

**Doctoral Dissertation Research Proposal:
Geographic Representations of the Planet Mars, 1867-1907**

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Abstract

This dissertation research will use archival and interpretive methods to examine geographical representations of the planet Mars produced by Western astronomers and science writers in the late nineteenth century. Specifically, this project will investigate the ways in which the development of cartography and texts portraying Mars between 1867 and 1907 participated in wider ideological discourses concerning science, imperialism and modernity. The working hypothesis is that representations of Mars' geography not only *reflected* the social contexts of astronomical societies, sponsored observatories, and the larger Western scientific communities through the use of common textual tropes and cartographic conventions; but that they also served to *modify* or *construct* these very contexts. The proposed research will investigate the extent to which historical geographies of Mars challenged or altered dominant discourses of modern Western superiority by representing the planet as a landscape inhabited by beings with superior engineering and organizational skills.

This inquiry will be conducted through archival investigation of three specific conflicts in the representation of Mars that marked turning points in the planet's astronomy: over (1) the nomenclature assigned to its geographical features, (2) the mapping of canals on its surface, and (3) the interpretation of such canals as the work of intelligent beings. Interpretive analysis of archival materials – including astronomers' original maps, sketches, manuscripts, observation logbooks, correspondence and lectures; popular media coverage of astronomers' findings; and contemporaneous maps and documents produced for imperial and other purposes – will focus on reconstructing the historical, social and cultural contexts in which astronomers worked, while also establishing the extent to which discourses of Mars' geography infiltrated other scientific, imperial and popular dialogues during the same time period. Analysis will be guided by the hypothesis stated above, but will remain open to other scientific-cultural explanations for the nature and meaning of what appear today to be rather curious and remarkable geographies of the Martian landscape. By focusing on maps and texts that are relatively unknown to scholars outside the history of astronomy, this research will contribute materially and theoretically to the history of cartography, science studies, historical geography and studies of colonialism.

Introduction and Research Question

Despite the growing interest in nineteenth-century geographical representation, no geographer has yet seriously examined the remarkable discourses that emerged during the latter half of the century to represent the geography of worlds beyond Earth. Popular histories of astronomy (e.g. Sheehan 1996; Morton 2002) indicate that astronomers collected extensive geographic data about the nearby planets, usually recording their findings in detailed maps that were strikingly similar in appearance to many of the well-studied imperial maps produced during the same time period. Although much of this astronomical-geographical knowledge compiled during the late nineteenth century has since been revised or discarded on the basis of twentieth-century remote sensing images, I contend that colonial-era discourses concerning *otherworldly* geographies had widespread scientific and cultural significance at the time they were created.

The representation of Mars as a canal-covered landscape in 1877, for example, not only reverberated throughout the Western world's scientific communities, but also initiated a storm of public debate and speculation regarding humankind's isolation in the universe. Numerous astronomers' claims that they could see a canal network on the Martian surface induced widespread theoretical acceptance of the "plurality of worlds" (the existence of humanoid life on celestial bodies other than Earth) in both Europe and the United States over nearly four decades (Guthke 1983; Crowe 1986). Despite the clear cultural significance of this episode, it has largely been dismissed by standard teleological approaches in the history of astronomy as a case of scientific error. The proposed research rejects that interpretation, suggesting instead that a detailed investigation of the statements and interactions of individual astronomers, scientists, public officials and even public media between 1867 and 1907 will reveal the Mars "canal craze" to be a significant and complex negotiation of sciences, cultures, and modernities. Specifically, the project will address the following research questions:

1. In what ways did prominent nineteenth-century geographical discourses regarding Mars' surface features and inhabitants reflect the specific social contexts of astronomical societies, sponsored observatories, and the larger Western scientific communities?
2. How were scientific representations of Mars as an inhabited, irrigated planet contested and, ultimately, widely accepted as true in Europe and the United States?
3. To what extent did geographies of Mars challenge dominant discourses of modern Western superiority by representing the planet as a landscape inhabited by beings with superior engineering and organizational skills?

Theoretical Context

This project is theoretically informed by several related literatures that form a compelling interdisciplinary intersection: studies of colonialism, the history of cartography, and science studies. The proposed project will draw from recent inquiries in these literatures, contributing materially or theoretically to each.

