Theism, Naturalism and Persuasive Design:

A Rhetorical Analysis of Darwin's Origin

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On the Origin of Species is one of the most persuasive texts in the history of western thought.[1] Analogous to Descartes' Discourse on Method, the Origin changed almost overnight the way europeans understood the natural world and humanity's place within it.[2] In his anticipation of the reader's skepticism, in the variety of plausible reasons he offers for how complex structures might have been formed according to his theory, and for why the positive evidence for them is not found in the geological record, Darwin deliberated well. Updating Paley's watchmaker Darwin used the analogy of domestic breeding and the imagery of technological power to reread nature's "designs" as the unintended side effects of nature's productive self-sufficiency.[3] When in his conclusion (itself a stirring peroration) Darwin declares that with acceptance of his theory "we [will] no longer look at an organic being as a savage looks at a ship" (Origin, 485) design becomes a synonym for barbarism and anti-science. Through the novelty and variety of his arguments and evidence and through his sheer mastery of scientific decorum Darwin lent credibility to an argument which, on occasion, he himself "freely confessed" seemed "absurd in the highest possible degree." (Origin, 186).

Central to understanding the Origin's epochal character and abiding vitality is close examination of its rhetorical structure. How was it possible for Darwin to convince a lay and expert audience accustomed to viewing life as a product of wise design that organic structures were the unintended outcomes of undirected mindless forces? Paralleling the strategy Paley pioneered in reconstructing the case for Christian miracles in the wake of Hume's critique--Darwin showed not that transmutation had happened but that it was not as absurd to believe in as commonly supposed.[4] Darwin did not prove either that evolution

had happened or that natural selection could account for it. What he did was give transmutation an epistemic dignity and social congruence that shifted the cultural presumption in its favor.[5]

The paradox of intellectual revolution is that in proportion as a thesis is truly revolutionary it is also incomprehensible.[6] Against the context of convention truly radical ideas always seem ridiculous. This is the deep espistemological truth in Protagoras' scandalous teaching that the art of the logos makes the weaker case appear the stronger and the stronger weaker.[7] The key to Darwin's rhetorical genius and of such similar geniuses as Galielo and Descartes is their ability to find within the thoughtways of the prevailing culture the very resources necessary to take an idea that by convention seems weak and by convention make it seem strong.[8] The core of Darwin's rhetorical appeal is his ability to use the analogy of domestic breeding to establish a parallel between human industry and nature and then to reverse this parallael by arguing *a fortiori* nature can accomplish whatever man can--and more--but without art. (Origin, 61,83--84) By showing how a new narrative of nature seems to follow from received theological, methodological and cultural assumptions Darwin uses design to undercut design and establish a radical philosophic naturalism on seemingly conservative grounds.

Darwin's Introduction: Natural Theology & Baconian Induction

The Origin begins with obeissance to tradition as Darwin positions on the fly leaf opposite his title two carefully selected citations from the tradition of natural theology.

> But with regard to the mateial world, we can at least go so far as this--we can perceive that events are brought about not by insulated interpositions of Divine power, exerted in each particular case, but by the establishment of general laws.
>
> W. Whewell *Bridgewater Treatise.*

> To conclude, therefore, let no man out of a weak conceit of sobriety, or an ill-applied moderation, think or maintain, that a man can search too far or be too well studied in the book of God's word, or in the book of God's works; divinity or philosophy; but rather let men endeavour an endless progress or proficience in both.
>
> Bacon: *Advancement of Learning.*

Starting with the second edition Darwin added a third.

> The only distinct meaning of the word 'natural' is statted, fixed, or settled; since what is natural as much requires and presupposs an intelligent agent to render it so, i.e., to effect it continually or at stated times, as what is supernatural or miraculous does to effect it for once.
>
> Butler: *Analogy of Revealed Religion.*

All three citations are important both because they invite the reader to understand the Origin as a continuation of the priror tradition of natural theology--and because of what they take that tradition to have been.[9] In the citation from Whewell Darwin seems to suggest that his own book is simply an extension to the organic world of a principle already well recognized in other branches of natural science. The Bacon citation seems to reaffirm the accomodiationist principle that governed British science since its inception--that a true understanding of physical causes cannot help but clarify scripture and that scripture and nature--these two ultimate sources of divine truth--will ultimately agree.[10] The third of these citations is something of an qualification or restatement of the strong theme of naturalism in the first.

The Butler citation was in fact added in response to negative theological reviews of the Origin's first edition, it reaffirms that naturalism itself is not opposed to supernaturalism in that the very orderliness of the laws of the physical universe is evidence for the existence

of "an intelligent agent to render it so." As his Autobiography makes clear, Darwin believed in a very general and weak form of this argument. Darwin did not believe the universe as a whole was the result of chance. But more particularly--and particularly as applied to the argument of his book--Darwin did not believe biology provided evidence of the existence of a creator--except to create life in the first place.[11] Darwin was very careful to affirm belief in a God who acts only where it was safe--at the begining of life. As his letters show Darwin was impatient with Lyell and Gray for their failure to see that variations, accidentally preserved, could not be the result of divine forethought.[12] Even if we grant that Darwin changed his mind after the first edition of the Origin, the evidence is overwhelming that Darwin's religious language, like his scientific, did not aim at precision but at creative ambiguity.

Taken at face value Darwin's citations encourage his reader to believe his argument is a continuation of received theological tradition. Some readers, like Huxley and Spencer, saw through his language and drew the appropriate naturalistic conclusions; others, such as Asa Gray, even after being told otherwise by Darwin himself, persited in affirming natural selection and belief in design were compatible.[13] The important point from a rhetorical standpoint is what Darwin encouraged his reader to believe. We must remember that Darwin was in a fight for the project of his life. Sensitive as he was in most things about his word, in this titanic struggle for the prize of the century, Darwin was not above deliberately misleading his reader. Evidence of how far he was willing to go appears just after the Table of Contents in the third edition of the Origin in the following notice.

> An admirable, and, to a certain extent, favourable
> Review of this work, including an able discussion on the
> Theological bearing of the belief in the descent of species,
> has now been separately published by Professor Asa Gray
> as a pamphlet, about 60 pages in length. It is entitled,
> 'Natural Selection not inconsistent with Natural Theology.

> A Free Examination of Darwin's Tratise on the Origin of Species, and of its American Reviewers.' By ASA GRAY, M.D., Fisher Professor of Natural History in Harvard University.

What Darwin does not tell the reader in addition to the fact that he emphatically rejects Gray's argument personally, is that he suggested the themes for Gray's title, personally paid for the republication as a pamphlet of what had been Gray's unsigned essays in the Atlantic Monthly and supervised their distribution to journals and opinion leaders whom he thought they would persuade.[14] Only after the victory, if not for Dawin's particular theory at least for the principle of evolution, did Darwin repudiate Gray publicly. Darwin's repudiation appears in the concluding pages of his two volume 1868 tome Variation of Plants and Animals Under Domestication. All six editions of the Origin, including the final and cheapest edition of 1871, which was aimed at the widest distribution to the general public, include Darwin's natural theology citations and his advertisement for Gray's pamphlet.

Even as the citations on its fly-leaf present the Origin as a continuation of the prior tradition of natural theology, so its opening paragraph invokes the tradition of Baconian inductivism.

