
Darwin's Early Reading of Lamarck

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include incidental botanical notes (added by Bernard Paludanus in the latter) on Indian plants.

The Portuguese were instrumental in introducing several important plants from the Malay Archipelago, East Indies, and the New World into India.³⁹ Notable among these are the cashew nut (*Anacardium occidentale* Linn.), pineapple (*Ananas sativa* Schutt), sweet potato (*Ipomoea batatas* Choisy), cassava (*Manihot utilissima* Pohl) (all introduced from Brazil), sapodilla (*Achras sapota* Linn.), century plant (*Agave americana* Linn.), custard apple (*Anona squamosa* Linn.), groundnut (*Arachis hypogaea* Linn.), averrhoa (*Averrhoa bilimbi* Linn.), and chili peppers (*Capsicum frutescens* Linn.) from other New World countries. They also helped in the diffusion of some useful plants formerly restricted to certain regions of the country: for example, turmeric (*Curcuma zedoaria* Rosc.), which grew wild in the eastern Himalayas and in moist deciduous forests

³⁹P. Maheshwari and R. N. Kapil, "A Short History of Botany in India," *Journal of the University of Gauhati*, 1958, 9:1-34. K. L. Mehra, "Portuguese Introduction of Fruit Plants into India," *Indian Horticulture*, 1965, 10 (1): 8-12, 36; (3): 9-12, 32; (4): 23-25, 31.

of coastal tracts of Kanara, was spread to other parts of India.⁴⁰

Briefly, then, the Portuguese enjoyed a monopoly on the oriental trade for a short period. Their primary interest lay in disposing of their merchandise lucratively and in procuring commodities in demand elsewhere. Nonetheless, the credit for renewing interest in the plants of India, for creating awareness among foreigners of Indian economic flora, and for introducing several useful plants into this country is due to the Portuguese. This is fully evidenced by Garcia da Orta's book, which has been summarized in or translated into Latin, Italian, French, and English. The full impact of Portuguese contributions to Indian botany cannot, however, be appreciated until this and other relevant works lying scattered in Indian and European libraries are fully analyzed. With the improvement of the political atmosphere in Lisbon and an increased cooperation with universities of Portugal, we expect to obtain additional information on this subject.

⁴⁰W. Dymock, G. J. H. Warden, and D. Hooper, *Pharmacographia Indica* (London, 1890).

DARWIN'S EARLY READING OF LAMARCK

By Frank N. Egerton III*

The general outlines of Darwin's intellectual history are well known, but as yet there has been no detailed account of it, and some of the histories that are available are biased or otherwise unsatisfactory. A detailed documentation of Darwin's intellectual history is desirable because of the importance of his work, because of the per-

sistent controversy over the extent of his originality, and because of the availability of evidence for this documentation. The purpose of this note is to illustrate how his unpublished papers can improve our understanding of his intellectual history.

Because of the persistent doubts that have been expressed about Darwin's originality, and even his integrity, I wish to say at the start that I do not myself interpret the following illustration as evidence for such doubts. These doubts materialized from the nature

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of his work and his time and especially, I believe, from the conjunction of the following three factors. First, his theory was a comprehensive and synthetic one, drawing upon the work of many other naturalists as well as his own. Second, he published his theory in a detailed monograph after twenty years of work, rather than piecemeal as his ideas developed. He believed that this was necessary because of the prevailing hostility to evolutionary ideas among the majority of contemporary naturalists. However, this delayed publication made less clear the sources of his ideas than a series of papers would have.

Third, in his desire to separate himself from the earlier discredited evolutionists he took almost no notice of them in the first edition of *The Origin of Species*. That policy backfired, because it provided Richard Owen with an opportunity to imply in a long, hostile, and anonymous review that Darwin had inadequately acknowledged his indebtedness to his predecessors.¹ Darwin responded to that implication by writing an "Historical Sketch" which he added to the German translation of *The Origin* (1860) and to the third (1861) and later English editions. This sketch is interesting, but it did not lay to rest the question of what Darwin's intellectual debts were. He owed very little, if anything, to most of the thirty-six authors he discussed, but he was considerably indebted to others, such as Humboldt, Lyell, and Malthus, who had not defended theories of evolution and were not included in the sketch.

