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RESEARCH NOTE

Darwin, Malthus, and Selection

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Occasionally in history a matter of interpretation comes to be settled by the addition of new evidence. This is what is happening in the debate over Darwin's reading of Malthus—the time at which Darwin first read him and the extent to which he was influenced by him. Previously lost pages from Darwin's "Notebooks on Transmutation of Species" were published in 1967. These pages establish the dates on which Darwin was reading Malthus and record Darwin's immediate response to the importance of what he was reading for his own ideas on the origin of species. A passage dated September 28, 1838, taken from "D." the third notebook on species, reads as follows:

28th. We ought to be far from wondering of changes in numbers of species, from small changes in nature of locality. Even the energetic language of Decandolle does not convey the warring of the species as inference from Malthus.—increase of brutes must be prevented solely by positive checks, excepting that famine may stop desire.—in nature production does not increase, whilst no check prevail, but the positive check of famine & consequently death. I do not doubt every one till he thinks deeply has assumed that increase of animals exactly proportionate to the number that can live— . . .

Population is increase[d] at geometrical ratio in *far shorter* time than 25 years—yet until the one sentence of Malthus no one clearly perceived the great check amongst men.—[there is spring, like food used for other purposes as wheat for making brandy.—Even a *few* years plenty, makes population in man

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increase & an ordinary crop causes a dearth.] Take Europe on an average every species must have same number killed year with year by hawks, by cold &c.—even one species of hawk decreasing in number must affect instantaneously all the rest.—The final cause of all this wedging, must be to sort out proper structure, & adapt it to changes.—to do that for form, which Malthus shows is the final effect (by means however of volition) of this populousness on the energy of man. One may say there is a force like a hundred thousand wedges trying force every kind of adapted structure into the gaps in the oeconomy of nature, or rather forming gaps by thrusting out weaker ones.—¹

Interpretations of the importance of Malthus to Darwin made before this passage was discovered erred in several directions. The most obvious and correctable error was misjudging the time when Darwin read Malthus. For example, Gavin de Beer, editor of the Darwin notebooks, estimated the reading to have taken place after the third notebook was filled. Thus de Beer could cite the following passage from the third notebook, now known to have been written after Malthus, as evidence that Darwin had no need of Malthus in coming to the notion of natural selection: "(All this agrees well with my views of those forms slightly favoured getting the upper hand & forming species.)"² Believing

1. "Darwin's Notebooks on Transmutation of Species," Parts I-IV, Edited, with Introduction and Notes by Sir Gavin de Beer; Addenda and Corrigenda, edited by Sir Gavin de Beer and M. J. Rowlands; Part VI (excised pages) edited by Sir Gavin de Beer, M. J. Rowlands, and B. M. Skramovsky, *Bulletin of the British Museum (Natural History) Historical Series*, vol. 2, nos. 2-6, and 3 no. 5 (London, 1960-1967); Part VI, pp. 134-135, excised from the third notebook. Darwin's pagination is used throughout in citations from the notebooks; De Beer's Parts I, II, III, and IV correspond to Darwin's "B", "C", "D", and "E". Other notebooks in the series kept during 1837-39 include "A" on geological topics and "M" and "N" on the human aspect of transmutation with regard to views of philosophers and moralists and to the reinterpretation of human behaviour that would be required by transmutationist theory.

In the passage quoted those sentences in brackets appear in between the lines of the text in smaller and darker script. Fortunately for the dating of the passage we have Darwin's own word. Otherwise the date would be difficult to set as there are succeeding entries in the notebook with earlier dates. Darwin apparently decided on September 11 to begin a separate section on "Generation" towards the back of the book on page 152. There are thus two separate runs of dates in the notebooks which did not, of course, prevent the paper-saving Darwin from using free space in the notebooks without respect to chronological order of entry. Nevertheless, the Malthus entry seems to have been made in order since the entry begun on page 134 continues at the top of page 135 and since the entry on the bottom of page 136 dated September 29th continues without interruption for three pages.