> When on board H.M.S. 'Beagle,' as naturalist, I was much struck with certain facts in the distribution of the inhabitants of South America, and in the geological relations of the present to the past inhabitants of that continent. These facts seemed to me to throw some light on the origin of species--that mystery of mystries, as it has been called by one of our greatest philosophers. On my return home, it occurred to me, in 1837, that something might perhaps be made out on this question by patiently accumulating and reflecting on all

> sorts of facts which could possibly have any bearing on it. After five years' work I allowed myself to speculate on the subject, and drew up some short notes; these I enlarged in 1844 into a sketch of the conclusions, which then semed to me probable: from that period to the present day I have steadily purused the same object. I hope that I may be exused for entering on these personal details, as I give them to show that I have not been hasty in coming to a decision.1

In Darwin's first two sentences it is not his mind but the facts that seize the initiative for they "struck" him and of their own and through the sheer incadescence of their impact "shed light" on what had been the "mystery of mysteries." Darwin neither asked for this epiphany nor did he respond to it immediately or directly. There is something doubly passive both in the lapse of time from the voyage to his return before he picked up these ideas again and in the nature of his response when it came. Darwin owns that no hypothesis occurred to him but merely the bare notion that "*something perhaps might* be *made out* [my emphasis] on this question". Darwin admits to a first glimmer of active thought when in addition to "patiently accumulating" he admits to "*reflecting* [my emphasis] on all sorts of facts which could possibly have any bearing on it."--as though speculation were an indulgence. Even this minimal acknowledgement of intellectual initiative is qualified by his claim that only "After five years did he allow" himself "to speculate on the subject". Aside from the fact that the well spring of all his thought was his South American cruise, virtually every assertion in Darwin's account of his research methods is technically false and socially true. Darwin's notebooks show without question that he never worked without an hypothesis and that natural selection was his last hypothesis of several--with recent scholarship showing that there were at least two distinct versions of it. What we have in Darwin's opening paragraph is a methodological creation myth of the sort that Peter Medawar described when he answered in the affirmative the title

of his essay "Is the Scientific Article A Fraud?"[15] What is rhetorically remarkable about the opening paragraph of the Origin is its fidelity to the conventions that constrained Darwin to present himself as a caricature of Baconian rectitude if he hoped to be believed and the novel twist that Darwin presents this caricature as though it were a personal confession!

The tone of the work becomes even more personal, and more realistically so, in the second paragraph where the reader learns that Darwin's work is not yet finished, that "two or three more years" will be required to finish it "and as my health is far from strong, I have been urged to publish this Abstract." As it turns out, however, there is an additional reason "I have more especially been induced to do this, as Mr. Wallace, who is now studying the natural history of the Malay archipelago as arrived at almost exactly the same general conclusions that I have on the origin of species." Here the reader is given another meaning of "induction" that would elicit the reader's sympathetic understanding as did the first his confidence in Darwin's methodological orthodoxy. The induction of the first paragraph presented Darwin the scientist, passively motivated by the intiative of facts. The induction of the second paragraph presents Darwin as mortal, subject to ill health and, however delicately put, forced into print by the appearance of a rival. As the introduction continues, Darwin, on the basis of all these circumstances makes a direct plea for the reader's indulgence "This Abstract...must necessarily be imperfect. I canot here give references and authorities for my server statements; and I must trust to the reader reposing some confidence in my accuracy. No doubt errors will have crept in...." It would be a hard reader who would not be sympathetic with the author of the Origin, whatever his or her position on the theory, who took the reader so much into his confidence.

If the tone of the opening paragraphs of the Origin are apologetic, well before the concluding paragraphs the author's voice takes on a note of unflinching conviction. In his paragraph concluding his introduction Darwin affirms "I can entertain no doubt...that the view which most naturalists entertain...that each species has been independently created...is erroneous." (Origin, 6) From apology at disturbing the world's peace to

affirmation that his views are correct is the distance Darwin has traversed in his introduction. To persuade his reader to folow him over this terrain--from hesitation to disturn convention to defiance of it (or to come part way)--is the rhetorical challenge of his work.

Arrangement:

The Persuasive Logic of The Origin's Organization

Darwin's answer to the question of how to lead an audience accustomed to viewing organic nature as the product of divine design to see it instead as the result of natural self-sufficiency--is adumbrated in the arrangement of his first four chapters. Darwin leads his reader from Variation Under Domestication to Variation Under Nature, to Struggle for Existence and at last to Natural Selection. Chapter five Laws of Variation, while technically part of this sequence is less a step forward than a detailed development of miscelaneous points about variation and inheritance made in the opening pages of chapter one. From five forward the chapters of the Origin follow no obvious sequence. Chapters six through eight, which Darwin treats as a group, are devoted to rebuttal--to applying his mechanism to hard cases--organs of extreme perfection such as the eye and remarkable instincts such as ants making slaves. Chapters nine and ten are devoted to geology, eleven and twelve to geographic distribution. Chapter thirteen addresses a miscellany of associated topics--morphology, embryology and rudimentary organs with chapter fourteen serving as a recapitulation of the argument as a whole.

Based on the work of Vincent Kavalovski, MJS Hodge has argued that the Origin is not the miscellany that its chapters suggest and that an expert reader would see that their arrangement is governed by a *vera causa* logic.[16] According to this view, for a cause--natural selection--to be regarded as a "true cause" of a phenomena its advocate must show that it passes three tests: existence, that it exists independent of the phenomenon to be explained, competency, that it is able to bring about the results required, and responsibility, that there is reason to believe in fact the cause did it. On this argument chapters one

through three of the Origin address existence, four through eight, competence and nine through thirteen responsibility. Hodge has urged that though Darwin's chapters fail to highlight his logic an expert reader would be able to see the wood through the trees. While Hodge may well be correct that an expert reader could see the *vera causa* logic in Darwin's chapters I wish to underscore in the present analysis that the Origin's chapters gain their force from an underlying social and rhetorical logic set in place in the first four chapters--particularly chapter one. It is upon this his earlier rhetorical logic that Darwin relies to extricate his argument from the empirical embarrassments he candidly addresses in later chapters.[17]

The Tactics of Darwin's Origin:

Dialogue, Common Ground and The Abolition of Design

As the opening four chapters of the Origin indicate, Darwin's strategy is to lead his reader from the familiar to the less familiar by convincing him that what he is asking is merely an extension of what convention already affirms. For Darwin to persuade he must engage the reader's active assent. The verbs of the opening sentences of Darwin's first chapter "When we look.... When we reflect...I think we are driven to conclude." show Darwin's passive response to nature in the Origin's introduction is replaced by the active and mutual curiosity of Darwin and his presumed reader. From the opening sentences of Chapter one to the end of the book Darwin treats his reader as an equal partner in a second voyage of discovery. The propositions to which Darwin has solicited--ora ssumed--his reader's assent are reavealing: "When we look to the individuals of the same variety or sub-variety of our older cultivated plants and animals [we see]...they ...differ much more from each other than do individuals of any one species in a state of nature. When we reflect on the vast diversity of the plants and animals which have been cultivated...during all ages [and] climates...we are driven to conclude that this greater variability is ... due to our domestic productions having been raised under [different conditions] from ... the parent-spcies...."(Origin, 7) If the reader accepts the terms of this joint endeavor of looking and

reflecting he has agreed from the start that in domestic variability--induced by differences in the conditions of life--we have a margin of variation more than sufficient to cross the barrier between varieties and species as we see them in nature. Dramatizing and drawing out the implications of this naturalistic premise is the persuasive task of the remainder of Chapter one.

To persuade his reader to accept a naturalist world view Darwin does not begin by asking the reader what he thinks about the origin of species. He asks instead how the reader thinks domestic breeds originated. In the course of the chapter he explains there are two schools--those who believe each domestic breed originated from an aboriginally distinct wild one and those believe each, or many, came from a single wild ancestor. When he discusses how greatly belief in species immutability would be shaken were it possible to to show that all dogs had descended from a single wild species and how this might shed light on the origin of the many closely allied families of foxes Darwin seems to lean toward the single ancestor school--and to forecast the broader sweep of his argument. But, it turns out, "I do not believe...that all our dogs have descended from any one wild species...." (Origin,17) That other groups as internally diverse as the dog may have a single common ancestor Darwin leaves open.

