the paleontological work were all at the top of their field. So were the geologists, John J. Stevenson, Jules Marcou, Archibald Marvine, and especially Grove Karl Gilbert. Acting assistant surgeon Joseph T. Rothrock who also doubled as botany observer developed an outstanding reputation and became a leader in the drive for forest conservation. Henry W. Henshaw served as Wheeler's ornithologist and later moved on to head the Biological Survey in the Department of Agriculture. Another assistant surgeon, Henry C. Yarrow, made significant contributions in his fields of zoology and ornithology. Wheeler had some of the best men available. (Bartlett, 1962, p.354)

Indeed it often seemed that "Most of the geologists whose names are connected with the development of the geology of that interior region have served in these War-Department explorations," as General Humphreys wrote to James Garfield, chairman of the House Appropriations Committee, in 1873. ("Surveys West of the Mississippi," 1874, p.4) Yet Wheeler was not able to retain all of his top caliber civilian scientists. Cope worked for one field season, and then argued with Wheeler over personal references to Cope's rivals in the official paleontology report. (Bartlett, 1962, p.355) Both Gilbert and Marvine left to work for Hayden, and Gilbert later moved on to join Powell. Army discipline and the subordination to a young, egotistical, brash and headstrong lieutenant made the scientists prefer the civilian surveys to Wheeler's efforts.

The necessity of subordinating themselves to a young Army officers who could act only in an administrative and executive

capacity made the Wheeler survey unattractive to the best civilian scientists. The Army lieutenants in charge of the various field parties were qualifed and capable astronomers and surveyors, but the scientific establishment sought a more purely scientific focus for the exploration of the West. Henry Adams wrote of his friend Clarence King, "He had organized, as a civil--not military--measure, a Government Survey." (Adams, 1946, p.312) West Point, as evidenced by the limitations acknowledged in Wheeler's assignment of duties to the lieutenants in the survey, was no longer in pure scientific studies the equal of the Eastern civilian colleges such as Harvard and Yale. Science in America had come of age, and wanted to assert its independence of the military.

The stature of the Army Engineers in scientific circles was diminished by the retirement of General Humphreys. On leave of absence during the 1878-1879 report of the National Academy of Sciences and the ensuing Congressional debate, Humphreys had represented the close ties between the Army and acientific circles that had existed before the Civil War, when military reconnaissance surveys represnted the only scientific work being carried out in the West. Humphreys belonged to the prestigious National Academy of Sciences, and his absence during the formation of the committee by Marsh may have been crucial to the demise of Wheeler. Humphreys's successor, Horatio Governour Wright, lacked the national stature of his predecessor.

After the 1871 season such adventures as the Grand Canyon trip, undertaken for the sake of excitement or publicity, seem to have subsided. In the thousands of pages of official correspondence

of Wheeler's survey that have survived, no documents record any trouble among Wheeler, his officers, or military subordinates. (Bartlett, 1962, p.353) Aside from the largely ideological conflict with the scientific community, Wheeler appears to have been a capable administrator and executive for the survey. In fact by 1878 Wheeler was hoarding "the time that could be spared by the officer in charge from increasing office duties." (Wheeler, 1879, p.1460)

Wheeler's survey lost its appropriations and Congressional support in the spring of 1879. His personality might have played some role in the loss of a role for the Army. But the effect of his personality and its impact remain ambiguous, with the "accustomed generosity" phrase used by Powell, with the cooperation always arranged with the telegraph companies for free or reduced rate use of their lines for accurately determining position by transmitting time signals, with the relationship to Brigham Young whose help Wheeler acknowledged in 1871 and whose son Willard (West Point class of 1875) served under Wheeler, and with his marriage into the influential Blair family (see appendix), which all point to a man who would not easily antagonize others. Yet Wheeler's difficulty working with men like Gilbert and Cope has already been mentioned.

