

Cambridge University Press

978-0-521-43395-2 - Patronage, Practice, and the Culture of American Science: Alexander Dallas Bache and the U. S. Coast Survey

Hugh Richard Slotten

Excerpt

[More information](#)

Introduction

The growing importance in the twentieth century of the scientific enterprise, as practiced in the United States, has resulted in a dramatic increase in interest in the history of American science. Indeed, a recent observer has warned that this development threatens to help create “a flood that may completely wash away certain more esoteric and traditional specialities.”¹ Although this book builds on recent trends, it emphasizes the nineteenth-century context. A study of the involvement of Alexander Dallas Bache with the U.S. Coast Survey is essential for understanding a number of important issues, including the growth and professionalization of American science, especially in the context of the nascent support of the federal government and the interconnections between science and antebellum society and culture. My main interpretive aim has been to cast my nets widely and pursue an analysis that will shed light on broad historiographic themes in the history of science in the United States.

The U.S. Coast Survey was one of the earliest scientific agencies of the federal government. Congress first authorized the Survey in 1807 to chart and map the country’s coastline. In order to accomplish these practical functions with great accuracy and precision, the Coast Survey used the expert methods and knowledge of the nation’s scientifically trained personnel. The resulting connection with the emerging community of American scientists became strong, especially during the period from 1843 to 1867, when Alexander Dallas Bache, the great-grandson of Benjamin Franklin, served as the Survey’s superintendent after graduating first in his class from the Military Academy at West Point, arguably the best school for science and mathematics in the country. Under Bache’s direction, the Coast Survey became the largest and most important institution supporting science in antebellum America. Bache used his position on the Coast Survey to become the foremost patron of science in this period and to develop close relationships with influential politicians, businessmen, civic leaders, military officers, and other social and intellectual elites.

The antebellum period has been described by Nathan Reingold as the “crucial decades in which the American scientific community came

Cambridge University Press

978-0-521-43395-2 - Patronage, Practice, and the Culture of American Science: Alexander Dallas Bache and the U. S. Coast Survey

Hugh Richard Slotten

Excerpt

[More information](#)

into being” and by Robert Bruce as the era that saw the “launching” of American science.² During the years before the Civil War, leaders of the American scientific community founded a number of important institutions, established patterns of patronage to support scientific research, and helped organize the scientific community around professional ideals. Under Bache’s leadership, the Coast Survey played a central role in the transformations occurring in this period.

The Coast Survey pursued a wide variety of scientific activities, from astronomical and geophysical research to observations of the Gulf Stream and studies of microscopic animals from the bottom of the ocean. But neither Bache nor the Coast Survey were divorced from the social, religious, economic, and intellectual concerns of the period. A study of Bache’s involvement with the Coast Survey provides a unique opportunity to understand the place of science in culture.

As a contribution to the growing body of historical literature that explores the local context of science, this book is informed by recent work in post-Kuhnian history of science. According to Timothy Lenoir, “in place of the view of science as an eminently timeless, objective, and rational pursuit, we have inherited from Kuhn and others the interpretation of science as an historically rooted, socially and culturally contingent enterprise.”³ But my goal is not to restrict our understanding of science by demonstrating, in a naive way, how it is “socially constructed.” Rather, I attempt to understand the scientific enterprise as a complex, multileveled, multifaceted cultural phenomenon. Instead of defining science narrowly as an abstract body of knowledge discovered and confirmed through the use of logical rules, I pursue a broader analysis, also taking into account techniques, instrumentation, social arrangements, public interaction, patterns of patronage, and the values and ideals supporting professional development.

Chapters 1 and 2 examine the values and commitments that guided Bache’s scientific work. He was influenced by a political and cultural milieu that helped legitimate his scientific ambitions and interests. The elitist convictions and moral concerns of his family and friends in Philadelphia were especially important in providing him with a robust framework for his own development. An analysis of Bache’s efforts during the 1830s to “professionalize” American science and the American scientific community enables us to gain a better understanding of his later activities on the Coast Survey.