2. *Ibid.*, pt. III, p. 175. Since this sentence is taken from the section of

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that Darwin wrote this sentence without benefit of Malthus, de Beer then assessed the importance of Malthus to Darwin to be the “mathematical demonstration of the insufficiency of food supplies if numbers increased too fast and the consequent inevitableness of the penalties.”³

Other interpreters, while not assigning a date to Darwin’s reading of Malthus, yet concurred with de Beer’s general conclusion that Darwin was indebted to Malthus for the notion of the tendency toward the geometrical expansion of population rather than for any help in the definition of the notion of selection. Gertrude Himmelfarb, for example, suggested that “In general, what Malthus was concerned with was not how the struggle for existence affected the quality of the population but simply how it limited its numbers.”⁴ Loren Eiseley, also puzzled by Darwin’s expressed indebtedness to Malthus, concluded: “It may well be that Darwin really received only an increased growth of confidence in his previously perceived idea through reading the Malthusian essay. The geometrical growth of life as expressed by Malthus greatly impressed him and may have turned his thoughts more intensively upon the struggle for existence.”⁵ Giving a slightly different emphasis, Stephen Toulmin and June Goodfield have agreed that “Darwin did not learn anything new from Malthus,” but have traced what Malthusian seed there was in Darwin’s discovery to a new focus on the “struggle for the means of subsistence”.⁶

Now that the date for Darwin’s critical reading of Malthus is secure, however, the puzzle over why Darwin himself credited so much to this event still exists if the above interpretations are not altered. Gavin de Beer, for one, has remained faithful to his prior conclusion that Darwin already had accepted selection as a mechanism for evolution before reading Malthus. De Beer’s reconstruction of the discovery of natural selection has it that Darwin was actively looking for a natural corollary to artificial selection when he read Malthus. In substantiating his claim, de

the notebook on “Generation” [footnote 1], its date may still be questioned. This last dated page in this section is page 163, dated September 25. What probably happened was that Darwin inserted this parenthetical remark concerning his new insight into a longer speculation, left unquoted, on the variation caused by change in physical circumstance.

3. *Ibid.* Introduction by Sir Gavin de Beer, p. 29.

4. Gertrude Himmelfarb, *Darwin and the Darwinian Revolution* (New York: Doubleday, 1959), p. 159.

5. Loren Eiseley, *Darwin’s Century* (New York: Doubleday Anchor Books, 1961), pp. 181–182.

6. Stephen Toulmin and June Goodfield, *The Discovery of Time* (New York: Harper & Row, 1965), p. 203.

Beer cites Darwin's own words in a letter to Alfred Russel Wallace: "I came to the conclusion that selection was the principle of change from the study of domesticated productions; and then, reading Malthus, I saw at once how to apply this principle."⁷

Unfortunately, as clear as this citation is, the notebooks that Darwin kept at the time do not substantiate such a straightforward account of the discovery of natural selection. The most that can be substantiated by the notebooks on the point of the selective survival of the most fit is that Darwin considered the possibility that, somehow, only the well-adapted might survive and breed. In the first notebook, for example, there is speculation on this topic, though the distinction between individuals and species is not yet clear: "The father being climated, climatizes the child. Whether every animal produces in course of ages ten thousand varieties (influenced itself perhaps by circumstance) and those alone preserved which are well adapted."⁸ Darwin, however, could see no signs that only the "well-adapted" were preserved, and, not having the Malthusian fund of excess individuals to work with, he did not develop that line of thought. In regard to "artificial selection"—the phrase was not used—the record before Malthus is equally ambiguous. Darwin could refer to the existence of "two grand classes of varieties; one where offspring picked, one where not"⁹; but he could also remark, "It certainly appears in domesticated animals that the amount of variation is soon reached—as in pigeons no new races.—"¹⁰

Surveying all the comments in the notebooks made before Malthus, it does not seem that Darwin held a sufficiently unambiguous notion of artificial selection to have enabled him to anticipate finding, as a mechanism for evolution, a similar process at work in untended nature. Rather, it would seem, the

