he was widely regarded as a leading theorist of human evolution, and his correspondence became a great repository for curious facts and more dubious claims about human ancestry. The German zoologist and physician Carl Theodor Ernst von Siebold sent photographs of a sixteenth-century family with the surname Gonzales who had been celebrated in the courts of Europe for having hair all over their bodies. The photographs were made from paintings that hung in a castle in Innsbruck, and showed the hairy father, his son and daughter, and the non-hairy mother, the subjects of Siebold's study of medical monstrosity (letter from C. T. E. Siebold, 10 October 1877). An American banker, William Burrows Bowles, having read Ernst Haeckel on 'Pithecanthropus alalus' (or speechless ape-man), the hypothetical missing link of human evolution, offered his own theory of 'Speaking Monkies': 'They live in our midst … marry our sons and daughters, and by the intermingling of their impure and animal blood, … contaminate our blood and thus keep back our civilization' (letter from W. B. Bowles, 17 May 1877). Bowles proposed that such species were the offspring of forced 'co-habitation' between African women and male monkeys, whose progeny were then sold into slavery, the females becoming mistresses and wives of 'men of the white race'. In a follow-up letter he warned, 'you find them in multituds among the higer classes where often a superficial polish serves to hide the absence of humanity beneath' (letter from W. B. Bowles, 18 May 1877).

More transitional human forms were discovered around the world. The naval officer Arthur Mellersh, an old shipmate of Darwin's on the *Beagle* voyage, called his attention to a *Times* report announcing 'the discovery of Mr. Darwin's "missing link"' among the inhabitants of Kalili harbour in New Guinea, who reportedly had hard inflexible tails (letter from Arthur Mellersh, 1 January 1877). The American physician Jesse Portman Chesney sent anatomical details of a new 'specimen' found in Colorado, a man seven-and-a-half-feet tall with hand-like feet and arms of great length. 'The prime distinguishing feature', wrote Chesney on 28 October, 'is its caudal member.—a veritable tail'. Chesney was doubtful of its authenticity, however; and the specimen was later revealed as a hoax, crafted to resemble a fossil by a model-maker. The giant's 'discoverer', William Conant, was a colleague of the showman Phineas Taylor Barnum. Visitors were charged twenty-five cents to view the creature, and Chesney even hoped that Darwin would cross the Atlantic for its inspection.

More serious discussion of evolutionary theory was prompted by other correspondents. While continuing to work on grafting experiments with the aim of testing Darwin's theory of pangenesis, George Romanes sent Darwin lengthy notes made some years before about whether natural selection operated on individual organisms, or on groups or 'types'. A similar problem had been raised by Henry Charles Fleeming Jenkin in a review of the fourth edition of *Origin*, namely that variations in a single individual, no matter how favourable, would be lost through blending and swamped within a larger population ([Jenkin] 1867). Darwin had

addressed this criticism in *Origin* 5th ed., pp. 104–5, by clarifying that natural selection could act on variations that frequently recurred in populations. 'The point in question has not been a difficulty to me,' he replied to Romanes on 11 June, 'as I have never believed in a new form originating from a single variation…. Natural selection always applies, as I think, to each individual & to its offspring, such as its seeds, eggs'. Regarding the grafting experiments, which still bore little result, Darwin repeated the advice given in Anthony Trollope's novel, *The last chronicle of Barset*, to the poor clergyman Crawley, beset by difficulties: 'it is dogged as does it; & I have often & often thought this is the motto for every scientific worker. I am sure it is yours if you do not give up Pangenesis with wicked imprecations' (Trollope 1867; letter to G. J. Romanes, [1 and 2 December 1877]).

Darwin would need such determination himself against a new critic, Samuel Butler. A strong supporter of Darwin in earlier years, Butler had visited Down House and become friendly with George and Francis. He wrote to Francis on 24 September 1877 about his forthcoming work, *Life and habit*, 'as mad mad mad as a book can be'. Though he disclaimed its 'scientific value', he confessed in a letter of 25 November 1877 that the book had 'resolved itself into a down right attack upon your father's views of evolution'. 'I have read the Pangenesis three times … I feel the want of something to "boss" the whole embryological Process'. Butler believed that the answer lay in Lamarck's theory of inherited habit, which he reworked into his own account of 'organic memory', tracing the origin of characteristics in animals and even plants to 'memories' that had been acquired over many generations and become unconscious, gradually taking the form of instincts, reflexes, and organic structures. 'As for "natural selection"', he wrote to Francis on 25 November, 'frankly to me it now seems a rope of sand as in any way accounting for the "*origin* of species."' Butler's letters expressed much personal doubt and vexation, but they were unapologetic. A protracted and bitter dispute would unfold over the next few years.