More important causes for the loss of the Army's surveying role must have been the general questioning of the validity and value of military topographic or even geologic surveying, and the general impression that science was now too important to be left "to the leisure of army officers, and followed by them as a hors

d'oeuvre, or committed to savants whom they took along upon toleration in the trains of their military expedtions." (The Nation, 21 May 1874, p.328)

With the Army's survey and topographic mapping halted in 1879, of what value was Wheeler's work? Sadly most of the work was neglected and not carried forward by either the military or civilian scientists. Clarence King wrote Wheeler, saying that "I should consider it a calamity to the [Geological] Survey to be obliged to execute any considerable topographical work." (Wilkins, 1958, p.247)

Yet the Geological Survey soon returned to the topographical mapping field. Powell, by this time director, set about this move quietly, because in 1879 Congress had refused funds for this part of the programs set forth by both the War and Interior Departments. (Manning,1967, p.93) In 1898 Henry Gannett, chief topographer of the Survey and previously a worker under Hayden, wrote the following:

> The Geological Survey began, in 1882, the construction of a topographical map of the country. The work has now been in progress 16 years, and about 650,000 square miles have been mapped. The areas shown on these maps are widely scattered over the country. (Gannett, 1898, p.330)

In that 1898 article in National Geographic (he was one of the six founders of the National Geographic Society) Gannett corrected his omission of Wheeler from the history of mapping included in Gannett's monograph for the Geological Survey. Gannett had mentioned King, Hayden, and Powell under the heading of federal surveys, but the only reference to the Army was the curt, "The Engineer Corps, U.S. Army, has completed a number of small pieces

of topographic work in different parts of the country." (Gannett, 1893, pp.2-4) In 1898 Gannett admitted the debt to Wheeler.

> Between 1867 and 1878 extensive surveys and explorations of the West were made under Maj. George M. Wheeler. Of many parts of the west the maps prepared by this organization are the only ones to be obtained. They were published upon a scale of four and eight miles to the inch, in hachures. These maps are now extremely scarce and difficult to obtain. (Gannett, 1898, p.337)

By the late 1880's Wheeler had promised a complete, if preliminary, map of the West. His sheets would be available for miners, ranchers, and lumbermen who were rapidly filling in the vast expanses of the West. Instead Congress sided with the professional scientists. Some seventy years later, with topography given seconday importance under the Geological Survey, Bartlett could report in 1962 that Wheeler's goal of a complete map of the area west of the hundreth meridian had not yet been reached. (Bartlett, 1962, p.369)

Wheeler was born a generation too late. (Goetzmann, 1966, p.467) He wanted to achieve the grand overview of the West, its terrain, resources, and natural features. His plan followed the earlier work of the Topographical Engineers, with the scale magnified to include the entire West. But in the 1870's science had matured and was impressed with the quality and accuracy that could be achieved. The scientists wanted to perform the best job they could. American geodetic work was characterized in 1880 by its painstaking accuracy, fine methods, and slowness. (Army and Navy Journal, 17 July 1880, p.1027)

Wheeler had made a good start toward the mapping of the West, but with the ending of his survey his finished his final volume on

geography, which came out in 1889, delayed by his poor health. Wheeler's maps went out of print because the Geological Survey does not seem to have deemed Wheeler's work worth taking over. Although the only mapping done for large areas of the West, Wheeler's work was not available to the public. In essence the federal government had wasted the money spent on Wheeler's topographic mapping of the West by not following through on any of the partial results.

APPENDIX I.

Wheeler's Biography.

George Montague Wheeler was born October 9, 1842, in Hopkinton, Massachussetts. He entered the Military Academy in July 1862, nominally the first cadet appointed from Colorado, where his two brothers were living at the time, although George still resided in Hopkinton. (Fisher, 1975.

At West Point the young Wheeler succeeded rather well. In order of merit among forty, at graduation George ranked second in engineering, ninth in ethics, eigth in ordnance and gunnery, sixth in mineralogy and geology, seventh in Spanish, twenty-first in cavlary tactics, and in general order of merit he stood sixth in a class of thirty-nine graduates. The class motto could characterize Wheeler's later devotion to the exploration of the West and service to the nation: "Non sibi, sed patriae." (Diabolus, 1866, p.8)

Graduating as a second lieutenant in the Corps of Engineers on June 18, 1866, George reported to California where for two years he served on the survey of Point Lobos and vicinity and in the construction of the Defenses of Fort Point, San Francisco harbor. In 1868, by now a first lieutenant, Wheeler became the engineer on the staff of General Ord, commanding general of the Department of California. He held this post until early 1871, when he assumed his post with the survey of the region west of the hundreth meridian.