Studies of Colonialism

Historically, the late nineteenth-century production of scientific Mars maps coincided with a period of intense European imperialism, during which both science and cartography (especially scientific cartography) were fundamental to the establishment and maintenance of European power in the colonial realms (Anderson 1991; Godlewska 1995; Ryan 1996; Edney 1997). In the last two decades, studies of nineteenth-century imperialism and colonialism have been dominated by post-colonial scholarship that concerns itself with analysis of the ways in which imperial (and, to a lesser extent, indigenous) maps and texts constitute “discourses,” through which knowledge and power have been negotiated and institutionalized in various regions of the world.

The foundational post-colonial work, Said's *Orientalism* (1978), argued that imperialism depended for its power on discursive strategies and social practices that constructed geographical knowledge about the colonial realm. Specifically, Said analyzed “Orientalist” discourse to show that Western geographic knowledge about the Islamic world has relied on implicit epistemologies that powerfully support Western dominance of Islamic regions and peoples. He claimed that

Western Orientalists' creation of an "imaginative geography" to describe the Islamic world is traceable in the repetition of certain tropes and literary conventions, and that the uncritical acceptance and repetition of these tropes and conventions in Orientalist scholarship frequently resulted in an imaginative discourse that bore little relation to the region's actual geography. According to Said, Orientalist writing should thus be viewed less as a commentary on the Orient itself than as a reflection of the Occident, showing that Europeans establish their identity in opposition to non-Europeanness, establishing themselves always in a superior, hegemonic position.

Despite its merits, however, Said's work has rightly been criticized for presenting an essentialized, totalizing view of Western scholarship. Although *Orientalism* analyzed individual texts and authors, Said painted them as powerfully constrained within the bounds of Orientalist structure and ignored any resistance or divergence of approaches, thus leaving himself open to damaging criticism that his analysis implicated *all* Western authors/scholars in the production of imaginative geographies that fueled imperialism (Driver 1992). Subsequent post-colonial scholarship has helpfully focused its scope on a wider variety of Orientalist texts, authors, genres and historical situations (see especially Lowe 1991; Pratt 1992), highlighting many cases of discursive resistance to imperial ideologies and activities.

The proposed research will contribute to colonial studies not only by analyzing the extent to which selected astronomical imagery and writing served to construct a previously unstudied "imaginative geography" of Mars, but also by assessing the possibility that such representation constituted a challenge to the dominant Orientalism Said identified. Preliminary analysis suggests that nineteenth-century astronomers and popular science writers used common tropes and metaphors to make the planet's unfamiliar geography conceptually accessible and familiar to scientific colleagues and popular audiences. Through repetition and uncritical citation of each other's work, it appears that European and American astronomers created a powerful discourse that represented the red planet as an Earthlike, inhabited, engineered, and irrigated landscape.

This discourse employed a number of familiar metaphors that were also present in orientalist and colonial texts, including association with the eternal and immutable classical world (Godlewska 1995), the supposed crippling aridity (Saberwal 1997; Grove 1997) and ruined landscape (Grove and Rackham 2001) of the distant realm, and environmental determinism of inhabitants' physique/intelligence (Hudson 1977). The nineteenth-century imaginative geography of Mars, like those produced by Orientalists to represent the Islamic world, was certainly more reflective of astronomers' own geographical notions than of the reality of Mars' surface characteristics. Nonetheless, it seems to have constrained subsequent investigations and compelled certain perspectives of Mars' geography until at least the 1960s, when photographic imagery taken by remote probes contradicted the view of Mars as an inhabited planet.

Interestingly, however, the standard imaginative representations of Mars appear to have departed from or challenged several well-known imperial tropes, including the presentation of the unknown realm as an empty wilderness (Blaut 1993), the effacement of human presence (Pratt 1992) or "creative destruction" of an existing culture to make way for European customs (Godlewska 1995), the presentation of any inhabitants as backward and depraved (Said 1978), and the assumed superiority of European civilization through technology (Godlewska 1995). The imagined Martians of the late nineteenth century were not the animal-like inhabitants that Europeans described after visiting the Orient; they were skilled, noble engineers who managed to irrigate their arid planet with a massive global system of interlinked canals. These cosmic neighbors were hardly inferior to the modern European technologists who had just completed their *first* major canal (Suez) in 1869.

