Pioneer: The First American Doctorate in Meteorology

Abstract

This study examines one aspect of the early history of meteorology as a university discipline in America—the establishment in the late 19th century of a program of research and graduate training at The Johns Hopkins University. The cooperative efforts of Cleveland Abbe and other Weather Bureau officials with President Daniel Coit Gilman and Hopkins faculty members resulted, in 1891, in the establishment of the Maryland State Weather Service in association with the university. Under Hopkins geologist William B. Clark, the Service became both the focus for research and publication concerning the meteorology and climatology of the Chesapeake Bay region, and the vehicle for a graduate program, culminating in the award of the first American doctorate in this field to Oliver L. Fassig in 1899.

The late 19th century was an exciting period in the development of the environmental sciences, meteorology not excepted. The 1880s and 1890s in particular saw stirrings of a "professional spirit" among American meteorologists, exemplified in such activities as the formation of the short-lived New England Meteorological Society (1884–96) and the coterminus American Meteorological Journal, the provision of research facilities through the Signal Service's "Study Room" and the private Blue Hill Meteorological Observatory (1884), and the transfer of the federal government's weather function from the military to a civilian Weather Bureau (1891) (Koelsch, 1981; Whittenah, 1961).

This drive toward professional status also found expression in attempts to develop programs of research and graduate training in the new and expanding universities of the period. Graduate study in meteorology was undertaken in several institutions under the chaperonage of the departments of either physics or natural history, and their offshoots, geology and physical geography (Koelsch, 1980a). None of these early efforts resulted in a sustained production of Ph.D.s in meteorology, a development that is probably best traced to the establishment, under the auspices of the Daniel Guggenheim Fund for the Promotion of Aeronautics, of the meteorological program at the Massachusetts Institute of Technology (MIT) in the late 1920s. Still, an examination of these late 19th century educational experiments, culminating in the first American Ph.D. in meteorology just over 80 years ago, tells us something not only concerning institutional strengths and weaknesses, but also about the attempt of some meteorologists to overcome what Stone (1958) has seen as a climate of "disillusionment in the prospects of scientific meteorology that nearly extinguished the profession in the United States between 1890 and 1935."

Through much of this period the principal spokesman for the development of meteorological research and training programs was Cleveland Abbe, for 45 years the chief scientific advisor of the U.S. Army's Signal Service and its successor, the Weather Bureau of the Department of Agriculture. As early as 1876, Abbe (Fig. 1) began bombarding university presidents with proposals for a curriculum that would yield both baccalaureate and advanced degrees, statements on the aims and methods of meteorological research, surveys of developments in the field, and even lists of research topics for Ph.D. candidates and university researchers (Abbe, 1895; 1891).

FIG. 1. Prof. Cleveland Abbe (courtesy of the Manuscript Division, U.S. Library of Congress).

Cleveland Abbe (1838–1916) was born in New York City and earned his B.A. at the New York Free Academy (now City College) in 1857. He worked with Benjamin A. Gould on the Coast Survey's longitude studies in Cambridge and on astronomical problems with Otto Struve at the Observatory at Pulkowa. From 1868 to 1871 he was Director of the Cincinnati Observatory, where he developed a system of storm warnings forecast from the telegraphic reports of weather stations. From 3 January 1871 until 3 August 1916 he was a central figure in the U.S. Weather Service and in American meteorology, initially being the only scientist who held a full-time salaried position as a meteorologist (Humphreys, 1919).
Abbe was a principal conduit for interpreting meteorological research taking place in Germany and France to Americans, a chief stimulus to the research and training program of the Signal Service, begun in 1881 under Gen. William B. Hazen; and publicist for meteorological education as editor of the MONTHLY WEATHER REVIEW. After 1884, Abbe was, by courtesy, Professor of Meteorology in the new Corcoran Scientific School of Columbian University in Washington, where he supervised the training of Weather Service personnel and would-be employees in programs leading to the B.S. degree in meteorology and, after the new School of Graduate Studies was opened in 1893, to the master’s degree.

Even before geographer Daniel Coit Gilman (Fig. 2) had been inaugurated as president of the yet unopened Johns Hopkins University¹ in February 1876, Abbe began pressing him to institute a graduate program in meteorology. The following year Abbe also discussed with Gilman the possibility of establishing a state weather service in connection with the new university (Passig, 1899). In 1882 the Signal Service instituted a program of cooperation with university physicists at Hopkins and Harvard in the study of atmospheric electricity. One of the Service’s newly recruited college graduates, Park Morrill, was detached from Abbe’s “Study Room” to Prof. Henry A. Rowland’s physical laboratory at Hopkins, where he made observations and developed new instrumentation for such studies (Mendenhall, 1891).