Chapters 3 and 4 discuss the early history of the Coast Survey under the command of its first superintendent, Ferdinand Hassler, and Bache’s efforts to gain control of the agency after Hassler’s death in

Cambridge University Press

978-0-521-43395-2 - Patronage, Practice, and the Culture of American Science: Alexander Dallas Bache and the U. S. Coast Survey

Hugh Richard Slotten

Excerpt

[More information](#)

INTRODUCTION

3

1843, Like Bache, Hassler attempted to raise the scientific status of the Survey and use it to advance American science by supporting a broad spectrum of scientific activities. Although much of Hassler's ambitious vision for the Coast Survey remained unrealized, he did lay a foundation for his successor. Whereas Hassler was motivated by European cosmopolitan standards, Bache attempted to adapt European cultural traditions and institutional patterns to the American context. A comparison with Hassler thus illuminates the reasons for Bache's success.

Chapters 5, 6, and 7 examine major themes in the history of the Coast Survey using detailed archival sources. Chapter 5 explores the strategies Bache used to gain support and maintain control. An analysis of these efforts provides an excellent opportunity to examine the interrelationship of science and society, specifically in the United States. As Roger Hahn has argued, scientific institutions function as "the anvil on which the often conflicting values of science and society are shaped into a viable form."⁴ The growth and development of the Coast Survey can be understood in terms of a process of negotiation and boundary work. The political and organizational negotiations that Bache pursued were necessary to expand the base of support for the Coast Survey; when combined with a process of boundary work, the scientific component was invested with cognitive authority and social legitimacy. Used in combination, the two processes helped Bache mediate and manage the tensions inherent in the institution of science in the United States and transform the Coast Survey into what he liked to call the "Scientific National Work."

Chapter 6 explores the role of the Coast Survey as a source of patronage for antebellum American science. I analyze how Bache used his powerful position on the Survey to construct systems of sponsorship that influenced scientific practice during this period. Who received support? For what kind of activities? How important was Coast Survey patronage compared to other sources of funding? A detailed analysis of the patronage structure of the Coast Survey helps us understand how geographically oriented, Humboldtian research became the dominant style of science in this period. By supporting complex studies investigating the geographical distribution of interrelated phenomena, Bache received the highest praise from European savants and became one of the first scientist-entrepreneurs in the United States. These individuals played a major role in the transformation of modern science from a primarily individualistic activity to the large-scale, highly organized social practices of "Big Science."

Chapter 7 examines the social practices Bache developed in more

Cambridge University Press

978-0-521-43395-2 - Patronage, Practice, and the Culture of American Science: Alexander Dallas Bache and the U. S. Coast Survey

Hugh Richard Slotten

Excerpt

[More information](#)

detail. By looking at the management, organization, and scientific practices of the Survey, we especially see how Bache's cultural and social commitments shaped his scientific activities and interests. My investigation of the interrelationship between technical and social practices is influenced by recent work in science studies. According to Jan Golinski, scientific "facts are not simply presented to casual observation like stones picked up on the seashore; they have to be created by active labor with particular kinds of resources."⁵ The practical considerations involved in the organization of Coast Survey work became an important part of the scientific enterprise that Bache supported. An analysis of these practices provides an opportunity to investigate the relationship between the geographical style of American science and broadly held social, cultural, and moral values.

As a contribution to the history of American science, this study also throws greater light upon the function and meaning of other elite institutions in the late nineteenth and early twentieth centuries as analyzed especially by Daniel Kevles.⁶ An analysis of the Coast Survey uncovers the roots of the elitist values and social practices of such institutions as the United States Geological Survey and research universities such as the Johns Hopkins University. We may go so far as to suggest that a comprehensive presentation and analysis of the Coast Survey and especially the vision, work, and web of connections represented by Benjamin Franklin's great-grandson, Alexander Dallas Bache, offer the key to the institutional and cultural development of American science at a crucial turn in the nineteenth century.

Cambridge University Press

978-0-521-43395-2 - Patronage, Practice, and the Culture of American Science: Alexander Dallas Bache and the U. S. Coast Survey

Hugh Richard Slotten

Excerpt

[More information](#)

1

Becoming a man of science: Philadelphia, West Point, and patrician-republican culture

It really has surprised me . . . the facility with which you turn from your scientific calculations and the complicated arrangements of your immense superintendence to all the courtesies and amenities of social life. No one who saw you for the first time, without knowing you, among a party of ladies, joining in their conversation and talking of painting and poetry and music and all the elegance of female society as if you were in your favorite element would ever imagine that you are the Alexander D. Bache whose admirable direction of our noble coast survey is calling forth the praise and rivalry of the commercial world. Can it be that the mantle of Franklin, whose blood as an Anglo Saxon courses in your veins – and of D’Alembert or LaPlace as a Frank has fallen upon you and inspired you to sustain such usually opposite characters.