This preliminary analysis raises exciting challenges to Said's widely-accepted concept of Orientalism, suggesting that the discourse astronomers engaged in to represent the geography of Mars constructed a familiar imaginative Other that was actually *superior* to modern Europeans. The ways in which conceptual engagement with this Other – through scientific, philosophical,

and popular discourses – may have deflected, challenged or transformed modernity’s truth claims in the West will serve as the primary inquiry of the proposed research.

History of Cartography

Recent scholarship in the history of cartography has paralleled and contributed to many of the developments described above in studies of colonialism. Rejecting a common view of the history of cartography as a linear evolution of cartographic styles, conventions and technologies that continually increase the accuracy of observation, calculation and representation in mapmaking, new approaches in the last few decades have begun to question this prevailing narrative’s Eurocentrism, its claims to objective truth, and its linear notions of progress. A number of powerful revisions have instead begun to examine cartography as a cultural practice, fraught with ideological meanings and distortions that undermine its claims to scientific objectivity (Edgerton 1987; Boelhower 1988; Harley 1989). Following Harley’s (1989) revolutionary contention that maps should be read as ideological, cultural texts, cartography has generally come to be accepted as a form of discourse, in which knowledge and power are expressed and negotiated.

Given cartography’s long association with the exercise of political and military power, Harley suggested that geographers must consider how the particular historical and ideological circumstances of a map’s production, use and consumption reflect and establish such power (Harley 1988). Accordingly, some of the most productive recent work in the history of cartography has critically examined map series prepared by colonial-era explorers and administrators, especially examining the ways in which imperial cartographies metaphorically justified colonial activities or erased indigenous peoples from desirable territories (Ryan 1994; Carter 1999; Edney 1997). These works indicate that even reconnaissance cartographies representing basic geographic data necessarily carry ideological meaning. The identity and ideological position of the map’s maker, patron, and audience have been shown to fundamentally

influence the ways in which maps operate to construct or limit geographical knowledge (Helgerson 1988; Ryan 1994; Manners 1997).

This literature clearly informs the proposed examination of nineteenth-century Mars maps (and related representations), requiring a critical evaluation of the social contexts of astronomical societies and sponsored observatories in which individual Mars astronomers worked. Additionally, however, I suggest that the proposed research will contribute materially to the history of cartography by bringing to light a series of map, imagery and texts that closely paralleled the well-studied imperial maps of the same era. As argued above, the ways in which Mars representations differed from standard imperial representations of unknown territories should be examined as a potential site of resistance, in which astronomers differentiated themselves from surveyors or geographers and presented a very different view of Western superiority.

Although historians of astronomy and popular science biographers have made some use of the collections I intend to visit, I argue that no modern researcher has seriously considered the turn-of-the-century Mars maps as meaningful scientific or cartographic documents. Despite the fact that historians and geographers have extensively examined imperial cartography produced in the same era, the Mars canal maps have largely been disregarded as curiosities. The few historical works to examine the collections that are relevant to this research have either limited their analyses to chronological accounts of observation technology (Sheehan 1996) and the origins of present-day Mars nomenclature (Blunck 1977), or have dealt only briefly with nineteenth-century mapping as a historical backdrop to analysis of the cultural impact of twentieth-century photographic Mars maps (Morton 2002). By focusing on Mars maps, drawings and related items (correspondence, publications, lectures, etc.) that are relatively unknown to critical scholars outside the history of astronomy, this research will provide a material contribution to the history of cartography.

Science Studies

The investigative framework for this study is informed primarily by recent advances in science studies. Popular constructivist assertions of the 1970s and 1980s (e.g. Collins 1974; Callon 1986) – that scientific knowledge is influenced by a cultural dimension – have been replaced by critical scholarship that has formulated a model of science *as* culture (Shapin and Schaffer 1985; Biagioli 1993). In re-reading and revising historical accounts that treat science and culture as separate entities, this new approach to science studies suggests that scientific change occurs as a result of complex cultural negotiation. Identifying numerous instances of “translation” and “hybridization” (subversive appropriation) of one culture’s knowledge/power claims by another, recent scholarship rejects Kuhn’s (1970) idea that science proceeds in revolutionary leaps and bounds.