Gen. A. W. Greeley, Hazen’s successor as head of the Signal Service, periodically came to Baltimore to lecture on climate to the undergraduates. In December 1891, Abbe himself lectured before the Hopkins Scientific Association, a forum before which future university directions were frequently tested, on the topic “On the Possible Relations of a University to Meteorology” (Abbe, 1892). In 1893 Abbe publically offered his considerable meteorological library to any of a short list of new universities (including Hopkins) “where the auxiliary physical and mathematical sciences are properly taught,” which would establish a “well-endowed meteorological institute” (Abbe, 1893).

The major task of organizing facilities and instruction in meteorology at Hopkins, however, was the responsibility of Dr. William Bullock Clark,⁴ a Munich-trained paleontologist who had joined the university’s faculty in 1887. Clark (Fig. 3) was an adherent of the so-called new geology, a comprehensive science of the earth’s surface then also termed “physical geography.” In addition to his principal work in paleontology and stratigraphy, during the early 1890s Clark taught the required undergraduate physical and historical geography course, soon substituting meteorology for the historical content that historians J. Franklin Jameson and Herbert Baxter Adams had given it earlier. This course provided an enrollment of between 40 and 60 students each year to Clark’s small department. Prof. William Morris Davis of Harvard University, then the country’s leading physical geographer, was brought in during February 1890 for 10 special lectures on climate, and again the following year for three lectures on physical geography, including one on tornadoes.⁵

During 1890–91, primarily through Clark’s efforts, the University became host to two scientific agencies of direct concern to the new geology. The first of these was the Soil Survey of Maryland, carried on from a Hopkins base by Prof. Milton Whitney of the Maryland Agricultural College. The second was the Maryland State Weather Service, established in May 1891 with Professor Clark as Director and Professor Whitney as Secretary-Treasurer. By agreement with General Greeley, confirmed later that year by Prof. Mark

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¹ Two institutional histories of the early university, by French (1946) and Hawkins (1960), are drawn upon as background for this study, but are not separately referenced. Professor Hawkins prefaced his insightful study by affirming that “the documentary material is rich, and there is much of significance that is not told here. The role which most of the departments played in the development of their disciplines in America and in the creation of new disciplines is only suggested.” This brief study may be seen, then, as an extended footnote to Hawkins’s book.

² Manuscript collections used in the preparation of this paper are referenced only once each and all germane individual letters in that collection are cited under the reference, as in the Daniel Coit Gilman Papers, Special Collections Department, Eisenhower Library, The Johns Hopkins University: Abbe to Gilman, 9 and 12 February 1876 and 21 November 1891; Gilman, Memorandum, 4 November 1891 with additions by W. B. Clark; Clark to Gilman, 27 July and 18 August 1896; and A. W. Greeley to Gilman, 21 December 1888.

³ William Bullock Clark (1860–1917) was born in Brattleboro, Vt., and educated at Amherst College before going to Germany for graduate study. Refusing appointment to Harvard to succeed Nathaniel Southgate Shaler in 1906, he spent his entire 30-year professional career at Johns Hopkins (Clarke, 1919).

⁴ Much specific information about programs, courses, special lectures, etc., is drawn from two official university publication series: the Annual Report of the President of Johns Hopkins University, from 1876; and The Johns Hopkins University Circulars, Quarto Series, 1879–1903; and is not separately referenced. The same is true of Clark’s annual reports as Director of the Maryland State Weather Service, which are included with the president’s reports from 1891.
“The Available Water-Power of Maryland” (Clark); and “The Medical Climatology of Maryland.”

The Bulletins immediately received high praise from meteorologists, not only for their quality, but also as a model for working arrangements between government agencies and scientific research in universities. Biennial reports on the climatology and physical features of Maryland kept the legislature and the general public aware of what was being done. And for the World’s Columbian Exhibition in 1893, Clark and his associates produced sections of a book, *Maryland*, which summarized and systematized the contributions that Hopkins scholars were making to the sciences of the earth (Anonymous, 1893a,b).

Five years after its establishment, the Maryland State Weather Service underwent a transformation of function that brought its work even closer to academic science. As in New England a few years earlier, the routine task of collecting general temperature and precipitation data and issuing periodic climate and crop bulletins was assumed by the Weather Bureau’s new Climate and Crop Service. The Maryland State Weather Service, in concert with the newly established State Geological Survey (of which Clark, as State Geologist, was also Director) and the U.S. Department of Agriculture, shifted its emphasis toward larger climatological and physical-geographic problems, such as the influence of the Chesapeake Bay and the Atlantic Ocean on adjacent land areas, studies of the state’s agricultural soils in relation to geology and climate, the hydrography of the state, and the relationship of physiography and climate to forest development. A new series of special reports was begun, resembling the new-style academic monograph and the research publications of the geological survey, rather than the characteristic bulletins of the ordinary state weather service of the period.