The "Historical Sketch" was, then, a literature review and not a brief intellectual autobiography. However, for the historian interested in Darwin's development it inevitably becomes grist in the mill. This note is meant to correct a false impression which that sketch leaves concerning Darwin's reading of Lamarck.

Among the interesting questions that

one can ask about Darwin are when and how did he change his belief from that of a special creationist to that of an evolutionist? He wrote a prodigious number of letters during his lifetime, but there are none close to the period when the change occurred that provide a definite answer to these questions. In his old age he recalled the following relevant dates and events:

When I was on board the *Beagle* I believed in the permanence of species, but, as far as I can remember, vague doubts occasionally flitted across my mind. On my return home in the autumn of 1836 I immediately began to prepare my journal for publication, and then saw how many facts indicated the common descent of species, so that in July, 1837, I opened a note-book to record any facts which might bear on the question; but I did not become convinced that species were mutable until, I think, two or three years had elapsed.²

This recollection seems to have been recorded without his consulting his own notes which he had saved from the 1830s. According to a recent assessment of the evidence, Darwin actually abandoned his belief in the fixity of species at the end of 1836,³ and his "Notebooks on Transmutation" (1837–1839) reveal none of the lingering doubts which he later remembered.

It seems odd that the circumstances of this major shift in Darwin's thinking cannot be better documented. This is probably because evolution was a discredited minority opinion, causing a young naturalist to feel reluctant to announce a commitment to an unpopular idea for which he could provide only slender evidence. He would want to collect more evidence

² *More Letters of Charles Darwin: A Record of His Work in a Series of Hitherto Unpublished Letters*, ed. Francis Darwin and A. C. Seward (London: John Murray, 1903), Vol. I, p. 367.

³ Camille Limoges, *La sélection naturelle. Étude sur la première constitution d'un concept (1837–1859)* (Paris: Presses Universitaires de France, 1970), p. 19.

¹ *Edinburgh Review*, 1860, 111:487–532.

before disclosing his ideas to even his closest friends.⁴

Furthermore, even as early as, say, 1837, when he began writing his first notebook on transmutation, Darwin would probably have found it difficult to evaluate the progression of all his thoughts on evolution. His first exposure to evolutionary concepts had occurred before he went on the voyage of the *Beagle*, but that had not converted him to an evolutionary viewpoint. Of what significance, therefore, was that exposure for his later change of mind? He considered this question when he wrote his *Autobiography* in 1876 and thereafter, and he thought it "probable that the hearing rather early in life such views maintained and praised may have favoured my upholding them under a different form in my *Origin of Species*."⁵

From the context of his statement it seems clear that he placed greater weight upon the possible influence of his grandfather Erasmus Darwin's *Zoonomia* (Vol. I, 1794) than upon the influence of Lamarck. He apparently had read the *Zoonomia* at home before going off to college to Edinburgh in November 1826, and it does seem likely that his grandfather's words would be more significant for him than the ideas of Lamarck.

In his *Autobiography* Darwin also described his first awareness of Lamarck's theory. A zoologist with whom he collected animals along the coast, Dr. Robert Edmund Grant, advocated the theory: "He one day, when we were walking together burst forth in high admiration of Lamarck and his views on evolution. I listened in silent aston-

ishment, and as far as I can judge, without any effect on my mind."⁶ If one reads the natural history notes which Darwin made during his stay in Edinburgh,⁷ one gets the impression that he was oriented toward descriptive studies and that his theoretical curiosity was still largely dormant. That being the case, it is understandable that he responded with only passing surprise to Grant's remarks.

Nevertheless, his *Autobiography* conveys the impression that he at least made the connection in his mind between the ideas of Lamarck and his grandfather—and there the story seems to end. But actually there was more. Among the few notes that Darwin saved from his two years in Edinburgh is a classification chart which he copied, mainly in English translation, from Lamarck's *Système des animaux sans vertèbres* (1801).⁸ His transcription

⁶ *Ibid.* Thomas Henry Huxley later attested to Grant's ineffectiveness in propagating evolution: "Within the ranks of the biologists, at that time [1851–1858], I met with nobody, except Dr. Grant, of University College [London], who had a word to say for Evolution—and his advocacy was not calculated to advance the cause." In *Life and Letters of Charles Darwin*, London ed., Vol. II, p. 188; New York ed., Vol. I, p. 541. Darwin included Grant in "An Historical Sketch of the Recent Progress of Opinion on the Origin of Species," in *On the Origin of Species* (3rd ed., 1861) as follows: "In 1826, Professor Grant, in the concluding paragraph in his well-known paper ('Edinburgh Philosophical Journal,' vol. xiv. p. 283) on the Spongilla, clearly declares his belief that species are descended from other species, and that they become improved in the course of modification. This same view was given in his 55th Lecture, published in the 'Lancet' in 1834." P. Helveg Jespersen has written interestingly on "Charles Darwin and Dr. Grant," *Lychnos*, 1949, pp. 159–167.