Contemporary science studies has engaged concepts developed in cultural studies to explain the nature of scientific practice and its knowledge/power claims. A linguistic- or discourse-based approach to the ways in which science is negotiated and formulated with various cultural practices or political ideologies, however, raises a host of complex new issues for historians of science to contend with. In critiquing the universal view of science, for instance, historians of science must avoid lapsing into relativistic accounts of the linguistic “incommensurability” of cultural worldviews or knowledge claims (Hart 1999). Such relativism problematically asserts an unbridgeable divide between the “West” and its “Others,” lending unfortunate credence to the persistent notion that Westerners have achieved superiority over non-Western civilizations on the basis of technological superiority (Adas 1989) or unique quantitative perceptions of reality (for a critique of this view, see Hart 2000). Recent cultural studies of science have accordingly developed the concept of “translation” to dismantle monolithic notions of “the West” and its “science,” fundamentally revising traditional historiography of the cultural encounters between Western explorers, merchants, missionaries or colonial administrators and non-Western societies (Prakash 1999; Hart 1999).

The research proposed here will examine late nineteenth-century astronomy as a culture, governed both by internal rules and constraints as well as external needs to communicate with other scientific and institutional cultures. Archivaly, this research will investigate the particular settings in which individual astronomers worked to produce articles, lectures and, importantly, maps that recorded their observational findings regarding Mars' geography. Analytically, it will elucidate the intertwining of particular national, institutional, and social contexts with astronomers' scientific activities. For instance, the proposed research will investigate the ways in which astronomers' use of modern cartographic conventions may have functioned as an attempt to shore up astronomy's (and astronomers') disciplinary status in the face of increasing imperialist hype and funding for natural sciences such as geography. Analysis of the interactions among astronomers of differing nationalities, competing institutions, and varying social groups will focus on the localized contestation and negotiation of particular knowledge claims through both texts and maps. This focus will provide a critical view of the ways in which astronomers positioned themselves and defined their scientific identity through their studies of Mars.

In addition, the proposed research will investigate the cultural interactions among Mars astronomer-geographers and other intellectuals in related scientific and philosophical disciplines. Applying a science studies approach, the debated acceptance of certain astronomers' statements regarding the existence of a canal network on Mars' surface can be examined as a process of translation and negotiation. Examination of the publications and direct communications between individuals who interpreted the Martian canals as evidence of aliens and those who subscribed to a metaphysical belief that humans were alone in the universe will help determine whether these groups engaged in strategies of subversive appropriation and modification of each other's claims. If so, the textual and cartographic record of how such claims were translated and negotiated will be probed for evidence of the extent to which the discourse regarding Mars' canals produced new cultural worldviews.

Finally, this research will investigate the particular characteristics of the negotiated view of Mars as a “plural world,” inhabited by humanoid “Others.” Although the late nineteenth-century discourse regarding Mars’ inhabitants clearly employed notions of difference, familiarity and superiority – elements that Said (Said 1978) identified as central to the modern Western project of knowledge production – numerous astronomers and their allies formulated these concepts differently, postulating that Martians were actually superior to humans. In this sense, I argue, nineteenth-century Mars astronomy may have constituted an alternate modernity, one that in fact interacted significantly with the contemporaneous imperialist modernity. Using a cultural studies approach, this negotiation of modernities will be investigated as a process of cultural translation, discernible in the historical record through publications by and communications among representatives of the various modernities.

Research Plan and Methodology

Using methods of historical and archival research, this inquiry will be carried out by examining three specific conflicts in the representation of Mars: (1) the controversy over Mars’ nomenclature, which focuses mainly on the contentious transition from Richard Proctor’s 1867 surname-based scheme to Giovanni Schiaparelli’s 1877 classical Latin convention based on the geography of the ancient Mediterranean world; (2) the vigorous debate over the existence of Martian canals between Schiaparelli and Nathaniel Green, whose 1877 maps differed widely in level of detail; and (3) the conflicts regarding sensationalism during the “Canal Craze” of the 1890s and early 1900s, consisting mainly of attacks on Percival Lowell by skeptical astronomers and other scientists who refuted his interpretations of the Martian canals as the work of intelligent beings. Each of these controversies marked a turning point in Mars astronomy (Sheehan 1996) and thus represents a rich opportunity for detailed analysis of the research questions outlined above.