For the moment, the reader, having been given a dizzying view of enormous diversity reduced to single common ancestry, is given a breathing space as Darwin positions himself a voice of moderation. "The doctrine of the origin of our several domestic races from several aboriginal stocks, has been carried to an absurd extreme by some authors." (Origin,19) "Believing that it is always best to study some special group" 20 Darwin leads the reader to the case of the pigeon. Reinforcing the point of his opening sentence that domestic productions are more variabile than plants or animals in nature Darwin underscores the numerous particular differences that separate the domestic from the wild pigeon. "Altogether at least a score of pigeons might be chosen, which if shown to an ornithologist, and he were told that they were wild birds, would certainly...be ranked...as

well-defined species." (Origin, 22) Again this observation reinforces the premise set in place by the opening setence of Darwin's book.

Darwin's choice of the domestic pigeon seems curious for having described with his usual enthusiasm the striking differences in appearance and habit separating the numerous varieties there seems no controversy concerning the origin of domestic pigeons. Darwin believes "the common opinion of naturalists is correct that all have descended from the rock-pigeon (Columba livia)...." (Origin, 23) Why Darwin devotes several pages to refuting arguments that several aboriginally wild breeds might have gone extinct--becomes clear at the very end. Darwin's account of the difference in opinion between breeders and naturalists is a study in what today we would call the sociology of knowledge. Having shown in devastating detail why there is no controversy among naturalists about the descent of domestic pigeons from the rock-pigeon Darwin explains just as clearly why breeders see things differently. "I have never met a pigeon, or poultry, or duck, or rabbit fancier, who was not fully convinced that each main breed was descended from a distinct species." (Origin, 29) "The explanation" Darwin points out "is simple: from long-continued study they are strongly impressd with the differences beween the several races; and though they well know that each race varies slightly, for they win their prizes by selecting such slight differences, yet they ignore all general arguments, and refuse to sum up in their minds slight differences accumulated during many successive generations." Darwin has now prepared his reader for the epistemic/suasory turning point of the chapter and arguably of the book. The reader is invited to join Darwin in recognizing the inadequacies of the two professionally separate ways of looking at things and to see how their unification results in a new perspective.

> May not those naturalists who, knowing far less of the laws of inheretance than does the breeder, and knowing no more than he does of the intermdiate links in the long lines of sescent, yet admit that many of our domestic races have

> descended from the same paents--may they not learn a lesson of caution, when they deride the idea of species in a state of nature being lineal descendants of other species? (Origin, 29)

In the immediately following section entitled *Selection* Darwin sets forth "the steps by which domestic races have been produced, either from one or from several allied species." (Origin, 29) Darwin explains how man has usurped the prerogative of nature in adapting plants and animals--the greyhound, the fuller's teasel 30--not to its own good but to human needs. Various of Darwin's passages read very much like a celebration of English agriculture and animal husbandry. Darwin's own celebratory language easily blends with and reaches a creshendo in the agricultural epideictic of his sources. Darwin cites the respected breeder and agriculturalist Youatt that selection "'is the magician's wand by means of which [the agriculturalist] may summon into life whatever form and mould he pleases.'" and Lord Sommerville who says of sheep breeders "It would seem as if they had chalked out upon a wall a form perfect in itself, and the had given it existence." (Origin,31) Darwin establishes that the principle of selection is as powerful as it is well known and is proven by its market value. "What English breeders have actually effected is proved by the enormous prices given for animals with a good pedigree; and these have now been exported to almost every quarter of the world." (Origin, 31) Darwin hastens to add that the form altering power of the breeders is not due primarily to cross breeding but to selection. He emphasizes that even in those few cases "when a cross has been made, the closest selecton is far more indispensable even than in ordinary cases." (Origin,32) Darwin's own experience in breeding pigeons and the experience of agriculturalists come together in his praise for the principle he is about to freight with a new meaning. "Not one man in a thousand has accuracy of eye and judgment sufficint to become an eminent breeder. .... Few would readily believe in the natural capacity and years of practice requisite to become even a skilful pigeon-fancier." (Origin, 32)

In praising the self-consious art of the breeder Darwin would seem to have painted himself into a corner by reconstructing an industrially up-dated argument for design. Do not breeders have intentions and preconceived aims? As his subsequent passages make clear Darwin will blend "design" into nature and thereby not only give the "origin" of species a new non-miraculous meaning--but give the reader motive for accepting it. On the one hand he insists that while selection as a principle "has been reduced to methodical practice for scarcely more than three-quarters of a century" and while its results have been "rapid and important" on the other he shows the principle itself is found in agricultural "works of high antiquity." (Origin, 33) From various citations from Greek and Roman anitquity--civilizations with which Darwin's English reader would feel cultural affinity--Darwin leads the reader to the practices of groups with which the reader would feel little, none--or even antipathy. Darwin mentions the breeding practices of "The savages in South Africa...." 34 and "the value set on animals even by the barbarians of Tierra del Fugo, by their killing and devouring their old women, in times of dearth, as of less value than their dogs." (Origin, 36) Darwin has now led the reader from a practice raised to an art by an industial and scientifically informed people to a practice that is equally efficacious when carried on without any art or science whatever--indeed by people whome the reader (including Darwin himself on the Tierra Del Fuegians) regard as scarcely better than animals.[18] The direction of the argument to come is well adumbrated by the concluding line of Chapter one. "Over all these causes of Change I am convinced that the accumulative action of Selection, whether applied methodically and more quickly, or unconsciously and more slowly, but more efficiently, is by far the predominant Power." (Origin, 43)

Chapter two opens with the metaphysical issue which Darwin kept carefully out of sight in Chapter one now being placed squarely on the table. Darwin raises the question of how species are to be defined. After noting the lack of agreement among naturalists he observes "Generally the term includes the unknown element of a distinct act of creation." This is the very issue Darwin hinted at in his epistemic play off between the naturalists and

the breeders over the origin of the domestic pigeon. Darwin takes up this issue again first by drawing the readers' attention to individual differences "No one supposes that all the individuals of the same species are cast in the very same mould." (Origin, 45) He makes the importance of these differences clear "These individual differences are highly important for us, as they afford materials for natural selection to accumulate...." (Origin, 45) He grants some variation takes place in parts naturalists "consider unimportant parts" but immediately adds "I could show by a long catalogue of facts" that important parts also vary. Darwin then gives from his own observation and from responses he has gained from interlocutors a sample of the catalogue of observations on variation that he has collected.