⁷ Darwin Papers, University Library, Cambridge, Vol. 5, fols. 28–40, 49–51; Vols. 118 and 129. These manuscripts have been partially described and quoted by J. H. Ashworth, "Darwin as a Student in Edinburgh, 1825–1827," *Proceedings of the Royal Society of Edinburgh*, 1935, 55:97–113. See also Loren Eiseley, *Darwin's Century: Evolution and the Men Who Discovered It* (Garden City: Doubleday, 1958), pp. 146–148.

⁸ Darwin Papers, University Library, Cambridge, Vol. 5, fol. 28. I wish to thank Mr. P. J. Gautrey, librarian of the Darwin Papers,

⁴ Joseph D. Hooker thought he was the first friend in whom Darwin confided his ideas on evolution. The date was Jan. 11, 1844. *The Life and Letters of Charles Darwin, including an Autobiographical Chapter*, ed. Francis Darwin (London/New York, 1887), London ed., Vol. II, p. 23; New York ed., Vol. I, p. 384.

⁵ *The Autobiography of Charles Darwin, 1809–1882, with Original Omissions Restored*, ed. Nora Barlow (London: Collins, 1958; New York: Harcourt, Brace, 1959), p. 49.

supports the above suggestion that at the time he was primarily interested in descriptive natural history, but it also has a wider significance, because it provides the only evidence that Darwin had read anything by Lamarck before he went on the voyage of the *Beagle*. This evidence will correct a misimpression conveyed in Darwin's "Historical Sketch" that he had never seen the book.

By the time he wrote the "Historical Sketch" it is indeed possible that he had forgotten he had ever seen Lamarck's *Système*, since he had used the volume approximately thirty-three years earlier. His discussion of Lamarck in his "Historical Sketch," with the misleading footnote, begins as follows:

Lamarck was the first man whose conclusions on the subject excited much attention. This justly celebrated naturalist first published his views in 1801; he much enlarged them in 1809 in his *Philosophie zoologique*, and subsequently, in 1815, in the Introduction to his *Hist. nat. des animaux sans vertèbres*.

[Footnote:] I have taken the date of the first publication of Lamarck from Isid. Geoffroy Saint Hilaire's ('Hist. Nat. Générale,' tom. ii, p. 405, 1859) excellent history of opinion on this subject.

In this footnote Darwin indicated, though without explicitly saying so, that he was citing the date of Lamarck's *Système* from Geoffroy Saint-Hilaire's treatise because he had never seen the book himself.

for checking my reading of Darwin's handwriting and for other assistance in my study. I also wish to thank Professor Sydney Smith, Cambridge University, for comments on an early draft of this paper. The outline which Darwin made from Lamarck's *Système* (p. 50 and chart on molluscs facing p. 51) was briefly mentioned, but not identified as to source, by Smith in "The Origin of 'The Origin,' as Discerned from Charles Darwin's Notebooks and His Annotations in the Books He Read between 1837 and 1842," *Advancement of Science*, 1960, 16:391-401; see pp. 395-396.

Since one of his extant manuscripts shows otherwise, one wants to know what he might have gotten from reading the *Système*? The book is primarily a descriptive catalogue, with classification, of invertebrate animals. However, it is preceded by a lecture which Lamarck delivered at the Muséum National d'Histoire Naturelle on Floréal 21, Year 8 (i.e., May 12, 1800), which was his first public defense of his ideas that species change through time. If Darwin read as far as page 12 of this lecture, he encountered the beginning of Lamarck's discussion of species changes.⁹ It is difficult to imagine him getting that far and not being curious enough to continue in order to see how similar Lamarck's ideas were to those of his grandfather. On the other hand, Lamarck entitled the lecture "Discours d'ouverture," and if Darwin used the book only before Grant espoused Lamarck's theory, it is conceivable that he skipped over the lecture and only read the classification and descriptions of the invertebrates.