Archival Research

To analyze these controversies, I will travel to relevant libraries and observatories (see below) to view astronomers’ original maps, sketches, manuscripts, observation logbooks, correspondence, lectures and other materials in order to reconstruct the specific historical and social contexts that influenced their work. In addition, I will compare representations of Martian geography with the numerous geographical discourses presented in secondary sources that have been interpreted from contemporaneous maps and documents, such as those produced for imperial purposes. Finally, I will review original sources at each repository (and related archives, where necessary) for evidence of the extent to which discourses of Mars’ geography infiltrated other scientific and popular dialogues during the same time period. This will include examination of newspaper articles, popular essays, books and other materials.

Repository/Location	Collections
Lowell Observatory Library Flagstaff, Arizona	<p>Percival Lowell collection (1894-1916)</p> <ul style="list-style-type: none"> • Observation log books • Correspondence • Published manuscripts • Lectures • “Mars craze” clipping file
Royal Astronomical Society Library London, UK	<p>RAS Letters</p> <ul style="list-style-type: none"> • Richard Proctor correspondence • Other Mars-related correspondence <p>RAS MSS</p> <ul style="list-style-type: none"> • Nathaniel Green’s Mars maps/drawings 1877-1888 and assorted personal papers <p>RAS Papers</p> <ul style="list-style-type: none"> • Proctor’s / Green’s publications • Mars maps, various astronomers • Scientific and popular journals • RAS lectures • Mars globes • Cartoons
Brera Observatory Archive Milan, Italy	<p>Giovanni Schiaparelli collection</p> <ul style="list-style-type: none"> • Observation logbooks • Published manuscripts • Mars drawings/maps • Correspondence

Interpretation and Analysis

Interpretive analysis of these archival materials will remain open to various cultural and scientific explanations for the nature and meaning of what appear today to be rather curious and remarkable geographies of the Martian landscape. The interpretive focus, however, will primarily investigate the possibility that nineteenth-century Mars astronomy may have significantly challenged dominant discourses of modern Western superiority by representing the planet as a landscape inhabited by beings with superior engineering and organizational skills.

In order to assess the validity of this preliminary hypothesis, Said's methodological approach to discourse analysis will be used to identify narrative voice, literary structures, figures of speech, images, themes, and motifs evident in individual scientific texts. Although Said did not claim that his methods of discourse analysis could be applied to maps or other images, this research will methodologically follow the examples of scholarship in the history of cartography that suggests the identification and interpretation of conventions such as scale, framing, selection and coding (Harley 1988; Cosgrove 1999) can be used to interpret maps as texts. To determine the ways in which tropes and conventions used in individual texts and maps constituted (or did not constitute) a broader discourse, Mars representations will be examined in relation to one another. As Said showed for the Orientalist literary canon, I expect to be able to demonstrate that certain representational conventions became broadly established in the Mars-related scientific literature over time, especially when they metaphorically presented Mars' geography in familiar (terrestrial) terms.

Accepting Said's (1978) premise (drawn from Foucault) that knowledge reflects and maintains power, this project will seek to interpret the ways in which nineteenth-century representations of Mars, which had widespread scientific and cultural significance at the time they were created, influenced the hegemonic power of the modern Western nations in which such representations were produced and consumed. In this regard, analysis of the Mars discourse will be situated alongside analyses of contemporaneous orientalist discourses, such as Said's argument

that imaginative geography produced the West's superiority complex, Mitchell's (1989) argument that Western forms of representation themselves constitute a "method of order and truth"(236), and even Bhabha's (1995) hypothesis that European modernity was fashioned by its encounter with the colonial Other.

In conducting an analysis of the Martian geography discourse, however, this research will carefully avoid the pitfall of treating Western astronomy as if it were a unified endeavor.

