

Unexpected Ceremony: Epideictic Rhetoric in Paleornithology Discourse

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Abstract

Three genres of discourse were recognized by classical scholars: forensic, deliberative, and epideictic. These genres correspond to both temporal and contextual factors. Forensic speech was found primarily in law courts to determine what happened in the past; deliberative discourse would be political or parliamentary, to determine a course of action for the future; and the classic epideictic form is the funeral oration as an example of speech intended to praise or blame in the moment. Much of the relevant literature places scientific discourse in the forensic or deliberative genres, eliminating the need to question this aspect of its rhetorical character. Rhetoricians of science tend to accept the claim that as scientific knowledge moves from the academic journal to the popular press, it changes in genre from forensic to epideictic. Science writing is said to feature reporting facts while similar information geared toward a popular audience is thought to celebrate or educate, not argue. My reading of paleontology discourse only partly supports this thesis. I suggest here that scientific discourse should be examined rather than categorized *a priori*, based on the fruitfulness of this approach with respect to paleontology discourse. The current paper examines the match between oratorical genre and paleontology discourse and concludes that ceremonial elements emerge in a way that cannot be tied linearly to audience or level of formality. I suggest here that even if scientific discourse is not *primarily* ceremonial, discourse that is both scientific and ceremonial should be noted for its ceremonial aspect to broaden our understanding of scientific discourse beyond what is encompassed by our current understanding of disciplinary genre. In this way, paleontology provides a site for a rhetorical analysis examining epideictic rhetoric. The study of epideictic rhetoric in scientific discourse may broaden rhetoricians' understanding of disciplinary writing beyond the knowledge provided by previous genre studies. Further, understanding that scientific discourse is at least partly epideictic may help us better understand the invention process of scientists as they create discourse and generate new knowledge in their fields. Academic practices may thus be informed, especially when we teach professional and workplace writing to undergraduates.

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Introduction

Much of the current literature in rhetorical studies of science places scientific discourse in the forensic or deliberative genres, eliminating the question of its rhetorical character. Fahnestock presents a claim that as scientific knowledge moves from the academic journal to the popular press, it changes in genre from forensic to epideictic (“Accommodating Science”). She bases the forensic nature of science writing on the premise that it focuses on “reporting facts”; popular accounts aim to “celebrate rather than validate” (333). My reading of paleornithology (paleontology specific to birds) discourse only partly supports her thesis. I suggest here that scientific discourse should be examined rather than categorized *a priori*, based on the fruitfulness of this approach with respect to paleornithological discourse. The current paper examines the match between oratorical genre and paleornithology discourse and concludes that ceremonial elements emerge in a way that cannot be tied linearly to audience or level of formality. I suggest here that even if scientific discourse is not primarily ceremonial, discourse that is both scientific and ceremonial should be noted for its ceremonial aspect to broaden our understanding of scientific discourse beyond what is encompassed by our current understanding of disciplinary genre.

Background

Little agreement exists on how rhetorical theory informs practice, or what lies within the purview of rhetorical theory (see Gaonkar; Lunsford and Ede 45; Kennedy). Dogged persistence by a varied cast of scholars has legitimized rhetoric of science as a course of study in English departments (*see* Weaver, Prelli, Harris). Informed by various disciplines including sociology, history, philosophy, and linguistics, rhetoric of science is slowly developing its own preferred methodologies, topical logics, critics, and adherents (Prelli, Harris, Gross & Keith). Bazerman approaches scientific discourse from a composition angle; Latour and Woolgar are famous in the subfield for their participant/observer ethnographic work. Fahnestock applies a literary approach to science discourse (“Rhetorical Figures”); Battalio’s study of the history of ornithological discourse combines a literary approach with a linguistic analysis. Typically, rhetoricians develop or adopt a theoretical approach and then apply it to text(s) for a case study. The best approach emerges from an investigative reading of the text rather than a prescriptive process. This hermeneutic process allows insights into the discourse to emerge, and the findings of the analysis are ideally not limited to what the rhetorician anticipates or seeks.

Classical rhetorical theory underpins the analysis done in all substantive rhetoric of science studies (see Lunsford and Ede), and its absence may account for the perpetuation of a negative image of rhetoric, and, by association, bad press for rhetoric of science (Haack). The question of whether rhetoric is substantive enough to justify its use as an interpretive tool has also been raised (Gaonkar). These critiques of rhetoric of

science studies should lead rhetoricians to pursue the most productive and justifiable analyses possible, in order to help develop rhetoric of science as a valid and respectable endeavor. William Keith, in fact, states that poorly done rhetoric of science analyses may be no more than vapid speculation (Gross and Keith). This paper attempts to properly apply interpretations of classical rhetoric as responsibly as possible to contemporary discourse.

For the purpose of this paper, paleornithological discourse is defined as any discourse generated by or about paleornithologists about paleornithology. Sankar Chatterjee of Texas Tech, John Ostrom of Yale, and other notable scientists like Larry Witmer are undisputed experts in this field. Their expert status is, in Sullivan's terms, important because their authority and legitimacy must be established before their discourse can be said to be representative of scientific discourse, if not orthodoxy ("Keeping Rhetoric").

Bruno Latour wrote, "[S]urprisingly few people have penetrated from the outside the inner workings of science and technology, and then got out of it to explain to the outsider how it all works" (15). The research presented here does not provide final answers, but provides a foothold from which to build future studies that provide the detailed, critical understanding Latour advocates. A broader purpose for this study is also articulated by Latour and Woolgar:

Science, in general, generates too much hope and too much fear, and the history of the relationship of scientists and nonscientists is fraught with passions, sudden bursts of enthusiasm, and equally sudden fits of panic. If the public could be helped to understand how scientific knowledge is generated and could understand that it is comprehensible and no more extraordinary than any other field of endeavor, they would not expect more of scientists than they are capable of delivering, nor would they fear scientists as much as they do. (13)

The rhetorician, then, may be a sort of intermediary between the complex world of scientific discourse and the day to day concerns of people. For example, rhetorical analyses offer ways to make sense of a seemingly senseless catastrophe (Winsor 1988, 1990).

Many rhetoricians of science appeal to readers familiar with literature or other academic pursuits. Jeanne Fahnestock offers exhaustive surveys of literary figures in science discourse, and researchers like Myers and John Battalio perform sweeping, varied analyses on particular fields, namely, biology and ornithology. Other researchers have contributed by developing particular research methodologies, as exemplified by Bruno Latour and Steve Woolgar's sociological/anthropological participant-ethnography. The methodology for rhetoric of science studies such as mine is invented by the rhetorician during a recursive, hermeneutic process of analysis.