No small amount of the rhetorical beauty and economy of chapter two stems from the way Darwin turns the tables on convention by using the sociology of knowledge argument nascent in Chapter 1 to full effect. The argument has a double aspect. First Darwin exposes the bias of professionals "systematists are far from pleased at finding variability in important characters" and Darwin gains credibility as a seeming reluctant witness when he records his own surprise at what he found when he looked in to the subject "I should never have expected that the brancing of the main nerves close to the great central ganglion of an insect would have been variable in the same species" (Origin, 45)

The reader of the chapter is constantly being shown the contrast between the professional norm of systematists--whose reason for being is to produce stable schemes of classification--and nature's teeming particularity which finally forces the systematist to practice tricks of definition. "Authors sometimes argue in a circle when they state that important organs never vary; for these same authors practically rank that character as important...which does not vary; and under this point of view, no instance of an important part varying will ever be found" (Origin, 46) Having instanced case after case where eminent authors cannot agree on what is a species and what a variety Darwin gives his reader a glimpse of a systematist at work. Rehearsing in a slightly varied form the lesson about nature's variableness through which he has already guided his reader Darwin

explains how seeming facts of nature are really artifacts of professional practice. "When a young naturalist commences the study of a group of organisms quite unknown to him, he is at first much perplexed to determine what difference to consider as specific, and what as varieties" (Origin, 50) If the novice limits his attention to one country he will "soon make up his mind how to rank most of the doubtful forms." Darwin's language nicely builds upon the breeder/naturalist contrast of chapter one and undercuts with considerable practical force the idea that the naturalists' descriptions correspond to reality. "His general tendency will be to make many species..." and then Darwin draws the crucial analogy with Chapter 1 "for he will become impressed, just like the pigeon or poultry-fancier...with the amount of difference in the forms ...he is ...studying" Darwin continues that the further the naturalist extends his observations "he will in the end generally be enabled to make up his own mind which to call varieties and which species" As though to underscore further the arbitraryness of this process, already implied in the words "make up his own mind" and "call" he adds "but he will succeed in this at the expense of admitting much variation,--and the truth of this admission will often be disputed by other naturalists." The further the naturalists presses his observations through examining "allied forms...from countries not now continuous...he will have to trust almost entirely to analogy, and his difficulties will rise to a climax." (Origin, 51)

In his account of classification Darwin, while in one sense speaking to the reader directly, in another and more important sense, has allowed the reader to look over the shoulder of a naturalist learning his trade. As in Chapter one Darwin enabled his reader to see both how domestic animals were produced from wild forms and why this process was invisible to the very breeders who practiced it. In chapter two he has shown how the systematist working with natural forms is likely to suffer from the same blindness--or "trained incapacity."[19] Through his analysis not just of nature but of professional practice Darwin has opened to his reader a vision of nature in which natural differences are the reality that science attempts to define away to protect its creationist metaphysic. But

Darwin and his reader who are free of the prejudices of the professional can see "These differences blend into each other in an insensible series; and a series impresses the mind with the idea of an actual passage." (Origin, 51)

Having established unstaunchable variation as the abiding natural reality and creationist dogma as the obstacle to be overcome in understanding it, Darwin proceeds to redefine the key terms in the debate. A "variety" now is to mean an "incipient species" and a "species" is to mean a more or less "strongly-marked and well-defined variety." (Origin, 55) Having artfully derived his new meanings from his sociological reading of practice, Darwin develops them in the spirit of aphorism as he continues "Where many trees grow, we expect to find saplings." What the aphorism means in terms of the study of nature he then explains "Where many species of a genus have been formed through variation...we might expect that the circumstances would generally be still favorable to variation." (Origin, 55) That Darwin is not just describing facts but using a description of selected facts to advance a systematic and philosophic naturalism is evident by his next sentence "On the other hand, if we look at each species as a special act of creation, there is no apparent reason why more varieties should occur in a group having many species, than in one having few" Starting from the view that the motive for traditional classification is metaphysical as opposed to empirical Darwin does not enter into dialogue with his colleagues who already grant the fact of widespread variation--and would critique his account of the metaphysical motive of their classification. Rather, he places anyone who would hesitate to affirm that variations connect or formerly connected living groups in the same position as the breeder who is incapable of figuring out that it was his own art not aboriginal wild species that produced the distance between domestic and wild breeds.

Darwin supplements his image with a second figure of nature as self-forming. Aptly, though not surprisingly, Darwin calls a larger genus a "manufactory" of species and proceeds to show that indeed the larger genuses continue to "manufacture" new species. Whether conscious or not he even invokes the Galileo's image of the moons of Jupiter

when he notes "As Fries has well remarked, little groups of species are generally clustered like satllites around certain other species." (Origin, 57) By the close of the second chapter Darwin has given his reader not just evidence that there is sufficient variation in nature to fund the process of divergence that occurs through human selection under domestication but that nature is a self contained factory of slight variants on a common pattern itself variable in every part. "The species of larger genera present a strong analogy with varieties. ... And thus, the forms of life throughout the universe become divided into groups subordinate to groups." (Origin, 59)

To a mind raised in humanity's first period of triumphal technology the idea of nature as law bound cannot help but have a certain allure--even if at the same time that mind keeps thinking of law, at least as manifest in nature in the sense of Darwin's fly-leaf citation from Butler, as the product of the forethought of an intelligent designer. Central to Darwin's persuasive design is to prise this analogy from its theistic context and give it a new frame of reference by connecting it with the notion of self-adjusting mechanism.

Chapters Three "Struggle for Existence" and Four "Natural Selection" fold into one another--their introductions are closely parallel and the early sections of each chapter address the readers' expectation of design, planning and forethought. In his opening sentences in Chapter three Darwin seems to diminish the importance of the preparatory images and arguments established in Chapters one and two. "But the mere existence of individual variability and of some few well-marked varieties" he concedes "though necessary as the foundation for the work, helps us but little in understanding how species arise in nature." Having summarized the grounds of the reader's scepticism perhaps better than could the reader, Darwin proceeds to reproduce both the language and affective associations of the reader's doubt. In the very accents of natural theology Darwin poses what seems to be--at least by convention--a rhetorical question. "How have all these exquisite adaptations of one part of the organisation to another part, and to the conditions of life, and of one distinct organic being to another being, been perfected?" Lest the reader

suspect something amiss Darwin follows this question with a catalogue of examples that reads and sounds--it really should be read aloud--like a section from a natural theologian's Nicean Creed.

> We see these beautiful co-adaptations most plainly in the woodpecker and missletoe; and only a little less plainly in the humblest parasite which clings to the hairs of a quadruped or feathers of a bird; in the structure of the beetle which dives through the water; in the plumed seed which is wafted by the gentlest breeze; in short, we see beautiful adaptations everwhere and in every part of the organic world. (Origin, 61)

The question Darwin posed initially and which, in the context of natural theology, would have been self answering--the answer being "through foresight planning and intelligent adaptation of means to ends" turns out to have been dialectical for the reader is about to learn a new answer. Through a combination of questions and telegraphed indications of themes to be developed later Darwin signals to the reader the transformation in thought to be effected in the pages and chapters to follow. "Again, it may be asked, how is it that varieties, which I have called incipient species, become ultimately converted into good and distinct species....? How do those groups of species, which constitute...distinct genera...arise? All these results" Darwin urges advertising the theme of Chapter four "follow inevitably from the struggle for life." (Origin, 61) The key turn--a turn at once social, conceptual and suasory--that Darwin wishes to affect in the reader's thought is to be mediated through the image of the breeder "I have called this principle, by which each slight variation, if useful, is preserved, by the term of Natural Selection, in order to mark its relation to man's power of selection." To believe in Darwin's theory is, in the first instance, to recognize the implications of what already is a familiar fact of experience. Darwin asks his reader to believe that nature can accomplish on itself what the reader

knows man to have accomplished through domestication whether done more quickly through the art of the breeder or more slowly through unconscious preservation.