Mitchel King to Alexander Dallas Bache, July 10, 1855¹

On November 20, 1843, Ferdinand Hassler, the first superintendent of the United States Coast Survey, lay dying in Philadelphia. Upon his death that evening, Philadelphia scientists lost no time in mobilizing to promote one of their own, Alexander Dallas Bache, to succeed Hassler. Bache’s credentials were impeccable. As an ambitious young leader of the scientific community in Philadelphia, Bache was zealously committed to advancing American science in order to gain the respect of European elites and had, for a number of years, coveted Hassler’s position. He believed that progress in American science would occur only if scientific elites such as himself gained control of national institutions. The Coast Survey, as one of the most important scientific institutions of the young Republic, would become a central focus of Bache’s efforts to improve the institutional structure supporting American science.

By successfully winning an appointment to succeed Hassler as superintendent of the Coast Survey, Bache eventually became one of the most important leaders of the antebellum scientific community. Until

Cambridge University Press

978-0-521-43395-2 - Patronage, Practice, and the Culture of American Science: Alexander Dallas Bache and the U. S. Coast Survey

Hugh Richard Slotten

Excerpt

[More information](#)

his death in 1867, he used the Coast Survey to set the highest scientific standards, to provide research opportunities for American scientists, and to influence, if not control, other scientific institutions. Bache worked to professionalize the American Association for the Advancement of Science by preventing individuals he considered amateurs or “charlatans” from dictating the standards of science. As one of the most influential regents of the Smithsonian, Bache helped orient the institution toward supporting the advancement rather than the diffusion of knowledge. And as a major force behind the founding of the National Academy of Sciences, Bache sought to create an institution that would channel government support to the country’s best professional scientists.

Deeply held values motivated Bache’s scientific activities. By examining his family background, his educational experiences, and his early work as a scientist and educator in Philadelphia, we can better understand the intellectual and cultural convictions that helped shape Bache’s desire to pursue science as a cultural calling and his ambition to become “chief” not only of the Coast Survey but of the entire antebellum scientific community.

Family ties and patrician Philadelphia

Both sides of Bache’s family were committed to public service, intellectual self-improvement, and social elitism. More than any other single individual, the towering figure of his great-grandfather Benjamin Franklin inspired Bache’s scientific ambitions. By marrying Franklin’s daughter Sarah, Alexander’s grandfather Richard Bache inherited from Franklin the position of postmaster general; Alexander’s father Richard, in turn, became postmaster of Philadelphia. Social prestige and political influence were traditions that Alexander could take for granted not only because of the civic work of his father and grandfather but, even more important, because of the achievements of his father’s brothers and sisters. Benjamin Franklin Bache, for example, wielded considerable political influence in the early Republic as the editor of the journal *Aurora*; Louis Bache gained fame as an army officer during the War of 1812; Deborah Bache married William J. Duane, who served as secretary of the treasury during Andrew Jackson’s administration; and Sarah Bache married Thomas Sergeant, who succeeded Richard Bache as postmaster of Philadelphia and later became a justice of the Pennsylvania Supreme Court.² As one of the first families in Philadelphia, the Baches stimulated Alexander’s own ambitions.³

Alexander may have found inspiration for eminent achievement on

Cambridge University Press

978-0-521-43395-2 - Patronage, Practice, and the Culture of American Science: Alexander Dallas Bache and the U. S. Coast Survey

Hugh Richard Slotten

Excerpt

[More information](#)

his father's side of the family, but his mother's family, the Dallahses, provided an even stronger tradition, especially in politics. Alexander's mother Sophia Dallas was the daughter of Alexander James Dallas, a prominent Philadelphia lawyer who served as secretary of the treasury under President Madison and helped establish a powerful political dynasty in Philadelphia. Sophia and her brothers and sisters furnished Alexander Dallas Bache with the opportunities and experiences of an elite political family: George Dallas served as a U.S. senator from Pennsylvania during the 1830s and was elected in 1844 to the vice-presidency in James Polk's administration; Matilda Dallas married William Wilkins, who became a prominent judge in western Pennsylvania, served alongside George Dallas in the U.S. Senate, and became secretary of war in 1844; Trevanian Dallas followed his sister Matilda and her husband to western Pennsylvania, where he also became a judge; and Alexander Dallas became a distinguished commodore in the navy. With the marriage of Richard Bache to Sophia Dallas, the Bache family became an integral part of a state political machine known as the "Family Party," which was effectively run by George Dallas and included Trevanian Dallas, Richard Bache, William Wilkins (a Dallas relative) and Thomas Sergeant (a Bache relative).⁴ Through his close connection to the members of the "Family Party," Alexander Dallas Bache would acquire an intimate understanding of the practice of politics.