Prelli's traditional treatment of scientific discourse largely ignores epideictic rhetoric *per se*. However, Prelli builds a model of rhetorical theory that, when applied to scientific discourse, offers rich understandings of that discourse, without excluding aspects such as the epideictic that are not specifically mentioned. This is a result of Prelli's subsuming much of the rhetorical nature of discourse under categories like Kuhnian paradigms and Aristotelian *topoi*. Prelli does not claim that oratorical genre is nonproductive; he rather finds his own categorization of what scientists do to be more

relevant. Prelli claims that scientific discourse is rhetorical because it is addressed, invented, reasonable, situational, and representative of symbolic inducement. In other words, scientists invent reasonable claims and present them symbolically to persuade a situated audience.

Sullivan presents a categorical approach to epideictic rhetoric in science, going as far as to classify several authors' previous work as studies in epideictic (238). Looking at science as culture, and matching that to the cultural function of epideictic rhetoric – "the genre understood to create and to maintain a society's value system" - Sullivan proposes five ways that epideictic maintains the orthodoxy of a culture (232).

Sullivan names these five functions education, legitimation, demonstration, celebration, and criticism (232-233). Legitimation revolves around the scientist-writer's goal of effectively appealing to the audience, the peers who review journal article submissions, and attempt to gain approval: acceptance for publication in the journal.

Demonstration, in Sullivan's terms, describes a ritualistic performance with an audience of spectators, not judges. Though this seems to directly contradict the appeal to a judging reader in the legitimation play, audiences are complex, as are rhetor's motives, and demonstration is surely at work in some of Chatterjee's discourse as well. Celebration as a site of epideictic manifests in science discourse in two ways, to Sullivan: bardic and priestly. The bardic voice follows a format accepted by the community and, through citation of experts, reminds the reader of the pantheon. The priestly form of celebration occurs whenever scientists speak to a non-expert audience. Note the overlap here between education as a site of epideictic and education as a site of the priestly version of celebratory epideictic in Sullivan's categorization.

Similarly, Sullivan's criticism function of epideictic can also occur in education, as well as contexts primarily featuring review or crisis. Criticism entails the praise/blame definition of epideictic handed to us directly from Aristotle. Interestingly, Sullivan claims that "the most important use of criticism in scientific discourse occurs during the times of crisis in science when the present orthodoxy or paradigm is threatened in some way" (240). This supports the appropriateness of examining Chatterjee's revolutionary ideas through an epideictic lens.

As a marginalized member of his discourse community with respect to his *Protoavis* fossils, Chatterjee's discourse should certainly reflect his desire for legitimation. Sullivan, however, cites examples that illustrate successful legitimations, while my study presents what is a to-date unsuccessful attempt at legitimation. Prelli describes failed legitimations that failed because the scientists were not scientific enough; my case study does not represent this pattern.

Sullivan's method assumes epideictic as a function of orthodoxy, however, and the discourse I analyze here is revolutionary. Sullivan's categories are useful in expanding the viewfinder as I search for instances of epideictic, but they seem less useful as I analyze findings, however anecdotal those findings may be. Perhaps revolutionary discourse exhibits epideictic differently from discourse entrenched in orthodoxy; likely this is a matter for another investigation.

Kuhn offers a view of science as a set of negotiations operating either within the established understandings of the scientific community or challenging them. These understandings are paradigms, involving either exemplars of science or the "entire constellation of beliefs, values, techniques, and so on shared by the members of a given

community” (175). In Kuhnian terms, Chatterjee’s revolutionary work is paradigm-shifting because of the crisis his discovery inflicts on the established truths in paleornithology. This is not normal science; reporting of the incontrovertible is notably absent in paleornithology overall.

Kuhn’s notion of discovery and rhetorical concepts of invention overlap here. Kuhn refers to discovery as “an extended... process of conceptual assimilation” (56), which rhetoricians will probably agree resembles invention. To be fair, however, Kuhn is not speaking of rhetorical processes as we use them in rhetorical studies today. At the same time, even a strict reading of Kuhn reveals his claim that paradigms determine how evidence is interpreted (Bizzell 764), a key point in the *Protoavis* controversy.

This Kuhnian aspect to paleornithological discourse deserves explanation in part because the marginalization of Chatterjee’s interpretation of *Protoavis* may be closely tied to its paradigm-threatening nature. Chatterjee’s fossil discovery, 225-million year old partial skeletons, have caused a stir in paleontological circles, reaching the public via publicity by Chatterjee’s sponsor, The National Geographic Society, popular magazines such as *Discover*, and Chatterjee’s popular book, *The Rise of Birds*. Chatterjee described and named the fossils to reflect his opinion that they represent the oldest bird known to science. Thus, *Protoavis texensis* rivals the long-standing father of birds, *Archaeopteryx lithographica*, for primacy, at least among the community of scientists who accept Chatterjee’s claims.

Kuhn focuses his analysis in *The Structure of Scientific Revolutions* to the worldviews of scientists, and the manner in which those worldviews, or paradigms, evolve. This becomes interesting in the case of paleornithological discourse because, as I argue elsewhere, Chatterjee’s hypotheses constitute a paradigm shift in his field. Kuhn helps situate the way paleornithology operates on the verge of a new paradigm when he writes: “Normal science does not aim at novelties of fact or theory... New and unsuspected phenomena are, however, repeatedly uncovered by scientific research, and radical theories have again and again been invented by scientists” (52). The lack of normalcy in paleornithological discourse and its controversial essence may provide more sites of epideictic discourse for scientists than a more normal scientific enterprise would; determining the extent to which this is true is beyond the scope of this paper. The salient point is that Kuhn and Prelli offer a way to view paleornithological discourse as a product of an invention process that, by its very nature, requires certain rhetorical ventures on the part of the scientist-writer. Some of those ventures, I propose, are epideictic.

As the ostensible site of the scientific controversy, *Protoavis* itself is not without its weaknesses, regardless of how attractive one finds the notion of it as the Urvogel: its fossils include no feather imprints, and the quality of the fossil remains of *Protoavis* are paltry in comparison to the famous, beautiful, intact, feathered stamps *Archaeopteryx* left imprinted on the sediments of Europe. Paradoxically, the very paradigm *Protoavis* threatens to unseat is Chatterjee’s major impediment to shifting that paradigm. The paradigm is created by the rhetoric of the discourse community, not the fossils, though in this case the fossils may appear to be the arbiter of truth.