In one guise or another Wheeler served with his survey until his retirement in 1888. He supervised operations between 1871

and 1880, and again from 1883 to 1884. Field operations had ceased in 1879, but the office work remained, and Wheeler spent 1885 to 1888 again supervising the last publications. Except for the period April 1881 to June 1883 when he served as War Department delegate to the Venice geographical exhibition and prepared a report for Congress, Wheeler spent all his active career after 1871 exclusively on the survey. During the 1880's Wheeler was on leave of absence three times for periods ranging between four and six months, and spent one entire year on sick leave. His health had been ruined in the course of the work in the West, and in June 1888 he retired with a disability contracted in the line of duty. (Cullum, 1891, pp.65-66) In 1890 Wheeler was given the rank and pay of a major, retroactive to 1888 when he would have been promoted had he ramained on active duty. (DAB, X, p.47)

Wheeler's last years were spent in obscurity and hardship. In 1894 he became a member of the American Society of Civil Engineers, and spent the rest of his life in Washington, although he seems to have had a home in New York as well. (NY Times, 5 May 1905, p.9) He had contracted malaria while surveying the West, and that turned into peritonitis, so that the last years of his life were those of a very ill man. Wheeler was plagued with lawsuits, evictions for nonpayment of rent, the illness and many operations. His wife Lucy died in February 1902, and when George Wheeler died in New York City on 3 May 1905 there was no one there with him. Notified of the death, his classmate Colonel Daniel Wright Lockwood came to New York and arranged for burial at West Point. Lockwood had served with Wheeler in the West, and was one

of the few people to note the passing of the servant of the country. (Fisher, 1975) Both the New York Times and the Army and Navy Journal carried short obituaries, but the annual West Point Annual Reunion was unable to find any one to write an obituary. Wheeler's service to the nation was rewarded with the standard military tombstone: small cross, name, Massachussetts as the state of record, and his date of death. The grave is in section V, row A, tombstone 3 in the Military Academy cemetary.

The Blair Family.

Wheeler married into the family of Francis Preston Blair, a prominent Washington family. Contrary to the statement by Goetzmann that he married the daughter of Francis P. Blair, Jr., (Goetzmann, 1966, p.467) the Army explorer married the daughter of James Blair who was a brother of the younger Francis. (DAB, X, pp.47-48; Smith, 1933, II, p.496)

The career of James Blair provides an interesting parallel to Wheeler's own explorations. James was a lieutenant in the United States Navy, and served on the Charles Wilkes Antarctic Expedition between 1838 and 1842. In 1846 James married the daughter of General Sydney Jessup (not a West Pointer). Leaving his wife in Washington, James continued his career in the Navy, where "his inclination to scientific study led him to gather data on marine life and seafaring for his own use." Included in this work was sounding the San Francisco harbor, so that when the gold rush developed James accumulated a fortune piloting ships into the harbor after he had resigned from the Navy. (Smith, 1933, I,

pp.210-211) James died young, most probably 15 December 1852, having never recovered from badly frozen limbs during his Navy days. (Smith, 1933, I, p.210) Another source lists the date of death as 1855. (Fisher, 1975.)

Lucy Blair was born in 1853, either on 26 December (Smith, 1933, II, p.496) or 13 February (Fisher, 1975). Accepting the date of her father's death as 1852, Lucy never knew him and grew up in a fatherless home so that she would have accepted the idea of marrying a soldier who would spend his time in the field. Lucy's uncle Montgomery Blair (West Point class of 1835; resigned his commission in 1836 to study law) managed the estate left by James. (Smith, 1933, I, p.210) Lucy was nicknamed Jimmie (Fisher, 1975), probably becasue she was the youngest daughter of the prematurely dead James.

When Wheeler met and married Lucy poses a problem not solved with the records available. It must have been before 1876, because in that year Wheeler inserted a footnote to a section of his annual report dealing with an investigation into the diversion of the Colorado River. "I am indebted to Hon. Montgomery (Lucy's uncle] Blair for reference to the decision of the Supreme Court regarding water-rights under the law of 1866.--G.M.W." (Wheeler, 1877, p.296)