From a sense of duty and commonly held ambitions, Alexander's nine brothers and sisters upheld the family's upper-class traditions of leadership and achievement and, in the process, helped support their older brother's own entrepreneurial efforts. One of Alexander's sisters married Pennsylvania native Robert J. Walker, who became a senator from Mississippi and secretary of the treasury in Polk's administration; another sister married William Wallace Irwin, who served as mayor of Pittsburgh and as a U.S. congressman. Two of his brothers, Richard and George, and one of his brothers-in-law, Richard Wainright, became distinguished naval officers, and another brother-in-law, William H. Emory, became one of the most important officers with the Corps of Topographical Engineers.⁵ The family, as an analogical concept, was an important ideal for Alexander and his brothers and sisters. In pursuing his career as a public figure, Alexander Dallas Bache relied on the complex network of kinship relationships that tied the Baches to the Dallahses and to other elite American families.⁶

In Alexander's immediate family, Sophia Dallas ruled as the matriarch, having been forced to raise her children single-handedly after her husband left the family when many of the children were still young.

Cambridge University Press

978-0-521-43395-2 - Patronage, Practice, and the Culture of American Science: Alexander Dallas Bache and the U. S. Coast Survey

Hugh Richard Slotten

Excerpt

[More information](#)

Richard Bache's reasons for abandoning his family remain unclear, as does the exact date that he left Philadelphia. Although some evidence indicates that he may have left to escape financial difficulties, it seems more likely that he was forced to leave by a political scandal, in 1828, that cost him his position as postmaster of Philadelphia.⁷ In any case, Richard Bache lost contact with the family after moving to Texas, where he became involved in local politics.⁸ Thereafter, Sophia Bache played a major role in shaping Alexander's character.

Sophia Bache inculcated her children with a sense of responsibility to both family and country. According to a close friend of the family who had read the letters Sophia had written to Bache at West Point, she "inspire[d] her son with high sentiments and encourage[d] him to persevering industry."⁹ Sophia Bache stressed that because Alexander was the oldest son in a family lacking a father, he should look after the welfare of his eight brothers and sisters. Through his mother's "maternal solicitude" Bache also learned the importance of such virtues as self-discipline, hard work, and perseverance.¹⁰ Descriptions of Bache's character by some of his contemporaries emphasized the importance of his mother's moral influence. In the opinion of one friend and colleague, Joseph Henry, Bache's mother had shaped her son's capacity to "suppress all tendency to self-indulgence" and his ability to maintain "control over his passions and feelings." Throughout his life Bache would be inspired by unusually high ideals and convictions.¹¹

Military engineering and public education

Sophia Bache also helped prepare Alexander for a career that would honor the family tradition of military and public service. With his mother's – and probably his father's – encouragement, Alexander entered the U.S. Military Academy at West Point in 1821 at the age of fifteen. The Academy had only recently come under the command of its third superintendent, Sylvanus Thayer. As an admirer of French military education, especially the *Ecole Polytechnique*, Thayer had reformed the Academy by introducing advanced training in French science, analytical mathematics, and engineering. A major purpose of the Academy had always been to produce military officers who would excel as enlightened "men of science," the contemporary term for what would come to be called a scientist.¹² Thayer placed a strong emphasis on this Jeffersonian tradition. While a student at the Academy, Bache gained a solid background in scientific fields from chemistry and mineralogy to dynamics and astronomy.¹³ He received one

Cambridge University Press

978-0-521-43395-2 - Patronage, Practice, and the Culture of American Science: Alexander Dallas Bache and the U. S. Coast Survey

Hugh Richard Slotten

Excerpt

[More information](#)

of the most advanced scientific educations available in the United States during the early nineteenth century. The Military Academy also helped define Bache's interest in science as a cultural enterprise closely linked to engineering, internal improvements, commerce, economic development, and the practical world.¹⁴