Sullivan wavers in whether epideictic rhetoric is used primarily by those scientists who are marginalized or those who are members of the orthodoxy. To clarify the position of Chatterjee, his credentials are fairly prestigious, his list of publications is lengthy, and even his fiercest detractors seem to grant him good intentions. His major rival, however,

is the virtual high priest of paleornithology: Dr. John Ostrom of the Peabody Museum at Yale. Against Ostrom, few scientists win arguments. This reality of the field is noted by Shipman, Zimmer, and others.

Fahnestock posits that the relative lack of power by an advocate of a controversial position may even be turned toward his or her advantage (“Bering”); the invoking of the ethos of the minority may win converts in an argument where the truth is difficult, if not impossible, to pin down. And in fact, the ethos of the minority is invoked in some discourse generated by scientists who essentially believe in some of Chatterjee’s controversial ideas.

The *Protoavis* debate is just the beginning of the controversy in which Chatterjee invents. He is also a vocal advocate of the arboreal theory of flight, in which dinosaurs climbed trees and learned to fly by hopping, then soaring, between branches, and ultimately to the ground. Contrast this to cursorial theory, in which dinosaurs leapt along the ground and eventually developed flight as their leaps lengthened. Cursorial theory is the more popular in the scientific community, in part because a relatively new method of data analysis, called cladistics, tends to support cursorial theory, but probably also in part because Ostrom advocates it.

My explanation of paleornithological dispute is not intended to be a background for determining the right and wrong of the arguments; it serves merely as a backdrop for investigating the epideictic nature of some of the discourse produced in this complex and contentious rhetorical context. The appropriateness of applying epideictic rhetoric to scientific discourse analysis may be questionable; only a grounding in classical terms and modern interpretations of those terms will defend this approach. Perelman and Olbrechts-Tyteca warn that the study of epideictic rhetoric necessarily forces the rhetorician to determine the difference between education and propaganda. One proposed definitional difference between education and propaganda depends on the audience: explaining something controversial to an audience who already agrees would be education, while trying to convert an audience with contrary beliefs would constitute propaganda. Perelman and Olbrechts-Tyteca dismiss this as too simplistic, and note that if this is true, the development of ethos is quite different in both situations, as the educator would not have to develop credibility with the audience and the propagandist would.

Perelman and Olbrechts-Tyteca do not see the role of the educator as a necessarily easier one based on an educator’s lesser requirement for building ethos:

“In the epideictic, more than in any other kind of oratory, the speaker must have qualifications for speaking on his subject and must also be skillful in its presentation, if he is not to appear ridiculous. For it is not his own cause or viewpoint that he is defending, but that of his entire audience.” (52)

When Chatterjee writes to a popular audience in *Rise*, addresses a group of amateur bird watchers, or otherwise discourses in a non-confrontational medium, he is taking on the role of an educator, which Perelman and Olbrechts-Tyteca align closely with epideictic oratory. A quick glance at *Rise* will show the analyst that Chatterjee does establish his qualifications and is skillful in his presentation. However, he is probably not defending the views of his entire audience, as will be examined below. If, perhaps, Chatterjee is guilty of propagandizing, that propaganda is directed not at an unwitting public, but at

Chatterjee's colleagues who hold contrary beliefs, Perelman and Olbrechts-Tyteca suggest.

Sullivan only goes so far as to say that the educational function of epideictic scientific discourse has to do with classroom education of science students ("Epideictic Rhetoric"); I enlarge this context because scientists' popular texts intended for an audience of the general public also have an educational role. Rather than inspiring action like deliberative and forensic oratory, the educational and epideictic "create a mere disposition toward action" (Perelman and Olbrechts-Tyteca 54).

Traditional, philosophically conservative treatments of invention in scientific discourse are sometimes referred to as "moderate" (Campbell and Benson 1996), and this approach is the one most mirrored by my work to date. Though Prelli's (1989) book lacks much treatment of "epideictic," it still argues that science discourse is a productive site of inquiry for rhetoricians based on the usefulness of the knowledge gained by such inquiry. His argument about discourse production is less compelling because it is circular: insofar as rhetorical behaviors and situations lead to the invention of scientific discourse, such discourse is rhetorical. Prelli argues that scientists must invite readers to agree with them, at least temporarily, as they write inherently controversial discourse (89). Referring to Kuhn's notion of paradigms, Prelli claims that all readers must accept the writer's paradigm in order to read the text, even if they later choose to refute it. This complicity speaks directly to Perelman and Olbrechts-Tyteca's discussion of epideictic as educational and addressed to a (perhaps temporarily) believing audience. Thus, though Prelli frames his discussion in terms of paradigms and context rather than the epideictic nature of the discourse itself, he sees much of the situation of scientific discourse in the way that Perelman and Olbrechts-Tyteca do. Prelli's discussion, he writes, is warranted by Kuhn's failure to fully develop the role of persuasion.

Similarly, I defer to the conservative definitions of epideictic rhetoric of Perelman and Olbrechts-Tyteca because they ground those definitions in a clear understanding of Aristotelian terminology. Epideictic rhetoric differs significantly from judicial or deliberative discourse. The typical case of epideictic oratory would be a speech or text distributed without debate or argument, for which an audience would express appreciation. Though this may be an extreme case, isolating the epideictic from overlapping purposes of persuasion, even this model applies to paleornithological discourse. The example I consider is when Dr. Sankar Chatterjee addressed the Llano Estacado Audubon Society at a general meeting in Spring, 2001. Chatterjee discussed the *Protoavis* fossils he had discovered and his interpretations of them. He gave little explanation of competing theories except that required to dismiss them in favor of arboreal theory, all to a receptive, appreciative, and docile audience. I became familiar with the debate about the origin of bird flight at this very meeting. As I later studied the literature about the origin of bird flight, I was surprised to see that Dr. Chatterjee's compelling theory is actually not widely accepted, and his interesting and paradigm-shifting fossils are so controversial that few scientists agree with Chatterjee's interpretation that they represent an ancestor of modern birds. Clearly, the talk that Dr. Chatterjee presented was an example of the most pure model of epideictic rhetoric in Perelman and Olbrechts-Tyteca's terms: "After listening to the speaker, [we] merely applauded and went away" (48).