Controversy was stirred by other correspondents who tried to recruit Darwin to their social cause. After reading an account of African elephants becoming drunk on the fruit of the Umganu tree, the temperance campaigner Warren Maud Moorsom asked whether animals could develop a taste for liquor in the wild: 'If this be a fact it is, I think, confirmatory of the idea that the passion for intoxicating drink which so many men exhibit is in many cases purely physical' (letter from W. M. Moorsom, 10 September 1877). Darwin was doubtful of the elephant story, but he thought that monkeys would take to alcohol if it was available: 'I heard lately of a publican who keeps several monkeys & his customers give them drink so that they become quite tipsy' (letter to W. M. Moorsom, 11 September [1877]). Moorsom replied with righteous enthusiasm. Here was proof that the passion for alcohol was '*natural* to mankind' and that remedial measures were useless: 'we might as well expect chastity among men in a country where brothels were at every corner held by respectable people and licensed by the state' (letter from W. M. Moorsom, 13 September [1877]). The only remedy was to ban the sale of liquor and label it a poison.

Another reformer, Charles Bradlaugh, sought Darwin's support for the cause of birth control. Bradlaugh, along with Annie Besant, had reprinted a pamphlet by an American physician that advocated contraception within marriage as a means of checking population. Darwin had credited his reading of Thomas Malthus's *Essay on population* as a cornerstone of his evolutionary theory, and Bradlaugh evidently thought that he would be supportive of birth-control measures to reduce the poverty of the poor. Darwin however was quite opposed to contraception, and warned that should he testify he would be forced to give his true opinion: 'any such practices would in time spread to unmarried women & wd destroy chastity, on which the family bond depends; & the weakening of this bond would be the greatest of all possible evils to mankind' (draft letter to Charles Bradlaugh, 6 June 1877). Darwin enclosed an extract from the second edition of *Descent*, p. 618, which presented population pressure as a natural spur to improvement: 'if [man] is to advance still higher it is to be feared that he must remain subject to a severe struggle … hence our natural rate of increase, though leading to many and obvious evils, must not be greatly diminished by any means'.

Darwin's concern for social welfare was expressed largely through charitable activities. In the village, he had helped to found the Down Friendly Club in 1850 and served as its treasurer for many years. Members contributed by annual subscription and funds were distributed to persons in need. In 1877, there was a move to dissolve the organisation, probably in response to new regulations involving more oversight of friendly societies by the state. Darwin printed a circular dated 19 February strongly urging the members to stay the course, warning that it was their best safeguard against the degradation of being supported by the Poor Law Union: 'It is no pleasure to me to keep your accounts … except in the hope of doing some small good to my fellow Members, who have hitherto always treated me in a considerate and friendly manner.' He wrote to John Brodie Innes, the former vicar of Down, on 25 February : 'I gave the club a long harangue, which I think produced some effect; at least it acted like a bomb-shell for all the members seem to have quarrelled for the next two hours.' Darwin's advice was heeded and the club continued, although a portion of its savings was withdrawn and distributed to members later in the year.

In addition to regular charitable giving, Darwin occasionally helped friends and colleagues in financial distress, and contributed to public memorials. Darwin's reputation for generosity was evidently widespread, for he began to receive petitions from strangers. The writer Francis Lloyd, who was in poor health and living abroad, possibly in Greece or Turkey, asked Darwin to help raise a subscription for his further work. Lloyd had written a critique of Francis Galton's theory of heredity in 1876, but as he was a philosophical writer rather than a scientific researcher, Darwin thought such a fund hopeless. 'On painful occasions like the present', he counselled, 'it is the best plan to speak without any reserve, & as I think you must be at present in want of cash, I hope that will allow me to send you a cheque for £10' (letter to [Francis Lloyd], 1 May [1877]). Another appeal came from Germany and went straight to the point: 'I am a forester of scientific learning— I have entered some debts….'

A repayment scheme was proposed, discretion was promised, and apologies were given for 'bad English' (letter from Frederick Schwerzfeger, 29 August 1877).