Though a reader may grasp, intuitively in some cases or only with effort in others, that Darwin is setting forth a principle of natural self-sufficiency the question of intelligence will not out. "Selection" implies criteria and consciousness and the reader--particular the Victorian reader--knows this. Overcoming the associations of old and familiar terms is precisely the rhetorical challenge Darwin faces, particularly in chapters three and four, for he must use the very langauge that tells against his views to establish them. Whatever the merits of the Malthusian argument Darwin will presently develop, rhetorically and culturally Darwin must transfer the uncritical certainties of common sense associated with the breeder, helped by the ambience of the manufacuring image of Chapter two, to the equally uncritical certainties of natural self-sufficiency. Darwin's task requires a revolution in language and the core of this revolution occurs in the transfer in the meanings of terms that Darwin sets in place in chapters three and four. The key to this transfer is well indicated by the concluding sentence of Darwin's second paragraph in chapter three "But Natural Selections, as we shall hereafter see, is a power incessantly ready for action, and is as immeasurably superior to man's feeble efforts, as the works of Nature are to those of Art." (Origin, 61)

The common sense core that gives Darwin's argument social traction is a simple uncontroversial maxim--whatever man can do nature can do better. Throughout the chapter Darwin seeks to mobilize his audiences' prior understanding of the universal and omnipresent fact of struggle in nature for a new meaning--that out of random variation and "the struggle for existence" emerges biological novelty. Analogous to the natural process he describes Darwin participates with his reader in the struggle for language and understanding. "Nothing is easier than to admit in words the truth of the universal struggle for life, or more difficult--at least I have found it so--than constantly to bear this conclusion in mind." Darwin warns that on the reader's grasp of what he already knows about

struggle hinges his understanding of "the whole economy of nature". Unless the reader understand this aright "every fact on distribution, rarity, abundance, extinction, and variation, will be dimly seen or quite misunderstood." (Origin, 62) That social resonance rather than conceptual precision is Darwin's aim is well indicated by his account of what he means by "struggle." "I should premise that I use the term Struggle for Existence in a large and metaphorical sense" Darwin's senses of the term go from a literal struggle, as between "two canine animals in a time of dearth" to a "far-fetched" sense in which the missletoe which depends on the apple and similar trees can "be said to struggle with those trees."[20]

Darwin's account of the delicate balance of nature in Chapter three is superb. He begins with a familiar tone of voice that cannot help but evoke recognition from the reader of a truth known but purposefully kept in the background. "We behold the face of nature bright with gladness, we often see superabundance of food; we do not see, or we forget, that the birds which are idly singing round us mostlylive on insects or seeds, and are thus constantly destroying life; or we forget how largely these songsters, or their eggs, or thier nestlings, are destroyed" He then moves to a series of inter-related examples about the teeming competition in nature that makes nature's struggle vivid, clear, present, indeed felt by the reader. Darwin does not so much restate Malthus' laws of population as set him to music or make his principles sound like the commandments of an industrial deity "Lighten any check, mitigate the dstruction ever so little, and the number of the species will almost instantaneously increase to any amount." (Origin, 67)

A more subtle but equally important move in Darwin's chapter is his redefinition of ignorance. What we remain ignorant of is not, as one might suppose, the origin of variation or what allows variations to be coordinated as they must be to form a new biological structure, we are ignorant of "What checks the natural tendency of each species to increase in number" The remainder of the chapter with its wonderful examples of the complex dependency of being on being illustrates two conceptual points--the relentlessness of the "struggle" in Darwin's various senses and--despite the knowledge the chapter

contributes to our understanding--our ignorance of exactly what checks the increase of any living form in any particular case. How the vivid, readable exposition Darwin pprovides and the ignorance he claims we yet suffer from translate into a vehicle of persuasion is well illustrated by a seeming small "thought experiment" Darwin proposes to his reader at the end of the chapter.

In the personal tone of voice that has characterized his exposition from his first chapter Darwin asks the reader "Look at a plant in the midst of its range, why does it not double or quadruples its numbers?" A reader of the Origin can scarcely help but feel the personal force of that question or, almost as a mental reflex, retrace the examples in the chapter he is just concluding. Darwin's next sentence seems to state exactly what a reader would be thinking "We know that it can perfectly well withstand a little more heat or cold, dampness or dryness, for elsewhere it ranges into slightly hotter or cooler, damper or drier districts." (Origin, 77/78) Darwin rehearses in the sentences that follow the various conditions examined in the chapter and then changes the example so that the "plant or animal is placed in a new country amongst new competitors" Darwin reminds the reader that closely similar to the conditions in the original country as these circumstances may be they will not "be exactly the same as in its former home." The reader may or may not recall that changes in the conditions of life were what Darwin identified in his first sentence in chapter one as the reason domestic productions differed from one another more markedly than did wild forms. The key point arguably of the chapter and certainly of his thought experiment is that "we should have to modify it in a different way to what we should have done in its native country; for we should have to give it some advantage over a different set of competitors or enemies."

Darwin's seemingly negative conclusion that while "It is good...to try in our imagination to give any form some advantage...probably in no single instance should we know what to do" is in fact an important testimony of the new idea Darwin has successfully communicated to his reader. Whether or not the reader is willing to take what Darwin has

said to the lengths that Darwin will take it in the fourth chapter, the reader now has a new picture--a picture she certainly did not have at the beginning of the book--of how biological novelty might naturally occur and be preserved. It would be a very closed minded reader who would not give Darwin's principle some credit. How much credit the reader will grant Darwin is an open question subject to negotiation in the chapters to come. The degree of credit Darwin will receive from a reader or from professional peers or from his culture at large will be in rough proportion to how much credit individuals, peers or the culture are willing to give to the principle of explanation Darwin has embodied in the bavura performance that is his chapter and his book. While later sections of the Origin show Darwin in triumphal moments, not least of his persuasive gifts in his early chapters is his ability to cloak his central epistemic claim in the language of humility. As though conceding defeat Darwin drives home once again the conceptual point of his chapter "All that we can do, is to keep steadily in mind that each organic being is striving to increase at a geometrical ratio; that each at some period of its life...has to struggle...and to suffer great destruction."

Humorous as Darwin's concluding sentence may seem in our own context, its resonance with a culture deeply involved in seeing nature from the standpoint of the mystery of evil should not be under estimated. "When we reflect on this struggle, we may console ourselves with the full belief, that the war of nature is not incessant, that no fear is felt, that death is generally prompt, and tha the vigorous, the healthy, and the happy survive and multiply." (Origin, 59) Precisely because of the way Darwin's language combined strangeness and intimate familiarity his message must have sounded errily resonant to Victorian readers--some of whom it may have motivatd to question if nature might not in some sense, to some degree, form itself. And once the reader granted this principle what limit could he place to how far variation might lead?

The introduction to chapter four, as we have indicated, reads like a continuation, or a restatement of the introduction to chapter three. Darwin begins with two rapid fire

rhetorical questions "How will the struggle for existence...act in regard to variation? Can the principle of seleection, which ...is so potent in the hands of man, apply in nature?" He immediately answers for himself--but implicitly for the reader as well. "I think we shall see that it can act most effectually." (Origin, 80) Darwin then cross examines the reader reminding him of what she already presumably understands. Darwin is not just leading the witness, he is teaching the reader to appreciate the force of what she already knows--and to express that knowledge with a confidence born of conviction. Even the bare opening clauses of Darwin's sentences "Let it be born in mind.... Under domestication it may be truly said....Let it be born in mind.... Can it then be thought improbable....?" (Origin, 80) communicate the passionate rhetorical force with which he beseeches the reader to recognize for herself the truth of what he has said about domestic breeding, variation, competitive advantage and survival. As his language shows Darwin is aiming not to oppose convention with some esoteric perspective above or outside it, but to make convention itself confess as its own a truth already within it but suppressed--waiting to be articulated.