7. Gavin de Beer, *Charles Darwin* (New York: Doubleday Anchor Books, 1965), pp. 100–101. Quoted from *More Letters of Charles Darwin*, ed. Francis Darwin, 2 vols. (New York: D. Appleton & Co., 1903), dated from Down, April 6, 1859, to Alfred Russel Wallace, vol. 1, p. 118. For some reason de Beer lists the date as being 1858. Domestic species maintained no balanced relationship against each other; thus there was no world or system of domestic species to analogize with the species of the undomesticated world of nature. Domestic species were of value to Darwin before Malthus not as a miniature of the larger world of species but for their presentation of the facts of variation and the opportunity they afforded for study of the laws of inheritance.

8. "Darwin's Notebooks," pt. I, p. 90.

9. *Ibid.*, Addenda and Corrigenda, p. 106, from the second notebook.

10. *Ibid.* Addenda and Corrigenda, p. 104, from the third notebook.

discovery of natural selection made the domestic analogy much more clear to Darwin than it had been before.

It is clear from the evidence of the third notebook prior to the entry concerning Malthus that Darwin was developing two lines of thought in his search for rules governing transmutation. First, he was looking for the causes of variation among what he designated as external agencies (as, for example, climate) and as internal agencies (the "laws of organization"— growth, reproduction, and the connection between mental and physical discussed under the title of "habit"). Second, he was trying to discover the rules of inheritance. The third notebook abounds in cases recorded to prove or disprove what seemed most likely to him from a transmutationist point of view that the least variable structures in a species were the oldest. Although Darwin never abandoned his early interest in either of these two questions, they were no longer crucial to him once he had natural selection to rely on. Thus, for example, one can contrast the keen-eyed attention he was paying to habit six months before reading Malthus with the comparative detachment attending discussions of habit later. The following passage is from the second notebook: "According to my views, habits give structure, therefore habits precede structure, therefore habitual instincts precede structure."¹¹ Indeed, two weeks before reading Malthus Darwin could declare the structure of a species formed over a long time by habit to be superior to a "mere monstrosity propagated by art."¹² The following passage, written eight months after Malthus, puzzles again over external and internal agencies only to conclude:

All that we can say in such cases is that the plumage has not been so injurious to bird as to allow any other kind of animal to usurp its place—& therefore the degree to injuriousness must have been exceedingly small.—This is a far more probable way of explaining, much structure, than attempting anything about habits.¹³

It was not that Darwin no longer suspected habit of having some role in the occurrence of new variations in structure but that, after Malthus, with selection as the primary mechanism for species change, he could afford to put off "attempting anything about habit."

If the role of Malthus in Darwin's development of the idea of

11. *Ibid.*, pt. II, p. 199.

12. *Ibid.* pt. III, p. 107.

13. *Ibid.* pt. IV, p. 147.

natural selection was more complicated than pictured by traditional interpretation, then what precisely was that role? Of the three elements comprising the theory of natural selection—individual variability, the tendency toward overpopulation, and the selective factors at work in nature—Darwin certainly owed little to Malthus concerning variability, for Darwin had already spent much energy documenting the differences and similarities of individuals belonging to the same or related species. The recurrent difficulty Darwin experienced in future years with individual variation related to its causes, not to its fact.

The tendency toward overpopulation is another matter. As all his students have agreed, Darwin on his own entertained little notion of such a tendency as universal, nor was he, at the time of reading Malthus in late September 1838, engaged in speculations relating to such an idea. Nevertheless, Darwin's great forerunner, Charles Lyell, had at least raised the issue of fertility. First, though not very seriously, Lyell had quoted the Italian geologist Giovanni Brocchi to say that species might "degenerate" and, like old men, lose their capacity to reproduce as fruitfully as in their prime. Second, and again from Lyell, domestic species could be said to be less fertile than their uncultivated cousins. At the place where this suggestion appeared in the sixth edition of the *Principles of Geology*, Darwin penciled a firm "no" but also inserted some heavy question marks.¹⁴ Slightly closer to the population issue as raised by Malthus was the credit Lyell gave overpopulation as a stimulant to species migration, though there are no marks alongside this passage in Darwin's copies of the *Principles*.¹⁵