In Bache's case, the implicit policies of moral and cultural training at the Academy reinforced his childhood upbringing. By placing a special emphasis on disciplinary guidance and benevolent control, Thayer practiced what John Quincy Adams called a "severe but paternal superintendence."¹⁵ Thayer expected students to follow strict military regulations; any violation could lead to expulsion from the Academy. As a means of teaching students the value of academic discipline and competition, he established a highly rationalized system of grading, which required that teachers evaluate, with quantitative precision, students' performances in all subjects at the end of each day.¹⁶ Although Thayer also encouraged students to develop a sense of esprit de corps while at the Academy, the military community that he developed was by no means egalitarian or democratic. Thayer stressed the importance of a hierarchically organized social system, in which leaders would hand down orders authoritatively along a clearly defined chain of command.¹⁷ He wanted to make sure that the Academy would produce good soldiers as well as good engineers and men of science. Bache embraced Thayer's values, partly because they matched his childhood experiences.¹⁸ By demonstrating that the best leader should combine strict rule and control with parental care and concern, Thayer inspired Bache's own work as a leader of American science.¹⁹

After four years at the Academy, Bache graduated first in his class. Because of his excellent record, he spent an additional year teaching mathematics and natural philosophy in the Engineering Department. His academic performance also landed him a prized position as a lieutenant with the Corps of Engineers. During the two years he spent as an army engineer, Bache gained valuable practical skills working on the construction of Fort Adams in Newport, Rhode Island. In Newport, Bache also met and later married Nancy Clarke Fowler, the daughter of a notable Newport citizen.²⁰

Despite his training, Bache was not interested in a career as an army engineer; he would instead seek to become a respected man of science. The Military Academy served as America's elite scientific school during this period. The importance of science at the Academy can be seen in the attempt by faculty and students, in 1829, to found a national institution committed to the promotion of science.²¹ Drawing on the emphasis on science at the Academy, Bache would pursue a reputation as a man of science, first by publishing a few scientific

Cambridge University Press

978-0-521-43395-2 - Patronage, Practice, and the Culture of American Science: Alexander Dallas Bache and the U. S. Coast Survey

Hugh Richard Slotten

Excerpt

[More information](#)

papers and then, in 1828, by returning to Philadelphia to accept an appointment as professor of natural philosophy and chemistry at the University of Pennsylvania. Although he officially resigned from the army after accepting this position, he maintained close ties with military officers for the rest of his life. These contacts would become immensely valuable in the years to come, especially by providing political support for his administration of the Coast Survey.

During the first seven years after moving to Philadelphia, Bache taught at the University of Pennsylvania and, in his spare time, undertook physical and geophysical research, especially in meteorology and terrestrial magnetism. Using this devotion to research as a foundation for organizational work, Bache soon became a leader of the Philadelphia scientific community. Through his family connections and his involvement with the prominent institutions of the city, including the American Philosophical Society, the Franklin Institute, and the socially exclusive Wistar Club, he gained the acquaintance of the city's elite scientists, engineers, manufacturers, and civic leaders. Much of Bache's scientific work in Philadelphia, including his federally sponsored research at the Franklin Institute on the cause of steam-boiler explosions, was closely connected to public support from either the state or the federal government. He served as the chair of a state committee analyzing the standardization of weights and measures in Pennsylvania, as one of the commissioners of the Geological Survey of Pennsylvania, and as a close advisor to the Philadelphia Mint.²² Bache's experiences in Philadelphia working on government-supported scientific projects helped to inspire a belief in the necessity of government patronage for the advancement of American science.

Bache's scientific work in Philadelphia did not limit his involvement in other cultural activities, however. For Bache, scientific and technological developments were not merely ends in themselves, sufficient to constitute the idea of progress, but also means to broader social, political, and cultural goals. He was thus committed to what Leo Marx calls an "Enlightenment belief," rather than a more restricted "technocratic concept," of progress.²³ He believed that a true man of science would both specialize in science and take an active interest in other social and cultural pursuits. Especially during the period from 1836 to 1843, Bache actively supported the cause of educational reform. Beginning with his election to the presidency of Girard College in the fall of 1836, Bache combined an interest in science with a strong dedication to general education.

As the president of Girard College, Bache sought to follow the instructions of the founder Stephen Girard, a wealthy Philadelphia businessman who had left a large endowment for the establishment of a