With this scaffolding in place, I undertake the analysis of paleornithology texts. These texts range from peer-reviewed journal articles to popularizations, including less formal texts such as editorial responses. The scientists of most interest include Sankar Chatterjee of Texas Tech, John Ostrom of Yale, and Larry Witmer.

Methods

My initial challenge was to define an exemplar of epideictic rhetoric. Comprising my corpus were two journal articles by Chatterjee, a book by Chatterjee, a book edited by Ostrom, one academic and several informal articles by Ostrom, an article by Bolt and Chatterjee, two books by Pat Shipman, and approximately 20 magazine articles, reviews, and similarly less formal, non-peer-reviewed texts. In an initial study, I located, highlighted, and copied specific text strings representing what I could easily justify as epideictic. Eventually, I focused my primary analyses on the two Chatterjee peer-reviewed journal articles, his book, and comments made by scientists about those texts. Sullivan's five-part classification scheme ("Epideictic Rhetoric") and Perelman and Olbrechts-

Clearly, the editor expected criticism for publishing the article that went far beyond normal, day to day dissensus; transmittal of factual information would never warrant this type of disclaimer. Indeed, one would think that any paper in paleontology would include new ideas, some potentially controversial, predictably containing “problems.” But this paper was different. This one contains ideas that, if accepted, may shift a dominant paleornithological paradigm because Chatterjee’s fossil, *Protoavis texensis*, threatens to unseat *Archaeopteryx*, king of the protobirds. For some reason, the editor felt the need to indicate that the content of Chatterjee’s article was substantially different from other articles in the journal. Sullivan’s discussion of how rhetoric works in the peer-review process fails to account for the presence of cryptic editorial notes like this one (“Keeping Rhetoric”).

Interestingly, this particular article seems to be one of Chatterjee’s most supported and least ambitious texts. For example, included in the *Paleontographica* article are plates with photographs of the fossils themselves, an inclusion notably missing from Chatterjee’s popular text, *The Rise of Birds*. At the same time, the transmission of factual information pictorially is subordinated to the verbal interpretation of the data.

Chatterjee’s legitimacy is obviously in question, at least to the editor anticipating a hostile audience. Unlike this example, most challenges to legitimation occur because the scientists’ credentials as a scientist are suspect; the typical case is that of the creationist attempting to gain scientific legitimacy via publication (Sullivan, “Keeping Rhetoric”; Prelli). This case is different, as Chatterjee’s interpretations are not challenged based solely on his stature as a scientist, but mostly on his suggestion that *Protoavis* deserves stature as a bird. The epideictic nature of this editorial footnote is interesting even when separated from its immediate context, Chatterjee’s article. In time, paleornithology may change as a field and adopt Chatterjee’s ideas, at which point an analysis of his struggle for acceptance in the *Protoavis* case may be even more interesting.

The article includes many obvious instances of praise/blame lexical items, which Sullivan classifies as criticism. Sullivan claims that “the most important use of criticism in scientific discourse occurs during the times of crisis in science when the present orthodoxy or paradigm is threatened in some way” (“Epideictic Rhetoric” 240). As noted, I believe paleornithological discourse featuring *Protoavis* necessarily threatens the orthodoxy. Following are examples of places Chatterjee performs praise and blame.

In the text, Chatterjee compliments a “beautiful” keeled sternum (7) and a “beautiful cast” of a holotype (76), “excellent postcranial elements” (14), and “remarkably avian” features of the protobird *Protoavis texensis* (22). Not many other examples of praising fossils are present in the article, but in other journal article titles, I have noticed the words “unusual” and “surprising,” which probably indicate additional sites of epideictic rhetoric. Most instances of epideictic rhetoric in Chatterjee’s peer-reviewed work are more subtle.

When Chatterjee characterizes the field, he is only slightly more demonstrative than when he writes about the fossils. The fossils, presumably, speak for themselves. The field, however, is subject to some more colorful description. In the journal article, Chatterjee bemoans a “long and confusing history” of avian anatomy (7). He claims that “what are needed are more fossils” (82) and later again refers to the “paucity of the fossil record” (83).

Chatterjee is parsimonious in his use of celebratory discourse though his fossil may be the most important paleontological discovery of the twentieth century. I next turn to his comments about his colleagues to seek examples of anything resembling the ceremonial, still working within the journal article from *Paleontographica*.

Chatterjee commends Raikow for “excellent work” (7). He implies gratitude toward Kurzanov, who “kindly sent me a cast” (70). Chatterjee seems to praise these scientists in much the same way as he does the fossils, with polite appreciation. His long list of acknowledgements supports this notion (87).

Other scientists, who, I know from other reading, oppose Chatterjee, are treated with care even when being blamed. When Chatterjee contradicts eminent scientist John Ostrom of Yale, he does so with care: “Ostrom ... maintained that the scapular and coracoid in *Archaeopteryx* are plesiomorphically fused as in nonavian theropods, but a distinct suture appears to be present in the London specimen...” (24). Chatterjee includes a figure that shows the suture in question in his article.

Chatterjee, as mentioned, advocates the arboreal theory of flight over the competing cursorial theory. He traces arboreal theory to its roots, citing Williston 1879, thusly: “Surprisingly, [Williston] gave no other details to support his theory” (55). Chatterjee presents cursorial theory before arboreal in Aristotelian fashion of saving the best for last and pointing out flaws in both cursorial theories and those versions of arboreal theory which his fossils do not appear to support. Nopsca is another advocate of cursorial theory, and Chatterjee mentions that his ideas were “severely criticized by other workers” (55). Chatterjee gives three citations at the end of that sentence, one being a citation of Ostrom himself. Here, Chatterjee may be performing epideictic moves by virtue of his careful explanations, reminiscent of the “education” function Perelman and Olbrechts-Tyteca advocate, as well as the celebration and legitimation functions of Sullivan (“Epideictic Rhetoric”).

Then, Chatterjee turns to the insect-net hypothesis of Ostrom, which Ostrom had posited in support of cursorial theory. Rather than saying that Ostrom was criticized, Chatterjee writes that “Ostrom’s insect net theory was heavily criticized on several grounds” (56), maintaining a distinction between the man and the theory. Chatterjee then lists those grounds, concluding that paragraph with the comment that Ostrom has abandoned that hypothesis. Chatterjee seems to blame Ostrom for the tenacity of the cursorial theory, though, in the next paragraph: “Though Ostrom’s model has many flaws it did encourage other groups to revive the cursorial theory...” (56).