All in all, the closest Darwin came to the notion of population held by Malthus was in the awareness of a typical constancy in numbers of individuals belonging to a given species in a given area. Yet the manner in which this notion was raised was so far from any consideration of the potential productive powers of a species, or of any two parents, that it prevented Darwin from arriving at natural selection on his own. For Lyell and Darwin assumed that most species tend to produce as many young as may be necessary to maintain their population at its present level. The reasoning of parents who have three children in order

14. Marginalia in Darwin's copy, now at the University Library, Cambridge, of Charles Lyell, *Principles of Geology*, 3 vols., (London: John Murray, 1840), III, 42.

15. Lyell, *Principles*, 6th ed. (1840), III, 119. This passage occurs in the fifth edition (1837) as well, where it went unmarked by Darwin, but does not appear in the previous (first) edition which Darwin owned. Reading Malthus apparently sensitized Darwin to the issue of birth rates.

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to assure that two will survive to adulthood is not unlike Lyell and Darwin's picture of the reproductive activity of most species.¹⁶ This assumption was linked to the belief that the amount of life which could be maintained in a given area was constant. Such a view is represented by this passage from the first edition of the *Principles*:

In the first place it is clear, that when any region is stocked with as great a variety of animals and plants as the productive powers of that region will enable it to support, the addition of any new species, or the *permanent* numerical decrease of one previously established, must always be attended either by the local extermination or the numerical decrease of some other species.¹⁷

That Darwin supported this view is evidenced by this entry from the second notebook:

The *quantity of life* on planet at different periods depends on relations of desert, open ocean, etc. This probably on long average equal quantity, 2° on relation of heat and cold, therefore probably fewer now than formerly. The *number of forms depends* on the external relations (a fixed quantity) and on subdivision of stations and diversity, this perhaps on long average equal.¹⁸

16. Even after integrating Malthusian over reproduction into his theory, Darwin remained sensitive to the checks within a species against maximum reproduction. In his own copy of Malthus' *An Essay on the Principles of Population* [Lond., 6th ed. 1826, I, 29; inside front cover, "C. Darwin April 1841"; Cambridge U. Lib.], Darwin reminds himself in the margin that even in the savagiest life not every man marries for wives must generally be bought.

All in all, before reading Malthus for himself, Darwin was not excited by the issue of rate of reproduction *per se*, especially compared to someone who was such as Alexander von Humboldt. In Darwin's copies of Humboldt's *Political Essay on the Kingdom of New Spain* (trans. J. Black, New York, 1811, 2 vol.; inscribed "C. Darwin, Buenos Aires 1832;" Camb. U. Lib.) and his *Personal Narrative of Travels to the Equinoctial Regions of the New Continent, 1799-1809* (trans. Williams, 6 vols., Lond., 1819-1829; "J. S. Henslow to his friend C. Darwin on his departure from England upon a voyage round the world"; Cambridge U. Lib.) Darwin did not choose to mark Humboldt's tallying of birth and death rates among various peoples or his citations from Malthus even though his markings show he gave attention to other portions of the works.

17. Lyell, *Principles*, 1st ed., II, 142.

18. "Darwin's Notebooks," pt. VI, p. 147, excised from the second notebook. For a similar statement from Darwin as of 1860 see *Sir Charles Lyell's Scientific Journals on the Species Question*, ed. Leonard Wilson (New Haven and London: Yale University, 1970), pp. 344-346.

Obviously, this attitude toward population does not touch on the Malthusian point of the tendency toward overpopulation, except that both views assumed the amount of life the earth could support to be fairly constant.