Darwin's generosity also found an outlet in wedding presents. September brought a very happy occasion with the engagement of William to Sara Sedgwick. She was the daughter of Theodore Sedgwick, an American legal theorist, and his wife, Sara. Her sister and brother-in-law, Susan and Charles Norton, had stayed at Keston Rectory near Down in 1868 and had visited Down House. Darwin was delighted. He worried that his future daughter-in-law would find Southampton a dull place, but he did his best to recommend William: 'his temper is beautifully sweet & affectionate & he delights in doing little kindnesses' (letter to Sara Sedgwick, 29 September [1877]). It was decided to keep the engagement a secret until news could reach Sara's family in the United States. After a visit from a family friend, Elinor Dicey, Darwin wrote to Henrietta on 4 October , 'You ought to have seen your mother she looked as if she had committed a murder & told a fib about Sara going back to America with the most innocent face…. what nonsense all this secrecy is … I hope they may be soon buckled fast together'. The couple were married on 29 November. 'I enclose my marriage present', Darwin wrote to William on 3 October, 'I fear that Sara will think it atrociously unsentimental' (he gave the couple 300 guineas); 'but I hope useful. Your old father wishes you both with all his soul as much happiness as this world can give.'

More cause for celebration came in November when Darwin's alma mater, the University of Cambridge, awarded him an honorary doctorate of laws. Darwin learned about it from George before the official announcement, and he considered declining in order to avoid the ceremony. 'They are going to formally offer you the L.L.D degree', George wrote before 28 May 1877, 'please do not answer by return of post as there is no hurry as I want to write about the manner of refusal if refuse you must'. George tried to reassure him on 28 May 1877: 'They say you have never received any recognition by any public bodies of England & that y^{r}. own University w^{d}. like to be the first…. the whole thing would barely last quarter of an hour'. Darwin consented, 'I can endure the thoughts of coming up & being hooted, at or cheered, but whether my courage will be up to the mark hereafter is another question' (letter to G. H. Darwin, 30 May [1877]). Darwin made the journey with Emma and Bessy. George, Francis, Leonard, and Horace also attended. The ceremony was held on 17 November in Senate House, and included an oration on Darwin's scientific life and work: 'With what intimate knowledge … he discourses of so many things—whatever flies, whatever swims, whatever creeps on the ground … with what generosity he takes under his patronage not only "the golden generations of peacocks", but also the less beautiful family of apes' (see Appendix VII). Levity was provided by undergraduates who lowered a stuffed monkey in academic dress from the ceiling and cheered for 'the primeval man' (*Cambridge Chronicle*, 24 November 1877, p. 4). According to Emma, Darwin remained 'quite stout and smiling' throughout the ceremony (*Emma Darwin* (1915), 2: 230), and he described the event to Hyacinth Hooker on 18 November 1877: 'There was a tremendous crowd &

hooting & cheering at the Senate House yesterday, with a suspended monkey &c; but I believe the cheering was more than the groaning which I thought was all against me, but was mostly against an unpopular proctor.' Darwin stayed three nights, but declined a room in the Master's lodge at Christ's College, and avoided dinner at the Cambridge Philosophical Society. 'I am not able to spend an evening even at home without lying down to rest', he explained (letter to J. W. Clark, 12 November 1877).

Aside from plants and infants, worms were Darwin's main object of study and reflection in 1877. In August, he observed their activity at the ruins of a Roman villa near Thomas Farrar's home in Surrey; and Farrer sent him a 'worm journal' with entries made almost daily on the number of holes, tracks, and casts on his property. 'Such a diary was never kept before', Darwin remarked on 24 September , 'I had not the least expectation of your taking such extraordinary pains … will you look once again to see how the worms go on.' Ancient remains and archaeological sites were key places of observation for Darwin. He and his sons visited Stonehenge to measure the depth of great monuments that had gradually sunk from the burrowing of worms. Horace started building a 'wormograph' to measure the rate at which stones were buried (letter from Francis Darwin, [28 October 1877?]). Horace went with Francis to examine the excavations of the Roman town at Silchester with the superintendent James Gerald Joyce, who sent reports and diagrams of worm activity inside the stone walls, much to his surprise: 'I should have said, and did say, that it was perfectly impossible such a wall could be penetrated by, or could contain, any earth worms' (letter from J. G. Joyce, 15 November 1877). Even at Cambridge, Darwin found time for scientific observation. Having lunched with George in Trinity College, he spotted evidence of worms in one of the courtyards, and asked his son to make a closer inspection: 'Please find out when Cloisters in Neville Court are swept & examine just before the time so as to see whether any connection between sagging of pavemts & castings' (letter to G. H. Darwin, 21 November [1877]). It is revealing of where Darwin's true passion lay, that he would absent himself from the evening festivities held in his honour (Thomas Henry Huxley delivered a rousing speech at the Philosophical Society dinner), and busy himself instead with observations of these humble creatures and their silent, steady work beneath the earth.

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