Even if he did not read the lecture, it is still interesting to know that Darwin had consulted the book and found it worthwhile to transcribe Lamarck's classification of mollusks, because it shows that when Darwin read in 1832 Lyell's critique of Lamarck's theory¹⁰ he had more to associate with Lamarck's name than merely Grant's praise. Although much later, after he

⁹Jean Baptiste Lamarck, *Système des animaux sans vertèbres, ou tableau général des classes, des ordres et des genres de ces animaux*; . . . (Paris, 1801; facsimile ed., Brussels: Culture et Civilisation, 1969), pp. 12-33. Some of the passages on evolution have been translated by Alpheus S. Packard, *Lamarck, the Founder of Evolution: His Life and Work* (New York/London: Longmans, Green, 1901), pp. 233-237.

¹⁰Charles Lyell, *Principles of Geology, Being an Attempt to Explain the Former Changes of the Earth's Surface, by Reference to Causes Now in Operation*, 3 vols. (London: John Murray, 1830-1833; facsimile ed., New York: Johnson Reprint, 1970), Vol. II, pp. 1-184. Darwin took Vol. I with him on the voyage and received Vol. II in the mail at Montevideo in Nov. 1832. *Autobiography*, p. 77.

had developed his own theory of evolution, he referred to Lamarck in disparaging terms,¹¹ it may be that at the time he first read Lyell's critique Darwin had enough respect for Lamarck's descriptive work that he failed to respond as enthusiastically to this part of the discussion as he had to the arguments in Lyell's first volume. He

¹¹ *Life and Letters*, London ed., Vol. II, pp. 23, 29, 39; Vol. III, p. 14. *More Letters*, Vol. I, pp. 41, 43, 125, 153.

made many more marks in Volume I of his copy of Lyell's *Principles of Geology* than he did in Volume II. Perhaps as he read Volume II he was already beginning to feel some sympathy for the ideas under attack, even though Lyell had the more effective arguments. Be that as it may, four years later Darwin had, in spite of Lyell, accepted the major premise of Lamarck's argument, that species change with time.

WAS SIMON MAYR GALILEO'S "ANCIENT ADVERSARY" IN 1607?

*By Stillman Drake**

In 1607 Galileo published an account of his proceedings against Baldessar Capra for plagiarism of his first acknowledged printed book, *The Operations of the Geometric and Military Compass*, printed at Padua in 1606. The instrument had been devised by Galileo in 1597, principally for the solution of a practical problem of artillerymen, and modified in 1598–1599 to become the first mechanical calculating device capable of solving all mathematical problems likely to arise in useful occupations. Galileo's book was written in Italian for the benefit of practical men; most of its contents were translated or paraphrased in Latin and published over Capra's name with a description of the design and manufacture of the instrument, which Galileo had preferred not to disclose. It was implied by Capra that the invention was his and that others had wrongfully appropriated it. Since Galileo had dedicated his book to Prince Cosimo de' Medici, from whom he hoped to gain employment, it was a serious charge that the instrument was not his own. Accordingly he took drastic measures to clear his name, which resulted

in the expulsion of Capra from the University of Padua and the confiscation of the unsold copies of his book.

The merits of Galileo's case against Capra are indisputable. His account books show that he employed a craftsman to make the instruments for sale in 1599 and that more than sixty had been sold by 1607. Capra was less than twenty years of age in 1599 and by his own statement did not commence the study of mathematics before 1602. Some of the scales on the instrument required a considerable degree of mathematical sophistication for their invention, especially those which gave the quadrature of any sector of a circle. Affidavits of credible witnesses confirmed Galileo's statement that his invention went back to 1597, and manuscript copies of his instructions for its use show that his first model differed from that which he began to sell in 1599. Other affidavits show that Capra and his father sought instruction in its use from Galileo about 1603, and borrowed from a friend early in 1605 one of the instruments and Galileo's written instructions. Galileo had befriended the father, Aurelio Capra, during these years, sending him pupils who wished instruction in fencing and obtaining for him a lucrative commission from the Duke of Mantua. At the beginning of

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