Although I argue that a dominant discourse emerged to represent Mars, this research will specifically focus on resistance and controversy (regarding the nomenclature applied to surface features, for example) as a way of highlighting the heterogeneity of approaches to the presentation of Mars. Learning from both Said's mistakes and the helpful corrections provided by subsequent colonial discourse analysts (Lowe 1991; Pratt 1992), this research will analyze the ways in which competing representations of Mars were produced by astronomers working in different professional and cultural settings, writing for different audiences. The resolution of various controversies in favor of certain astronomers' opinions over others' will be assumed to reflect a variety of power relationships that can be read through the discourse of the maps and texts.

Preparation to Conduct the Proposed Research

In preparation for undertaking this research, I have begun communicating with librarians/curators at repositories that hold the papers and maps of Proctor, Green, Lowell and their contemporaries. In initial contacts, I have verified the extent and accessibility of their collections, and have received enthusiastic support for my dissertation research. Although contact has not yet been established with the Brera Observatory, where Schiaparelli's papers and maps are held, other researchers familiar with the facility have assured me that it will be accessible and suitable for my research inquiries. Given this initial legwork, I propose that the

archival research activities outlined above can reasonably be accomplished according to the timeline below.

Methodological Preparation

As a doctoral student, I have taken methodological coursework in historical/ archival research and discourse/metaphor analysis that uniquely prepares me to undertake a complex research design that will rely on historical interpretation of a number of disparate archival sources. During this time, I have also completed two projects in original discourse analysis, both of which resulted in well-received papers that have allowed me to clarify my understanding of methodological nuances.

Language Competency

The majority of the documents and maps I intend to examine are in English, as Proctor, Green and Lowell published and corresponded primarily in English. Schiaparelli's work was published mainly in Italian, however, and some of his correspondence (especially with English and American colleagues) is in French. Accordingly, I have begun study of Italian this semester, with a focus on reading skills, intending to attain the equivalent of second-year Italian by the time I visit the Italian archives. My working knowledge of both Spanish and Portuguese will help me swiftly achieve reading knowledge of Italian before summer 2004. To analyze correspondence written in French, I intend to rely on existing or commissioned translations.

Timeline for Research Activities

Phase 1: January – April 2003 (Austin, Texas)

- Proposal defense, advancement to doctoral candidacy
- Secondary source readings on Percival Lowell and contemporaries
- Preparations for archival research at Lowell
- Italian language course
- Grantwriting

Phase 2: May – June 2003 (Flagstaff, Arizona)

- Archival research at Lowell Observatory

Phase 3: July – December 2003 (Austin, Texas)

- Analysis of research findings
- Followup travel to relevant U.S. repositories, as needed
- Secondary source readings on Richard Proctor, Nathaniel Green, Giovanni Schiaparelli
- Preparations for archival research at RAS, Brera
- Italian language courses (summer B and fall semester)
- Grantwriting

Phase 4: January – May 2004 (London, UK)

- Archival research at Royal Astronomical Society and related English repositories

Phase 5: June – August 2004 (Milan, Italy)

- Archival research at Brera Observatory and related Italian repositories

Phase 6: September 2004 – August 2005 (Austin, Texas)

- Analysis of research findings
- Dissertation writing
- Preparation of articles and conference presentations

Potential Funding Sources

To fund the archival phases of the proposed research, I applied in Fall 2002 or will apply in Spring 2003 for a number of grants, fellowships, and awards, including:

- Council on Library and Information Resources: Mellon Fellowship for Dissertation Research in Original Sources (\$20,000 – 12 months)
- NASA-American Historical Association: Fellowship in Aerospace History (\$20,000 – 12 months)
- National Science Foundation: Doctoral Dissertation Research Improvement Grant in Science and Technology Studies (\$12,000 – 9 months)
- University of Texas Department of Geography: Teaching Assistantship (\$11,900 – 9 months)
- Society of Women Geographers: Evelyn L. Pruitt National Fellowships for Dissertation Research (\$15,000 – 12 months)
- Royal Astronomical Society: Grants for Studies in Astronomy and Geophysics (£5,000)
- J.B. Harley Research Fellowships in the History of Cartography (£1,000 – 4 weeks)

In addition, I intend to apply in Fall 2003 for awards that would fund dissertation writing after the archival phases of the research are complete, including:

- American Association of University Women: American Fellowships for Dissertation Research (\$20,000 – 12 months)
- University of Texas: Harrington Dissertation Fellowship (\$25,000 – 12 months)

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