The pains Darwin takes to place what we might call the Malthusisn technical core of his argument in the context of a shared cultural and religious understanding of the world reachs a creshendo in his extended contrast/comparison between nature and the breeder. Starting with a rhetorical question "As man can produce and certainly has produced a great result by his methodical and unconscious means of selection, what may not nature effect?" Darwin sustains a series of contrasts between man and nature for three quarters of one page and a third of the next. (Origin, 83--84) All of these contrasts overawe the power of man in comparison with nature while at the same time portray nature as man--as a collosal breeder. Darwin's contrasts reach a climax as, in language patently sermonic, he issues what in form as well as substance is a kind of altar call for the reader to acknowledge the unlimited power of the thoroughly anthropomophic nature he has constructed "How fleeting are the wishes and efforts of man! how short his time ! and consequently how poor will his

products be, compared with those accumulated by nature during whole geological periods." The paragraph ends as it began on a rhetorical question "Can we wonder, then, that nature's productions should be far 'truer' in character than man's ... and should plainly bear the stamp of a far higher wokrmanship?" (Origin, 84)

In his famous personification of natural selection which immediately follows Darwin does not so much clarify natural selection as an impersonal force in nature as he does sustain the ambiguities that are built into the term--itself an oxymoron.

> It may be said that natural selection is daily and hourly scrutinising, throughout the world, every varation, even the slightest; rejecting that which is bad, preserving and adding up all that is good; silently and insensibly working, whenever and wherever opportunity offers, at the improvement of each organic being in relation to its organic and inorganic concitions of life. (Origin, 84)

The rhetorical beauty of this passage is that it allows Darwin to appeal to very different kinds of readers--for example Thomas Henry Huxley and Asa Gray. On the one hand the passage gestures toward nature as self-acting mechanism and, on the other, toward the suggestion that the whole process may be divinely guided. Even at the price of readers radically misunderstanding his concept the breeder image moves the question of origins in the direction of a technological vision of nature. To the extent that the self-acting aspect of technology can be foregrounded the idea of theism--of a mind outside of nature that acts within it--and naturalism--of nature as self acting--will be blurred to the benefit of naturalism.

Provocative and quotable as is Darwin's personification of the breeder one would have but a very partial notion of the range of Darwin's rhetoric if one priviledged this passage as its epitome. The second great rhetorical highlight of Darwin's pivotal chapter four is his chart expressing how species diversity preceeds and leads to taxonomic

disparity. Though the stark diagrmatic clarity of the chart may seem to epitomize rhetoric degree zero it is amazingly concrete and in fact freighted with the same leading-misleading qualities as his breeder image--though adapted for a more sophisticated audience. Space constrains me to consign the chart to the appendix of this paper. Suffice it to say that the chart shows how, for contingent reasons no one can specify in advance, one particular ancestor species may, after virtually untold generations, produce a race of descendants so different from itself as to constitute a new taxa. When one reads the chart in relation to its accompanying text the syntactic cartilage of colorless lines and dots becomes like a trellace that burgeons with images in the reader's mind. In the accompanying text Darwin has told the reader how there is in nature, especially under conditions of severe competition, something that favors extremes. Numerous domestic and wild examples have given this notion concreteness and common-sense credibility. The reader learns "It has been experimentally proved" that farmers can grow more herbage if the same plot of land is seeded with many kinds rather than one kind. (Origin, 113) If whatever man can do nature can do better the creative role of what we would call ecological niches in favoring certain variations, should they occur, becomes clear. In Darwin's account nature seems to work like a robust market economy that necessarily diversifies as it expands and brings about extinction by the same logic that it favors improved products. Darwin's chart, understood in the context of the accompanying narrative, makes clear not only how the predominantly negative and destructive picture of nature's "war" presented in chapter three can be "creative" in preserving advantageous variants but how competition leads to "divergence of character." For the dedicated reader , Darwin's chart supplements, or replaces, the earlier image of the personified breeder and provides a more literal picture of nature as an immense self-regulating market--a picture profoundly congruent with an industrial age. Though technically Darwin's diagram of ancestry is hypothetical, it could easily occasion in a reader an "aha" experience that convinces him--"this is the way the world must be." Such a reader would be well prepared to believe Darwin's interpretation of the gaps in the evidence in

chapters 6--9 and 10-12. Supplemented by the affecting similie of nature as a great tree with which the chapter concludes Darwin's thick and varied account of nature will have gained density in the reader's mind. Long before the conclusion of chapter four Darwin's image of new species and even orders originating through minor differentially adaptive variations added up over endless time in nature's self-regulating economy may seem more congruent with the reader's everyday experience of the world than the received account of distinct, empirically real types that vary only within limits.

While the fifth chapter of the Origin, The Laws of Variation, is an attempt to explain inheretance without benefit of genetics, the chapter illustrates how Darwin's scientific and "common sense" appeal to the reader's experience of reality has made his case not simply empirical and epistiemic but moral. Concluding a discussion of the horse family late in chapter five Darwin notes the universal appearance of stripes on the various species and invites his reader to imagine the common ancestor of the family. If the reader refuses Darwin lumps him with the "ancient cosmogonists" who believed that fossil shells in the mountains were created to mock the living ones on the sea shore. Darwin makes clear what already was implicit, as early as chapter two or before, one either believes in common descent by natural selection or one believes God is a liar "To admit this view [to deny common ancestry] is ... to reject a real for an unreal, or at least for an unkown, cause. It makes the works of God a mere mockery and deception." (Origin, 167) Darwin's horse example represents the proximate point in the Origin in which the tradition of natural theology falls into materialist receivership--to refuse Darwin's materialist argument is to refuse to recognize the immanent self-acting technological path of God in natural history.

The extent to which Darwin's moral case interacts with and helps to support his empirical claims is well illustrated by Darwin's chapers 6--8. These chapters, as Darwin points out at the beginning of six, are to answer a miscellany of objections chief among them: why the immerable transitional forms for which the theory calls are not to be found, how an animal like a bat could be formed by the modification of an animal with different

habits; whether instincts can be acquired and modified through natural selection; and why species when crossed are sterile whereas varieties, when crossed, are fertile. (Origin, 171, 172) Darwin's willingness to initiate objections to his theory cannot help but add to his credit in the eyes of his reader. His rebuttals certainly add to the dramatic interest of these chapters--and even if a reader is not persuaded the reader is likely to gain a high estimate of Darwin's intellectual heroism.

Chapters 6--8 unfold in a manner that anticipates the clif-hanger pattern of the Perils of Pauline and similar Saturday-matinees of the early decades of the film industry. Time and again the protagonist, natural selection, faces a seemingly fatal objection. But the worker ants are sterile so how could they have been selected? But selection favors the family not just the individual and if such sterile individuals should occur...the theory is still safe. (Origin, 237) As the reader follows Darwin's account of the origin of powered flight through the variations in the flanks of various types of squirrel from slightly flattened flanks to squirrels with membranes that allow them to glide, (Origin, 180--182) and then is asked if he really disbelieves that bats or flying lemurs--for which there is no known intermediate (Origin,182--183)--were formed any differently, or when asked to believe that an "optical instrument" as keen as the eye of the eagle could have been formed from an aboriginal nerve "sensitive to light" (Origin, 188-190) even a reader who rejects Darwin's accounts will have to recognize him as one of the most inventive arguers who ever lived. Further, Darwin's arguments will now have to be countered and it is a safe rhetorical principle that when convention has to justify itself it is no longer secure. Even by losing Darwin advances the case for naturalism for he creates the presumption that some naturalistic mechanism will succeed.