The creation of this institutional network (which was completed in 1906 by the creation of a separate State Board of Forestry, with Clark as its Executive Director) provided research opportunities and publication outlets to Johns Hopkins faculty, advanced students, and scholarly employees of the Weather Bureau. It also provided practical training and summer employment, as well as contacts for nonacademic posts then available in meteorology. In 1899, for example, the Chief of the U.S. Weather Bureau appointed two of Clark’s graduate students as assistants in the Weather Bureau office at the university, thereby giving them not only the opportunity to learn Weather Bureau methods but also “important financial aid.” It seems clear that Clark regarded the various activities going on under his direction as a coherent institutional base for the advancement of physical geography as it was understood at the time. Meteorology and climatology played an important part in this program (Clark, 1899).

Cleveland Abbe’s interest in the physical geographic work of the university was increased when his son, Cleveland Abbe, Jr., matriculated there as a graduate student in geology after his graduation from Harvard in 1894. Abbe, Sr., lectured at Hopkins again in 1895–96 on climatology. In the summer of 1898, at the same time as he was appointed lecturer in meteorology, he gave the university his private library of nearly 2000 books and serial publications, 37 bound volumes of charts, and 1000 pamphlets on meteorology and closely related subjects, a gift which put the Johns...
Hopkins library ahead of all others in this field. This was the consummation of private negotiations that began during the fall of 1891, in which Abbe had offered the collection to Hopkins in exchange for a commitment to instruction and research in meteorology. Abbe continued to add to this collection, which was kept in a special room in the geology building, and from 1899 on continued to lecture irregularly on meteorology. He also contributed an important essay on "The Aims and Methods of Meteorological Work" to Clark's new Maryland State Weather Service Special Publications series.

Clark, the German-trained paleontologist turned "new geologist," and Abbe, the ex-astronomer whose highest earned degree was an A.B. conferred more than 40 years earlier, together supervised a research program that led, in 1899, to the awarding of the first American Ph.D. in meteorology. The Johns Hopkins Department of Geology was the recommending mechanism, the Maryland State Weather Service and the Abbe Library the research base, and the U.S. Weather Bureau the financial supporter for this new venture. The degree recipient was Oliver L. Fassig, a career Weather Bureau official who had joined the old Signal Service under General Hazen's young scientist recruitment program in 1883.

Fassig (Fig. 4) had been assigned to the Baltimore office of the Bureau in 1896 after a formative period of study under Wilhelm Von Bezold and others in Germany, and at that time had been described to Clark by Bureau Chief Willis L. Moore as the best trained meteorologist in his employ. At the Baltimore station, now upgraded to first-class status, Fassig was assigned by Moore to work on the special climatological problems Clark had scheduled under his new research program for the Service, beginning with a history of climatological investigation in Maryland. For this project, as well as in his service as part-time curator of the Abbe Collection, Fassig drew on his earlier bibliographic experience as Librarian of the Weather Bureau's own library.

Fassig applied for admission to the doctoral program in November 1897 and was awarded the Ph.D. degree in the Department of Geology in June 1899. Clark and Abbe were the "referees" of his thesis, "March Weather in the United States, with Particular Reference to the Middle Atlantic States: A Study of the Relations Existing Between Mean Atmospheric Pressure and the General Characteristics of the Weather and Storms in March." The publication of Fassig's dissertation in the American Journal of Science for November 1899 marked a new stage of legitimation for meteorology as a university study in America (Brooks, 1923).

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1 Oliver Lanard Fassig (1860–1936) was born in Columbus, Ohio, and earned the S. B. degree in 1882 at Ohio State University, following which he entered the Signal Service. During 1896 and 1897 he studied climatology with the meteorological physicist Wilhelm von Bezold (1837–1907) at the University of Berlin, and also at Bonn. Fassig's research interests leaned increasingly toward climatology and he ended his nearly 50-year career with the weather service in 1932 as Chief of the Weather Bureau's Division of Climatology. He then became Research Associate in the Blue Hill Meteorological Observatory (Brooks, 1937).

2 Registrar's records, Ferdinand Hamburger, Jr., Archives, The Johns Hopkins University, Fassig file.

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The program Clark and Abbe had established had little staying power, however, owing to Hopkins's increasing financial problems and to the ongoing drive toward specialization that was eroding the generalized earth science represented here by the new geology. Fassig, promoted to Section Director after receiving his Ph.D., remained in the Baltimore office and conducted research on the climatology of Baltimore, published in 1907 as the second volume of Clark's State Weather Service monograph series. Also appointed Instructor in Meteorology at Hopkins the year he received the doctorate, Fassig was made Associate in Meteorology in 1901. He continued to give occasional courses or lectures in meteorology and climatology until 1909, both to advanced Hopkins students in geology, medicine, and physics and in special teachers' courses (Fassig, 1898). His work at Hopkins was sometimes interrupted, however, by other Weather Bureau assignments, some of which took him as far as Puerto Rico, in whose climatology he became a recognized authority.