Chatterjee hints at his awareness of the possibility of Kuhnian paradigm shift: “[A]nalysis of this new material [including but not limited to *Protoavis*] will result in fundamental revisions of our idea about the origin and early radiation of birds” (82). Not only does this show the importance of his work, but makes his invention process and other rhetorical strategies even more interesting to study because he is aware of the moment of his claims as he makes them.

Later, in the concluding paragraph, Chatterjee waxes poetic, driving the ceremonial potential of the moment home as much as he perceives propriety allows: “Some 225 million years ago, a small feathered theropod lived in the tropical riverine forest of Texas and leaped into the air to exploit a new frontier of ecospace. This was the beginning of a new age – the age of birds and their conquest of the skies.” (86)

An older journal article, "Cranial anatomy and relationships of a new Triassic bird from Texas," in which Chatterjee originally described and named *Protoavis texensis* for the paleontological community, was the first academically sanctioned introduction of the fossils to science (1991). Chatterjee had been criticized for waiting so long to reveal the nature of the fossils publicly, but this criticism was nothing compared to the comments made after the publication of the article. Though he seems painstakingly careful in the prose of the article, Chatterjee makes bold claims of *Protoavis*' Urvogel status (279) and relationship to modern birds. He necessarily places *Protoavis* in the geological record by comparing it to *Archaeopteryx*, which he admits is "generally considered as the oldest known bird" (278). He then handily unseats *Archaeopteryx*, a Mesozoic bird, and replaces it with Triassic *Protoavis* while admitting the consequences of this action: "The recognition of the Texas species as the 'Urvogel' or the earliest bird will require a radical modification of current views of the origin, evolution, and relationships of Mesozoic birds" (279). At the same time, Chatterjee expresses caution, if not doubt, with respect to *Protoavis*, admitting that "Without the presence of feather impressions, the status of the Texas species as a true bird deserves careful scrutiny" (279), though he reminds the reader that feathers are, as they know, rarely preserved.

Though I did not as carefully mine the 1991 article for instances of epideictic, they were easy to find. Chatterjee praises some fossils he found by saying that "the preservation was excellent" and referring to "a beautiful humerus" (283). Chatterjee seems abject in his discussion of incomplete Mesozoic bird fossils, which he states are "tantalizing in being too fragmentary to establish their affinities" (278) and of the fossil record itself, called "poor" (326). While these might be considered weak examples of critical epideictic, in other places Chatterjee's writing is more obviously so. He waxes poetic in a description of the dig site, and practically gushes with thanks in his acknowledgments. When criticizing the work of other scientists, he is measured but opinionated: "[Galton's] hypothesis has attracted little support" (312). Again, the definitions Sullivan provides for legitimation, demonstration, and criticism as functions of epideictic place Chatterjee's work squarely in the epideictic genre, if not as a primary genre, at least as one worth noting. Further, Chatterjee's educational purpose in this article supports its placement in the epideictic of Perelman and Olbrechts-Tyteca, if the audience can be said to even momentarily suspend doubt and listen to his claims.

Predictably, Chatterjee's popular book *The Rise of Birds* also exemplifies epideictic rhetoric. First, I will give a few notable examples from the text, and then I will turn to the heavy celebratory rhetoric of Larry Witmer's preface to that book. Later, metadiscursive comments occurring in various sites of discourse will be examined insofar as they provide examples of epideictic rhetoric.

By nature of its primary audience, *The Rise of Birds* avoids Sullivan's third type of epideictic, demonstration, "a ritualistic performance that ... transforms the audience from critics into witnesses and aims at reinforcing current beliefs" (238). First, the lay reader probably does not start out in the position of critic. Secondly, Chatterjee is not reinforcing current beliefs; he is proposing new ideas to an audience who might not even know how controversial and ground-breaking those ideas are. At the same time, Chatterjee is certainly aware of a secondary audience, the expert, who will read and review his book, and whom Chatterjee may be trying to convert from critic to witness.

Legitimation and criticism are the most neatly applicable categories Sullivan provides for the type of epideictic rhetoric found in Chatterjee's book, overall ("Epideictic Rhetoric").

Notably, in *The Rise of Birds*, Chatterjee avoids defensiveness, and writes in an active, positive way as he describes controversial ideas and heavily-criticized evidence. Even the illustrations reflect conviction that *Protoavis* was a bird; it flew thusly; it looked like the painting on the book's dust jacket. The absence of hedging devices and qualifiers characterizes much of Chatterjee's prose, for example: "*Protoavis* predates *Archaeopteryx* by 75 million years, pushing the emergence of birds back to the Triassic period" (xiv) and "Birds, the true living dinosaurs, deserve considerable respect as successful vertebrates that have evolved, adapted, and survived over a period of 225 million years" (xiv). Though Chatterjee refers in passing to the "controversy" generated by *Protoavis*, he couples it with "excitement" (xiv) that he claims the fossils generated, implying more equality between the controversy and excitement than my review of his critics supports.

Though Chatterjee does not always anchor his ideas with hedges and qualifiers, they do exist in his book, but they tend to be relegated to details rather than broad claims. Chatterjee writes about a detail of *Protoavis*' brain that "this feature *may* be linked to bipedalism" (62; emphasis mine). He also admits, during a protracted explanation of cladistic analyses and *Protoavis*' position therein, that "our models are *tentative at best* and will change as new evidence becomes available" (193; emphasis mine)

Chatterjee's book is full of adjectives that reflect his excitement about his discovery. He mentions "tantalizing" (195) rather than "frustrating" gaps in the fossil record. Features of his fossils are "remarkable" (53, 217), "beautiful" (54), "characteristically avian" (57, 217), and provide evidence not only of a bird, but one possessing "powerful" and "sophisticated" flight (80-81). When he compares *Protoavis* to *Archaeopteryx*, Chatterjee maintains his declarative demeanor, devoid of hedges: "...Although *Protoavis* is the oldest bird, *Archaeopteryx* is the most primitive taxon..." (193). *Protoavis* is "considerably more advanced than *Archaeopteryx*" and "more closely related to modern birds than is *Archaeopteryx*" (219). This, of course, is Chatterjee's primary thesis, and he reminds the reader of this periodically.

Generally speaking, birds are "awesome" and revered (273-4), and Chatterjee is sad that humans endanger their survival. In fact, the most argumentative and explicitly critical writing occurs in the final chapter of his book, "Birds and Humans," in which he scolds humans, calling our "alarming" effects "increasingly disastrous" on biota (282). With strong figurative language, Chatterjee claims that "We are stealing from future generations the basic necessities of life" (282) and provides what he admits is a "gloomy background" for further thought by the reader. Hostility toward those who argue with his science is absent throughout the entire book, but anger toward his fellow humans, his readers, is painfully evident in this chapter.