Yet, for Darwin, the manner in which Lyell treated numbers and species blurred the distinction between reproduction as a separate problem from competition. What was peculiar to the Lyellian point of view, particularly as it is represented in the quotation above, was the similar treatment accorded individuals and species. Indeed, it can be said that Lyell tended to treat individuals and species in the same breath. Where Lyell's conflation of species and individuals misled Darwin in his search for a mechanism for species change was in Lyell's very persuasive and forceful presentation of the struggle for existence in nature. Here is a typically Lyellian passage on selection which sounds so much like the *Origin of Species* that it is difficult to see at first glance what Darwin, or Malthus, could add to the concept:

If we consider the vegetable kingdom generally, it must be recollected, that even of the seeds which are well ripened, a great part are either eaten by insects, birds, and other animals, or decay for want of room and opportunity to germinate. Unhealthy plants are the first which are cut off by causes prejudicial to the species, being usually stifled by more vigorous individuals of their own kinds. If, therefore, the relative fecundity or hardiness of hybrids be in the least degree inferior, they cannot maintain their footing for many generations, even if they were ever produced beyond one generation in a wild state. In the universal struggle for existence, the right of the strongest eventually prevails; and the strength and durability of a race depends mainly on its prolificness, in which hybrids are acknowledged to be deficient.¹⁹

On closer reading, however, we see that Lyell is not really speaking of competition between individuals of the same group to represent that group in nature. All that he is saying with respect to intraspecific competition is that the "unhealthy" or the obviously abnormal will die. The "more vigorous individuals of their own kinds" is not enlarged on, for Lyell tended to see the division between "vigorous individuals" and "unhealthy" ones as sharp—no doubt because he spent relatively little time examining the differences between individuals regarded as belonging to the same species and made his distinctions between the two

19. Lyell, *Principles*, 4th ed., II, 391.

groups for the purposes of argument. Rather, the kind of selection always uppermost in his mind was that resulting in the extinction of some species—that is, in the competition between various species and races, to maintain their place on an earth with limited amount of life space. Thus we see in his ringing sentence on the “universal struggle for existence” where the “right of the strongest eventually prevails” that he is referring primarily to the competition between groups, for the sentence concludes: “and the strength and durability of a *race* depends mainly on its prolificness, in which hybrids are acknowledged to be deficient.”²⁰ Aware that the distinction I am making is one of degree of emphasis, I believe that it is correct to say that Lyell’s vision and depiction of the struggle for existence focused on the struggle between species—that is, its concentration was interspecific rather than intraspecific.

Once this distinction is made, it becomes easier to understand why Darwin, who accepted Lyell’s presentation of competition without protest, did not come to natural selection sooner than he did or, more interestingly, was not thinking in that direction at the time he read Malthus. For to see selection as a mechanism for evolution it was necessary to concentrate on the competitive edges to nature—predation, famine, natural disaster—as they played upon the individual differences of members of the same group. Since, save for the work of breeders and horticulturists, this was largely an act of imagination, Lyell’s concentration on competition at the species level could well have numbed—and I believe did—Darwin to the evolutionary potential of the “struggle for existence” at the individual level. Malthus, by showing what terrible pruning was exercised on the individuals of one species, impelled Darwin to apply what he knew about the struggle at the species level to the individual level, seeing that survival at the species level was the record of evolution, and survival at the individual level its propulsion. For that reason it is just that Thomas Malthus be ranked as contributor rather than catalyst to Darwin’s new understanding, after September 28, 1838, of the explanatory possibilities of the idea of struggle in nature.²¹

20. *Ibid.* (italics added).

21. Since this article was accepted for publication, several articles have appeared on the subject: Frank N. Egerton, “Humboldt, Darwin, and Population,” *J. Hist. Biology*, 3 (Fall 1970), 325–360; Peter Vorzimmer, “Darwin, Malthus, and the Theory of Natural Selection,” *J. Hist. Ideas*, 30 (October 1969), 527–542, and Robert M. Young, “Malthus and the Evolutionists: the Common Context of Biological and Social Theory,” *Past & Present*, 43 (May 1969), 109–145.