While Wheeler must have received some support from the Blair family, by the 1870's the family was supporting the wrong political party. Francis Preston, Sr., was most influential as editor of the Globe in Washington between 1830 and 1845. By the time Wheeler had started his Army career, the elder Blair was backing Seymour

for President in 1868 and Greeley in 1872. He died in 1876. Francis Preston, Jr., served as a Union general in the Civil War, eventually commanding a corps under Sherman. He was appointed a commissioner on the Pacific Railroad, but removed by Grant. He ran for vice-president on the ticket with Seymour in 1868, but was then chosen for United States Senator from Missouri. In 1873 he failed to win reelection, was stricken with paralysis, and died in 1875. Montgomery, the eldest son, was defense counsel for Dred Scott, and postmaster general in Lincoln's cabinet. He supported the Democratic losers Seymour, Greeley, and Tilden in the 1868, 1872, and 1876 elections. Montgomery aroused tremendous animosity for his opposition to the validity of the election of Hayes as President. He ran unsuccessfully for Congress in 1882, the year before he died. (DAB, II, 330-334,339-340)

Although the power of the Blair family during the late 1860's and 1870's was clearly not as great as it had been during earlier periods, the family still maintained a prominent place in Washington society and must have been able to introduce the young Lieutenant Wheeler to influential people in Congress and the capital. The Blair family also provided a link to the hierarchy of the Corps of Engineers. In 1869 Elizabeth (Betty) Blair, the daughter of Montgomery, had married General Cyrus B. Comstock. (Crane, 1945, p.34) Comstock graduated first in the West Point class of 1855, served as aide-de-camp to Grant from 1864 to 1870, and headed the survey of the Great Lakes under the Engineers. In marrying Lucy Blair, George Wheeler allied himself to many influential people.

APPENDIX II.

Sources Available.

Research was confined to published primary accounts and secondary sources. The manuscript records of the Wheeler survey must provide a wealth of information, but time and accessibility precluded use. Judging by the published reports, much of the field notebooks would record only tables of the survey and astronomical work, since Wheeler published many pages of such numbers.

Among the published works, Wheeler's annual reports provide the most information. They were issued as appendices to the annual report of the Chief of Engineers, and covered a fiscal year's operation. This meant that the report for the fiscal year ending in June 1875 covered the field season for 1874, with some comment on the organization and preparation for 1875. The report was then actually published in 1876, providing for some confusion in the dating of the reports. These were published as part of the Congressional documents from 1872 to 1880, and in some cases filled several hundred pages.

The final reports must once have been in the West Point library, since they were listed in 1902 at the centennial and also because Wheeler must have sent copies to his alma mater, if he considered West Point important enough to send his mineral collections back. Further, one of the maps in the West Point library had attached Wheeler's card. However the volumes cannot now be located; in any case, with their scientific nature they could only have supplemented other sources for the details of consolidation politics.

Four atlases are in the Cadet Library, although they do not appear to have been published as distinct entities. The binders seem to have been sent at one time, maps later as they were issued (as evidenced by the card of Wheeler's on one of the inside maps), and eventually they were bound. Thus a Geological Atlas dated 1874 on the cover includes a variety of maps, including topographic, some of which were mapped after 1874--for instance the sheet 70 (C) that lists field work from the 1874, 1875, and 1876 seasons. For this reason the maps figured in this report are documented not with reference to the atlas in which they were found but by the sheet number, workers acknowledged on the map, and dates of field work.

The Cadet library also has one set of stereoscopic views from the Wheeler expedition, and a large volume of photographs by Timothy O'Sullivan.

Besides the work of Wheeler, the New York Times carried dispatches about twice monthly during the field seasons of 1875 and 1876. This correpondent, William Rideing, also wrote three articles for Harpers during the same period. His work documents the life in the field, and provides some insight into the methods and purpose of the survey.

Throughout the entire period of Wheeler's work, the Army and Navy Journal carried articles on the work. With some imagination the index for the years 1871 to 1880 can be used to locate a number of relevant articles.

The Congressional Record and the published Congressional series of documents provide a number of reports from the various

surveys as well as debate on the issues, particularly in 1874 and then 1878-1879.

In contrast to the generally pro-military viewpoint of the Army and Navy Journal and Rideing's work, The Nation provided a civilial perspective on the question of the surveys. Articles appeared in 1874 and 1876.

Secondary works of particular value included the books by Goetzmann and Bartlett, both of which contain general accounts of all four surveys in the West. Dupree and Manning concentrate on the Geological Survey, but contain relevant information on the consolidation debate.

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