In Sullivan's terms, celebratory epideictic is "a revisiting of familiar places" (239), a litany of the great thinkers whose thoughts precede the current work. Chatterjee provides, in *Rise*, more of this revisiting than one might expect, given the nature of the audience. Despite the lack of interest a non-academic audience might have in this academic exercise, especially given the level of intricacy paleontological literature review entails, Chatterjee provides extensive background. Though this is needed more for the expert minority audience of the book than its public primary audience, reviewers

critique Chatterjee for his attention to the history and ideas in his field, calling his text overly technical, for example (Chiappe; Padian).

Fahnestock notes that different audiences constrain rhetors differently in terms of the accountability the scientist/rhetor has for her claims (“Accommodating Science” 58). A multi-layered audience certainly provides a challenge to a rhetor, and perhaps should be the focus of a meaningful and thorough rhetorical analysis of complex and controversial discourse, such as that generated by Chatterjee and his peers.

Complicating my rhetorical analysis of Chatterjee’s book is the existence of other voices in the text; not only those cited by Chatterjee and with whom he agrees or argues, but one in particular to whom he gives center stage for a moment: Larry Witmer. Witmer sings Chatterjee’s praises loudly in the foreword to *Rise*, while hedging more and performing impressive argumentative feats. Witmer makes the point that “the more important issue is whether *any* of the bones are avian because even if only *one* of the dozens of bones are actually avian, then there really is a Triassic bird” (viii; emphasis original). Witmer, in contrast to what many scientists write, claims that *Protoavis* “is just another avian fossil that slots in above *Archaeopteryx* with no other major effects on tree topology” (ix). More significantly, Witmer argues that the contribution Chatterjee makes in *Rise* is not the presentation of *Protoavis*, but the revision and improvement of the arboreal theory: “...the most sophisticated and detailed model to date...” (xi). Thus, Witmer argues, the book is significant and worthy, even if *Protoavis* fossils aren’t perfect. Witmer’s foreword is not only an enticement to read the book, but provides Chatterjee with the authority and legitimacy best bestowed on someone from without.

Witmer however acknowledges problems with *Protoavis*, admitting that “It is true that some of the specimens are not all that good and could be almost anything” (ix). Because of the structure of his argument, Chatterjee loses little by this concession. Witmer dismisses the controversy as part of ongoing, inevitable contention in paleontology. He ends his foreword with the priestly voice of celebratory epideictic, to use Sullivan’s terms, writing, “...*The Rise of Birds* surely will be viewed by history as a critical document in the debate on early avian evolution” (xii). An interesting absence of agent is apparent here – Witmer doesn’t lay claim to knowledge of what *people* will do, but *history*.

I now move away from Chatterjee’s writing about *Protoavis* to metadiscourse about the *Protoavis* controversy. Comments that praise and blame Chatterjee are found sprinkled throughout the scientific literature, especially in less formal discourse generated by experts. An example of discourse about science, written for a broader audience, about *Protoavis*, can be found in any review of Chatterjee’s book, *The Rise of Birds*.

In response to the publication of *Rise*, Jeff Hecht, Kevin Padian, and Luis Chiappe each wrote reviews in major popular science magazines. Hecht writes that the book is “readable, but full of anatomical detail” in his *New Scientist* review of June, 1998. Paleontologist Kevin Padian agrees with him, writing that “[T]oo much anatomical and paleontological terminology may be included for the average reader” in his *BioScience* review. Chatterjee is required to provide enough information that the reader can evaluate his ideas for themselves, as noted in the reviews. He appears to be in a no-win situation, being attacked for providing too much and too little information in the same text. Chatterjee had been caught in this dilemma for years, being criticized for not publishing about *Protoavis*, for publishing about *Protoavis*, criticized for any move he made. For

this reason, the upbeat tone of his writing in *Rise* is even more noteworthy, coming as it does on the heels of many harsh attacks on Chatterjee by his colleagues.

Luis Chiappe wrote a lengthy review for *American Zoologist* in 1998. In it, he mixed praise and blame in a review that could be mined extensively for rhetorical figures and numerous linguistic features which contribute to its persuasiveness (797). Chiappe praises only with qualification: "...Chatterjee summarizes *most* of these new developments in an elegantly written, nicely illustrated, and *to some extent* informative book" (797; emphasis added). The qualification, "to some extent" is a major one, and Chiappe elaborates on this qualification at length. "...[T]he reader," writes Chiappe, "should be careful about distinguishing evidence from speculation, since Chatterjee makes little effort to do so himself" (797). By telling his audience that Chatterjee lacks the scientific value of skepticism, Chiappe is strongly criticizing Chatterjee to the scientific community. At other times, Chiappe points the finger away from Chatterjee and to the book, seeming to blame the book: "...The Rise of Birds attempts to decipher what seems impossible with the available evidence" (798), accusing Chatterjee by implication of going too far with his interpretations, again violating the scientific *topos* of skepticism.

Even more interesting is the review in *BioScience* by Chiappe's friend and collaborator, Kevin Padian, who uses literary devices in his treatment of Chatterjee: "...[R]eaders familiar with dinosaurian biology may wonder about his proposed intermediate stages, which require ostrich dinosaurs to climb trees and leap between branches" (206). Again, Padian's review offers numerous sites for rhetorical analysis, perhaps in terms of rhetorical figures as Fahnestock models in *Rhetorical Figures in Science*.

These are just a few examples from reviews, to illustrate the point that praise and blame are certainly evident in non-peer-reviewed, metadiscursive works, as we would expect, because they are located in the realm of academic discourse. Even further on the informal side of the continuum, are letters to editors of these journals, often printed in response to Chatterjee's articles or book reviews of *Rise*. Occasionally, scientists seem to go out of their way to get comments published in ways that seem blatantly blame-oriented.

John Ostrom wrote one such piece for *Nature* in 1991, shortly after Chatterjee published the 1991 cranial anatomy of *Protoavis* article. Ostrom's comments speak for themselves:

- "Sad to say, for all its length, little support for the claim is to be found in this paper."
- "What we have are photographs of minuscule size and marginal quality, arranged in a confusing format..."
- "I am left with a deep sense of unease. It is understandable that Chatterjee has wished to make the most of his find, but it is surely time that others should now be able properly to evaluate his claims" (212).