In the meantime, as the educational hopes of the '90s were chastened by the fiscal realities of the new century, Clark was doing his best to preserve and strengthen his department at
Hopkins. Expansion of meteorology beyond what Fassig and Abbe could offer by way of part-time lecturing seemed out of the question. But Abbe, having traded his library for what he expected would be a going concern, continued his efforts to get the Hopkins authorities to guarantee a brighter future for meteorology. First pinning his hopes on Gilman and Fassig, in 1899 he offered to yield his own honorarium in order to support Fassig as curator of the Abbe Library, expressing his satisfaction with an honorific lectureship combined "with the assurance that the University is doing, at present, all that it can do to give meteorology a high standing and a full recognition in the curriculum."10

After 1901 Abbe bombarded the beleaguered new president, Ira Remsen, with additional demands. Offering to add his astronomical and physical collection to the existing Abbe Library at Hopkins, Abbe expressed his view that meteorology was neither climatology nor geography, but rather "a delightful branch of applied mathematics" or of mathematical physics. Abbe looked to Hopkins to establish eventually "a proper chair of meteorology," and to create "a special school of dynamic meteorology" as a subdivision of the Department of Physics. Abbe offered to conduct a special fund drive to support this school, and asked that he be allowed to direct it with the rank of Associate Professor of Meteorology and Climatology.11

Remsen's response to all these suggestions was to agree that the subject was indeed delightful but to stress the inability of the university to fund any such projects, unless some as yet unknown benefactor should come up with generous financial support. By 1910 even the small honorarium formerly assigned to Fassig had been directed to other, "more urgent," needs of the geology department. Although Clark himself still saw meteorology as an important field for Hopkins to cultivate, its relation to the geology program was clearly more peripheral than it had been a decade before.12

By the time of Clark's unexpected early death in July 1917, following Abbe's demise late the previous year, the drive toward specialization in geology here, as elsewhere, had eroded the last remnants of the new geology of the 1890s and, with it, meteorological instruction.

As at Harvard under William Morris Davis a few years earlier, the foothold for meteorological instruction and research at Hopkins was found initially in a single undergraduate course in physical geography. And as at Harvard, an energetic academic entrepreneur built a graduate edifice outward from that slender base. Similarly, the program required the cooperation of the federal government's Weather Service, extended through the initiative of Cleveland Abbe and confirmed by a series of Weather Service chiefs, and also the support of new private resources, in this case the Abbe Library donation. The base Clark and Abbe put together for meteorology at Hopkins in the 1890s is a typical example of the sort of "cobbling up" of institutional structure characteristic of scientific endeavor in the new (or newborn) American universities of the late 19th century (Koelsch, 1980a).

For some disciplines (e.g., anthropology, where local museums and the Bureau of American Ethnology served as support), such jerry-built arrangements held until a firmer university financial base could be provided to support full-time practitioners and their coteries of graduate students. This did not work in meteorology for a variety of reasons, among them the inherent instability of the initial physical geography base, tensions between government and academic science, and the inability of early university meteorology programs to attract the support of the business community (unlike chemistry, for example) or of private philanthropists until the applicability of meteorological research to commercial aviation was demonstrated in the 1920s.

As earlier at Clark University (Koelsch, 1980b), financial constraints and, after 1900, the compelling necessity to consolidate in the few areas where smaller universities had a comparative advantage meant that expansion into meteorology at Hopkins was out of the question, particularly given its seemingly peripheral importance at that time to either geology or physics. And at Hopkins at least, departmental expansion in the host discipline meant that the younger, more specialized, and "purer" geologists were soon clamoring for the slender resources allocated to that enterprise. They saw the comprehensive environmental science envisioned and partially instituted by Professor Clark as diversionary at best and, at worst, scientifically obsolete.

In the end, the graduate meteorology program at Hopkins was to rise and fall on local institutional and personal factors, and to be swept away by tides too strong for the champions of meteorology to control. Yet, in Gilman's willingness to open the doors of his university to this science, in William Clark's hospitable and comprehensive administrative practices, and in actually producing the first American Ph.D. in meteorology, Johns Hopkins demonstrated once more its institutional significance as the imaginative pioneer of American graduate education.

References


——, 1895: Meteorology in the university. Science, 2, 709–714.


11See footnote 9.

12See footnote 9.