The extent to which Darwin's battle in the Origin is over presuppositions and not just empirical evidence is most dramatically illustrated in Chapters 9 & 10 where Darwin points out that the facts of geology go directly against his theory and invites the skeptical reader to reject it out of hand on geological grounds. Once again, however, what at first

appears to be fatal to the theory--a high speed collision with the massive wall of geological fact--does not damage the theory nearly so much as one might expect. As it turns out the geological wall is just a picket fence in bad repair with plenty of gaps through which Darwin's theory, to use one of his favorte expressions, can "wriggle" its way.[21] Given the sheer number of times Darwin has asked his reader in earlier chapters to fill in gaps by extrapolating variation to any extent required, the missing geological evidence is not an exception to the rhetorical pattern of the Origin but merely another test of the reader's epistemic commitment to the philosophic naturalism that has been integral to Darwin's argument from the first. For a reader convinced by the stunning vision of nature Darwin presented in his taxonomic chart in chapter four, the evidence in chapters 9 and 10 that there is no fossil record of the myriad forms that on Darwin's theory must have existed, the near total absence of transitional grades will be seen as an artifact of preservation not as a reflection of what had to have been the biological reality. Once the reader sees the geological record, rather than the theory, as imperfect it is indeed true as Darwin claims at the conclusion of Chapter 10 "the main objections to the theory of natural selection are greatly diminished or disappear."

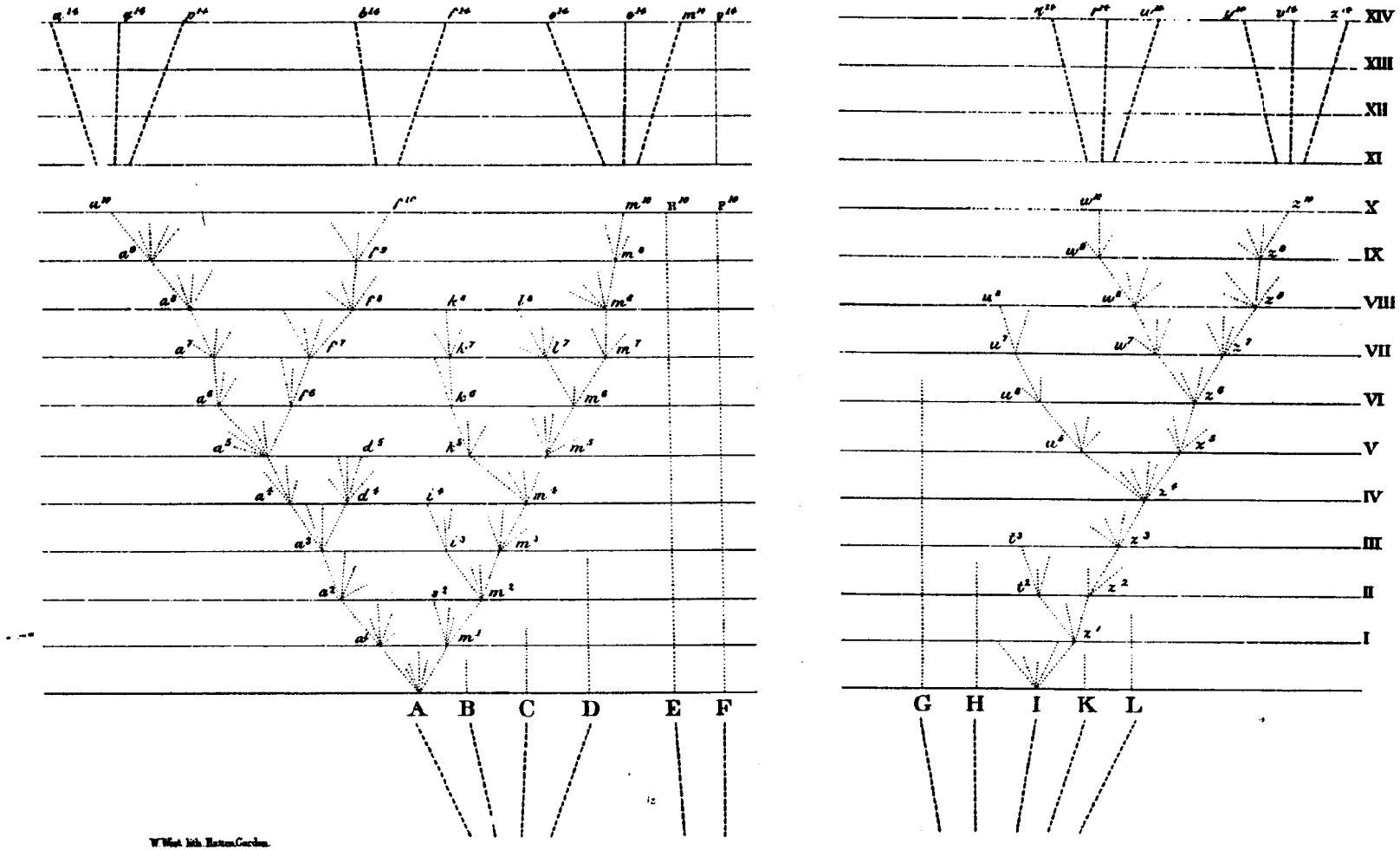
Throughout the Origin Darwin has supplied his readers both with a novel positive theory of nature and with answers to anticipated objections. Scattlered throughout the Origin, but particularly in the final chapter, Darwin also characterizes those who refuse to be persuaded. Such individuals are willfully blind "Nature may be said to have taken pains to reveal, by rudimentary organs and by homologour structures, her scheme of modification, which it seems that we wilfully will not understand." (Origin, 480); incompetent "it is so easy to hide our ignorance under such expressions as the 'plan of creation,' 'unity of design', & c., and to think that we give an explanation when we only restate a fact." (Origin, 482); or, and most deliciously, hopelessly reactionary "When we no longer look at an organic being as a savage looks at a ship as at something wholly beyond his comprehension...." (Origin, 486). This final image easily recalls the breeder of

Chapter one who cannot believe that his own art has summoned into existence domestic forms having no counterpart in nature.

This final point is important for it places in a particularly clear light how Darwin makes acceptance of his theory a metaphysical referendum on western technological culture. Upholders of Paley's design argument are consigned to the status of invincible barbarism and ignorance. If one might think Darwin's excommunication begs the metaphysical question, as a ship is most assuredly a product of design and intelligence, one would miss not just the point of Darwin's taunt--but the way his book has brought about a transformation in the very language of science. In this figure Darwin is asking the reader to choose between the scientific attitude now identified exclusively with reading mind out of nature and the antiscientific attitude that thinks that a ship must have been produced by God. Even as "savages" believe God makes ships, so proper europeans, if they would maintain the scientific attitude, must recognize nature is also made by intelligible "secondary means." By "secondary means" Darwin just meant "natural."

The magnificently eloquent and often quoted concluding sentence of the Origin provides occasion for a suitable final comment on the rhetorical design of Darwin's book. In the first edition of the Origin the sentence read "There is grandeur in this view of life with its several powers, having been originally breathed into a few forms or into one; and that whilst this planet has gone cycling on according to the fixed laws of gravity, endless forms most wonderful and most beautiful have been and are being evolved." (Origin, 490) By the third edition "breathed" had been changed to "breathed by the Creator". In a letter to his friend Hooker Darwin criticised himself for having "truckled" to "Pentateucal language" in the first edition.[22] As the third edition indicates his "truckling" had just begun. From his fly leaf citations, through his naturalistic analogies with domesitc breeding and manufacture, Darwin artfully constructed a scientific house on the solid rock of contemporary cultural experience with a theological annex on a foundation of sand.[23]

As Donald Flemming aptly observed the grin of a theodicic Cheshire cat hangs over Darwin's final sentence--but that is all the cat has fled.[24]



[DIAGRAM OF DIVERGENCE OF TAXA]