Ostrom critiques Chatterjee on every imaginable front. He attacks Chatterjee's scientific credibility by challenging Chatterjee's command of basic scientific faculties: communality, disinterestedness, skepticism, impartiality, and methodology, while building his own credibility as he writes. Once again this text is rich with potential for

rhetorical analysis; it certainly possesses sites of praise and blame, and my purpose here is simply to call attention to its potential, perhaps for future inquiry.

By far the most scandalous article on *Protoavis* has to be one written by Carl Zimmer for *Discover* not long after the 1991 cranial anatomy paper. Here, Ostrom seems to berate Chatterjee in an almost unscientific, emotional tone. Ostrom is quoted by Zimmer as calling the *Protoavis* research “a cold fusion phenomenon” (50), akin to calling Chatterjee an opportunist. Ostrom also stated that he was “unhappy” and “appalled” by Chatterjee’s informing National Geographic, who in turn informed the American public, “without any published material” substantiating Chatterjee’s contention that *Protoavis* is a bird (50). Interestingly, Chatterjee’s cranial anatomy paper appeared in 1991. Acknowledging this fact, Ostrom and Tim Rowe, a paleontologist from the University of Texas, claim that the paper actually proves Chatterjee to be wrong. Rowe implies wrongdoing on Chatterjee’s part, much like Ostrom did when referring to cold fusion: “He chose to publish it outside the United States, where the reviewers didn’t even see the bones” (52). Zimmer draws clear lines in the sand dividing Chatterjee’s supporters and detractors, and effectively isolates Chatterjee based on combinations of claims.

However, Zimmer also gives Chatterjee the chance to defend himself as informally as he is being attacked. Chatterjee uses the opportunity to invoke the ethos of the minority unmistakably: “I’m just a field worker,” he objects, and about Ostrom, “This isn’t science... he’s playing tricks” (54). Zimmer’s collection of discourse, presumably mostly through oral interviewing, reveals epideictic rhetoric in the most informal context likely to be revealed in a publication. As Fahnestock would probably predict, it is the most blatantly epideictic of the discourse I studied.

Discursive asides aimed at Chatterjee are also noteworthy. In a review of paleontologist Pat Shipman’s book *Taking Wing: Archaeopteryx and the evolution of bird flight*, Robert Schoch writes, in reference to Chatterjee:

“And then there is the tawdry tale of the premature announcement, under the auspices of the National Geographic Society (the same group that previously announced the discovery of a 225 million-year-old fossil dubbed *Protoavis* that, as it turned out, was based on such scrappy material its affinities, much less any possible birdlike features, are ambiguous at best—accordingly, most experts have virtually ignored *Protoavis*), of the new 125-million-year-old fossil ‘bird’ from China dubbed *Archaeoraptor Liaoningensis* in late 1999.” (574)

Schoch blames the fossils for being “scrappy,” he blames Chatterjee by association, he blames *National Geographic* for their publicity acts, and he credits “most” (but anonymous) “scientists” with the good sense to know better. Though he is certainly writing in the realm of judicial rhetoric (referring to what *was* done), he goes beyond the requirements of the rhetorical situation to invent discourse making a claim that seems more ceremonial than judicial or deliberative. Schoch’s blame fits neatly into Sullivan’s category of criticism as a function of epideictic rhetoric.

In *New Scientist*, Jeff Hecht reviews Shipman’s and Chatterjee’s books together as well, though he is explicitly reviewing Chatterjee, in contrast to Schoch’s incidental lambaste. Hecht has a different view of the book from Schoch: “The book is readable, but full of anatomical detail... Chatterjee, with an enthusiast’s zeal, describes the fossil in

great detail...” (58). Though we have seen Chatterjee attacked by the eminent Ostrom for not providing enough detail, Hecht criticizes the level of detail, despite earlier in the review mentioning “fresh, thoughtful perspective” and “differing approaches that will appeal to different readers,” comments which may only partially refer to Chatterjee. This example reaffirms that two reviewers may use the same attribute of a scientist’s discourse for the basis of both blame and praise.

Discussion

Overall, a plethora of epideictic rhetoric exists in paleornithological discourse. From the peer-reviewed journal article to the most casual attack in the popular press, examples jump off the page. The lack of treatment of epideictic rhetoric in the rhetoric of science literature may be a result of rhetoricians approaching texts with a prescription; no serious inquiry could overlook the epideictic rhetoric interwoven throughout the *Protoavis* controversy. Or perhaps Fahnstock’s suggestion that these texts are primarily forensic masks their other generic features. On the other hand, surely my foray into epideictic has caused me to overlook literary tropes, syllogisms, and other features that I wasn’t specifically seeking; I look forward to revisiting these texts to analyze their rhetorical aspects from other angles.

Because of its flexibility and omnipresence, epideictic rhetoric may eventually become the genre of choice when investigating how various audiences respond to rhetorical strategies of science writers. Chatterjee seems to have different messages to different audiences, ranging from proposals for legitimation to his colleagues juxtaposed with pedantic lecturing to the uninitiated. Those messages, however, cross generic boundaries and intersect with the messages of other voices in the conversation, including editors, reviewers, and colleagues.

My examples from journal articles and informal quotations show that epideictic rhetoric differs in tone and quality, from context to context. The next step for inquiry might be to record strictly oral exchanges at conferences or other professional meetings. Another useful extension of this discussion might be to introduce some type of qualifying scheme for epideictic. The difference between Chatterjee’s academic prose seeking legitimation and the sniping Zimmer quotes is certainly identifiably different, perhaps in texture or tone, and could be classified thereby.

I am interested in the juxtaposition of the approval Chatterjee afforded the fossils and his disparagement of the field and of humanity, emerging primarily in the text *The Rise of Birds*. Could the refusal of his colleagues to accept *Protoavis* affect the manner in which he addresses his lay audience? Could he be displacing anger at his expert detractors by attacking the public and humanity in general? I hesitate to stray into psychological analyses of his work, but note that psychological approaches to fiction have been productive; their application to scientific invention is promising.

Rhetorically, Chatterjee’s writing reveals the complexities of persuasion in the face of a discovery that should change the nature of the field in which he works – a classic paradigm shift. His *Protoavis* fossils, 225 million years old, potentially displace *Archaeopteryx* not only as the oldest bird fossils, but also as an ancestor to modern birds if *Archaeopteryx* is unseated both temporally and genealogically. That is, *Archaeopteryx* is not the First Bird, and is not the missing link between dinosaurs and birds, as

Chatterjee repeats in a mantric, perhaps to Sullivan, celebratory, fashion (“Epideictic Rhetoric”).