[1]It is, of course, ironic that Darwin's text popularized, as had no other before it, the notion of evolution and made evolution a respectable scientific thesis--while converting very few of his colleagues to his version of that thesis. Neither Lamarckian evolution nor the version of providentially directed evolution of Robert Chambers changed professional scientific hostility to transformism. Herbert Spencer's philosophy of evolution preceeded Darwin's work yet it made no appreciable difference in changing opinion--prior to the advent of the Origin. See my "Darwin and The Origin of Species: The Rhetorical Ancestry of An Idea, Speech Monographs, Vol. 37, (March, 1970), 10--11. While Darwin was no doubt lucky in his timing, one simply cannot consider the change in fortune in evolution in the nineteenth century without considering Darwin's text--despite the fact that it was rarely Darwin's specific version of evolution that was accepted by scientists or the general public. The specificity of Dawin's version was greatly compromised by the ambiguity of Darwin's language--for this ambiguity invited various interpretations. The most complete account of the confusions of Darwin's thought particularly his tendency to supplement natural selection with ancillary mechanisms is Peter Vorzimmer, Charles Darwin: The Years of Controversy: 'The Origin of Species' and Its Critics 1859--1882, (Philadelphia: Temple University Press, 1970). For the various non-Darwinian theories accepted by Darwin's peers see: Peter Bowler, The Non-Darwinian Controversies: A Study of the Protestant Struggle to Come to Terms With Darwin i Great Britain and America 1870--1900, (Cambridge: Cambridge University Press, 1979).

[2]Michael T. Ghiselin, Triumph of the Darwinian Method, (Berkeley: University of California Press, 1969), "The Darwinian revolution thus depended upon the collapse of the Western intellectual tradition." 52. Daniel C. Dennett, Darwin's Dangerous Idea: Evolution and the Meanings of Life, (New York: Simon & Schuster, 1995), "The creationists who oppose [Darwin's theory] so bitterly are right about one thing: Darwin's dangerous idea cuts much deeper into the fabric of our most fundamental beliefs than many of its sophisticated apologists have yet admitted, even to themselves. .... Not all scientists are atheists, and many who are believers declare that their idea of God can live in peacefrul coexistence with, or even find support from, the Darwinian framework of ideas. .... What both groups share, in spite of the differences in their deepest creeds, is a conviction that life does have meaning, that goodness matters." 18.

[3]Edward Manier, The Young Darwin and His Cultural Circle: A Study of the Infleunces Which Shaped the Language and Logic of the theory of Natural Selection, (Dordrecht, Holland: D. Reidel, 1977), 69--73

[4]Edward Manier, 164--168.

[5]John A. Campbell, "Scientific Revolution and The Grammar of Culture: The Case of Darwin's Origin," Quarterly Journal of Speech, 72, (November, 1986), 351--376.

[6]Ibid.

[7]Edward Schiappa, Protagoras and Logos: A Study in Greek Philosophy and Rhetoric, (Columbia, University of South Carolina, 1991), 103--114.

[8]I am thinking in particular of Galileo's turning common sense against itself in his argument for relative motion in his appeal to the experience of an observer aboard ship and in Descartes' appeal to common sense in the opening of the Discourse on Method. Galileo Galilei, Dialogue Concerning the Two Chief World Systems, Stillman Drake, trans.,

(Berkeley: University of California, 1967), 171--172; See also Jean Dietz Moss, Novelties in the Heavens: Rhetoric and Science in the Copernican Controversy. (Chicago: University of Chicago Press, 1993). Rene Descartes, Discourse on Method, (New York: Bobbs-Merrill Co. 1956), "Good sense is mankind's most equitably divided enowment...." 1

[9]Charles Coulston Gillispie, Genesis and Geology: The Impact of Scientific Discoveries Upon Religious Beliefs in the Decades Before Darwin, (New York: Harper & Row, 1951), 3--40. The natural theological tradition was being re-examined at the very time the Origin was published. The de-emphasis on the miraculous as the mark of Christian truth was the special point of a group of Anglican clergy represented in Essays and Reviews, published just before the Origin. Baden Powell, for example held that "'a revelation is...most credible, when it appeals least to violations of natural causes.'" Cited in Pietro Corsi, Science and Religion: Baden Powell and the Anglican Debate, 1800--1860, (Cambridge: Cambridge University Press, 1988), 219.

[10]Theodore Dwight Bozeman, Protestants In An Age of Science, (Chapel Hill, North Carollina: University of North Carolina Press, 1977), 3--33. See also my discussion in "Scientific Revolution and the Grammar of Culture," 352--358.

[11]Charles Darwin, Thomas Henry Huxley, Autobiographies, Gavin DeBeer, ed.,(Oxford: Oxford University Press, 1983), 11. See Philip Kitcher's astute observations on this aspect of Darwin's strategy in Philip Kitcher, "Persuasioin" in Marcello Pera and William R. Shea, Persuading Science: The Art of Scientific Rhetoric, (Canton, Massachussetts: Science History Publications, USA, 1991), 19--23.

[12]See my "The Invisible Rhetorician: Charles Darwin's 'Third Party' Strategy," Rhetorica, Vol, 7.,(Winter, 1989), 60--63, 70--74.

[13]On Asa Gray and Darwin see the account in my "Invisible Rhetorician," 70--74. For Gray's defense of Darwin see Asa Gray, "Natural Selection Not Incompatible with Natural Theology," in Asa Gray, Darwiniana, (The Belknap Press of Harvard University Press, Cambridge, 1963), 72--106.

[14]See my "Invisible Rhetorician," 72--74.

[15]B.P. Medawar, "Is The Scientific Paper A Fraud?" Saturday Review, (1 August, 1964), 42--43.

[16]V.C. Kavaloski, The Vera Causa Principle: A Historico-Philosophical Study of a Metatheoretical Concept from Newton through Darwin, Ph.D. dissertation, University of Chicago, 1974. H.J.S. Hodge, "The Structure and Strategy of Darwin's Long Argument," British Journal of the History of Science, 10, (1977), 237--246.

[17]For a fuller analysis see also John Angus Campbell, "Topics, Tropes, and Tradition, in Henry Krips, J.E. McGuire, Trevor Melia, Science, Reason and Rhetoric, (Pittsburgh/Konstanz: University of Pittsburgh Press, University of Konstanz Press, 1995), 211--235.

[18]See for example, Charles Darwin, Diary of The Voyage of H.M.S. Beagle, Nora Barlow, editor, in The Works of Charles Darwin, Paul H. Barrett & R.B. Freeman, editors, (New York: Washington Square Press, 1987), esp. 109-111.

[19]Kenneth Burke, Permanence and Change, (Los Altos, California: Hermes Publications, 1954), 48,49.

[20]For an excellent discussion of Darwin's ambiguous use of the term "struggle" see Manier, 180--181.

[21]Frances Darwin, ed. The Life and Letters of Charles Darwin, Vol;. 2., (New York: D. Appleton & Co.1911), 239. In a letter to Hooker on December 10, 1866, Darwin said of Herbert Spencer, "I feel that he is about a dozen times my superior even in the master art of wriggling....."

[22]Francis Darwin, ed., The Life and Letters of Charles Darwin, Vol II., (New York: D. Appleton & Co., 1911), 202--203.

[23]For a view of Darwin's theism as ultimately avoiding a metaphysical materialism see Neal C. Gillespie, Charles Darwin and the Problem of Creation, (Chicago: University of Chicago Press, 1979), 139--145. For a markedly critical view of the inevitable tendency of Darwin's theory by a contemporary see Charles Hodge, D.D. Systematic Theology, Vol II. (New York: Charles Scribner & Co., 1872), 12--33. See also Mark A. Knoll & David N. Livingstone, Charles Hodge What Is Darwinism, (Grand Rapids: Baker Books, 1994).

[24]Donald Flemming, "The Centenary of The Origin of Species," Journal of The History of Ideas, 20 (1959), 442--443.