However, Chatterjee’s claim is not considered reasonable enough to be adopted as orthodoxy. In a concession to modernism and positivism I grant that the quality, quantity, and context of his evidence probably accounts for part of this failed discursive venture. Other notable case studies have focused on unsuccessful discursive ventures (see Prelli 1989), but most often those ventures failed at the hands of not being “scientific” enough in nature for the science community to accept. Those cases, involving creationism and animal language, either attempted to redefine an accepted reality or to bend a definition that was consensual by scientists. Chatterjee does not commit these acts. He rather examines his fossils, studies them for years, and presents an interpretation of their origin, along with an explanation of how this fits into paleontological theory.

Superficially, the rejection of Chatterjee’s interpretation of *Protoavis* may seem to support the modernist notion that objective reality is the basis for scientific fact, and scientific truth is nothing more than the unclinking of reality. Had Chatterjee’s fossils been better preserved, less mangled in their depositional environment, and more numerous, science certainly would have accepted his notion that they are birds, because his proof would have been stronger, and that’s the end of it, for the quintessential modernist. Here, however, I argue that it is not the fossil that determines the acceptance of the argument, but at least in part, the discourse and the discourse community. This argument, however, is not new; in fact, the question of how much fact composes scientific truth has been asked and answered in numerous ways (Campbell and Benson 1996; Sullivan “Keeping Rhetoric”; Prelli; Harris). Rhetoricians at least tend to agree that “Reality is not so much discovered or discoverable as it is constituted by the interplay of thought and language” (Lunsford and Ede 47). While Alan Gross might argue that the force of the rhetoric builds the scientific theory, others would counter that when the rhetoric is stripped away, something tangible, measurable, and observable remains – something the scientific positivists and rhetorical moderates would be able to recognize quickly, but even relativists – and rhetorical radicals - would be forced to acknowledge.

The nature of scientific truth is not controversial only within scientific circles, and scientists are keenly aware of this. A secondary audience for Chatterjee’s work is the growing number of creationists who scan evolutionary biology discourse for sites of discord, using that dissensus as evidence for debunking evolutionary theory (Sullivan, “Keeping Rhetoric”; Gish). Showing the difficulties scientists have in making absolute claims, they argue that the underlying paradigm or theory of evolution is fundamentally flawed and untenable. The impact that this audience may have on scientists may be difficult to gauge, but surely impacts the invention processes of scientists involved in such important controversies as the one surrounding *Protoavis*.

Gish writes a disarmingly academic-sounding article in which he writes, “If the claims of Sankar Chatterjee prove to be valid, then certainly *Archaeopteryx* could not be the ancestral bird, and dinosaurs could not be ancestral to birds” (2). Gish continues, in an incomplete analysis of Chatterjee’s claims about *Protoavis*, “Totally contrary to what evolutionists would expect for such a fossil bird, however, Chatterjee claims that his bird is even more bird-like than *Archaeopteryx*!” (3) Chatterjee’s lengthy discussions of where *Archaeopteryx* and *Protoavis* fit into the evolutionary trail were not considered by Gish, as Gish fails to cite Chatterjee as a primary source. Any doubt as to the purpose of

Gish's article is erased by the postscript mentioning "the godless dogma of evolutionary humanism" (4).

Chatterjee's invention process and its discursive artifacts are, as Keith suggests, "strategic responses to the constraints that obtain for them" (Gross and Keith 239). Intentional misreadings by creationists are certainly constraints. Chatterjee is a skilled and educated scientist and rhetor; his awareness of his context is undeniable. The creationist influence on scientific discourse must be included as another facet of the poststructural demotion of science to a place within social systems, no longer immune to the influences of nonscience.

Generally speaking of context, Fahnestock notes the "extratextual" relevance of scientific articles, foregrounding the situatedness of the readers ("Accommodating Science"). Though she assigns this situatedness to scientists, primarily, I would argue that *all* readers bring their own inferences and contexts to the texts regardless of its level of formality or detail, regardless of whether or not they are members of the intended audience. To simply state that expert audiences are provided forensic rhetoric and lay audiences receive epideictic rhetoric is to barricade a productive and important avenue of exploration in rhetoric of science studies.

Conclusions

Based on definitions of epideictic rhetoric provided by Perelman and Olbrechts-Tyteca and Sullivan, few scientific articles would lack epideictic rhetoric. No departure from Aristotelian definitions is required for this claim. The citation of sources, the positioning of one's self in one's field, the explanation of one's position to the uninitiated, and the almost unavoidable use of praise/blame terms all serve to assign most, if not all, scientific discourse to the epideictic genre, as Sullivan suggests. Fortunately, that is not an argument that needs to be addressed. The salient point is that attention to epideictic is indicated by its presence regardless of the definition of epideictic employed; greater awareness of the rhetorical effectiveness of epideictic discourse may yield better rhetorical analysis and writing pedagogy.

Though my analysis is far from exhaustive, I present the following hypotheses with the suggestion that my findings here support them:

- Paleornithological discourse intended for an expert audience contains occurrences of epideictic rhetoric which do not appear to be different in quantity or quality from the epideictic rhetoric of discourse aimed at a public audience
- Paleornithological metadiscourse offers scientists significantly more opportunities to employ epideictic rhetoric than the peer-reviewed journal
- Understanding of the subtle use of epideictic by scientists can increase readers' awareness of the rhetorical aspects of scientific texts

Though epideictic may be less obvious in scientific discourse than forensic or deliberative rhetoric, its existence must be acknowledged to secure the best possible understanding of discursive practices in science. Sullivan says that "Failure on the part of genre critics to recognize epideictic aspects of internal scientific rhetoric is tantamount to

ignoring science as a culture” (“Epideictic Rhetoric” 230) and that writing pedagogy will improve with a greater understanding of science and other academic and professional cultures. This echoes Miller’s suggestions that we consider writing a process of enculturation. Even Fahnestock might admit as simplistic her classification of scientific journal papers as forensic. Analyses of the intellectual interactions between Ostrom and Chatterjee provide an accessible, fascinating case study for how scientific knowledge is socially constructed: among culturally-bound people, inventing ideas, seeking the most reasonable truth in a veritable sea of choices. Whether *Protoavis* flew through the Triassic skies of Texas may never be known; its place in the paleornithological paradigm will be established by the ideas and actions – rhetoric – of the writers whose words I have considered here.

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