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George Engelmann's Barometer: Measuring Civil War America from St. Louis

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Adam Arenson

April 12, 1861, 7 A.M. Barometer,
observed height 29.215
Thermometer 52.0
in open air
meteorological observations,
St. Louis University¹

*May the storms which are now disturbing the air
be no indication for the course of events which
brought our unhappy country to the edge of de-
struction by all this insanity and passions, espe-
cially not for your city.*

Adolph Francis Alphonse Bandelier,
Letter to George Engelmann, 1862²

WHEN the Confederate Army began firing on Fort Sumter early on Friday morning, April 12, 1861, Peter J. Koning, member of the Society of Jesus, stood ready in St. Louis, dutifully recording the conditions.³ On that fateful day, the barometer continued its decline. The spring morning dawned cool, with temperatures hovering in the low 50s. As is common with low pressure, soon the rain clouds let forth their moisture; under “Casual Phenomena,” the priests and brothers of the St. Louis University meteorological team inscribed, “A little shower at 11½ A.M. & at 2, 2½ and ¾ P.M.”⁴ The Civil War was underway.

Of course, many would argue that the Civil War did not begin at Fort Sumter. The firing that morning was merely the flashpoint along a smoldering front, one that had been building for decades, rolling across the nation like a political thunderhead. As far as I know, no one blames the weather for the Civil War, its complexities on changes in barometric pressure. Yet like the weather, the history of American expansion, slavery and emancipation, a new birth of freedom and the construction of new means to curtail rights — the history of Civil War and Reconstruction — touched every corner of the nation. Like a spring rain or the summer heat, the first frost or the spring thaw, the factors and causes of the great American conflict seeped into every-

day lives, shaped the observation of events, and influenced the course of history in ways minor and profound.⁵ And through it all, the careful reading of the barometer provided a baseline.

This is not really an essay about the weather, nor about the science of barometers.⁶ Reading the barometer — like consulting library records, courthouse murals, piecing together park dedications — might not seem obvious sources for local politics, the national mood, and international connections. But the story of the barometers at St. Louis holds all this.⁷

This essay considers real and metaphorical barometers in St. Louis, a city split between the nation's three regions — North, South, and West. The geographic baseline in St. Louis, created with one of the first barometers west of the Mississippi, played a role in mapping the newly acquired Western territories after 1848.

And the metaphorical barometer of St. Louis — a city that mirrored the nation's political, ethnic, cultural, and ideological diversity of the nation during the Civil War Era as no other. Measurements in St. Louis offer a baseline, not only recording national storms and the ripples of international sea changes, but the human actions to observe, record, and even change those conditions. St. Louis provides a remarkable place to consider the agenda of the American West during the Civil War, and how advocates for each region — including a few scientists, barometers in hand — measured the transformations that the nation experienced.⁸

In the age of the 24-hour Weather Channel, the newspaper's weather page, and confident predictions of the weather every 10 minutes on the radio, it is easy enough to forget how omnipresent and how unknowable the weather truly is. We have easy access to tables of seasonal norms, record highs and lows, and to satellite imagery and computer predictions. The meteorologists appear in public with their prognostications but do not face censure when their predictions are wrong. They rarely report whether the barometer is rising or falling, converting this information instead into automated computer graphics and shorthand phrases. They often receive data from the National Weather Service,

April 1861. P.G. H. H.

Barometer

Bar. height Sea level Bar. height in. 2.5 fathoms Thermometer in open air

	JAN	2 PM	9 PM	JAN	2 PM	9 PM	mean	JAN	2 PM	9 PM	mean	max	min	mean
1	29.582	29.705	29.760	54.0	57.0	60.0	29.515	29.640	29.675	29.610	43.5	55.0	57.5	54.0
2	29.735	29.682	29.664	53.0	61.0	61.5	29.655	29.596	29.577	29.609	45.5	59.0	54.0	52.8
3	29.618	29.561	29.492	59.0	59.5	60.0	29.543	29.480	29.404	29.479	50.5	52.5	56.0	53.0
4	29.420	29.362	29.395	59.0	68.0	68.0	29.343	29.258	29.291	29.297	56.0	73.0	67.5	65.5
5	29.372	29.376	29.344	66.0	70.0	69.0	29.273	29.267	29.237	29.259	62.5	74.0	65.5	67.3
6	29.163	29.166	29.266	67.0	68.0	66.5	29.063	29.044	29.166	29.091	62.5	66.5	59.5	62.8
7	29.387	29.125	29.252	63.5	66.5	60.0	29.195	29.027	29.169	29.130	58.0	70.0	62.0	60.0
8	29.200	29.156	29.211	57.5	58.5	57.5	29.124	29.077	29.135	29.112	50.0	57.0	48.0	51.7
9	29.251	29.296	29.364	56.0	59.0	59.5	29.178	29.216	29.283	29.226	46.0	58.0	53.5	52.5
10	29.441	29.373	29.408	57.5	62.5	61.5	29.365	29.284	29.321	29.323	52.0	63.0	57.0	57.3
11	29.335	29.279	29.333	53.5	59.0	59.0	29.256	29.199	29.253	29.236	50.0	52.0	53.0	51.7
12	29.215	29.224	29.317	57.5	61.0	64.5	29.149	29.140	29.209	29.166	52.0	57.0	52.5	53.8
13	29.386	29.465	29.542	57.5	58.0	58.0	29.310	29.387	29.464	29.387	48.5	58.0	52.5	53.0
14	29.605	29.637	29.584	53.5	60.0	58.5	29.539	29.554	29.505	29.533	51.0	58.0	52.5	53.8
15	29.517	29.445	29.486	56.5	59.0	59.5	29.443	29.365	29.405	29.404	49.0	60.0	51.5	53.5
16	29.511	29.509	29.574	49.5	54.0	55.0	29.456	29.443	29.509	29.469	39.5	51.5	46.0	48.7
17	29.600	29.430	29.270	50.5	57.0	60.5	29.542	29.355	29.186	29.361	42.5	60.5	50.5	54.5
18	29.404	29.450	29.643	56.0	61.5	60.5	29.331	29.353	29.539	29.408	57.0	61.0	51.0	56.3
19	29.714	29.708	29.651	53.0	58.0	59.5	29.644	29.630	29.570	29.616	47.0	54.5	50.0	50.5
20	29.624	29.467	29.438	56.0	61.0	63.5	29.551	29.381	29.346	29.426	49.0	62.5	59.0	56.8
21	29.396	29.254	29.288	62.5	68.0	72.0	29.307	29.150	29.173	29.210	63.5	79.0	72.0	71.8
22	29.386	29.361	29.384	71.5	75.5	76.0	29.273	29.238	29.259	29.257	72.0	81.0	74.0	75.7
23	29.442	29.343	29.634	73.0	78.0	72.0	29.331	29.213	29.519	29.354	69.0	79.0	59.5	69.2
24	29.702	29.668	29.592	62.5	65.5	68.0	29.613	29.571	29.488	29.557	58.0	68.5	61.0	62.3
25	29.569	29.470	29.442	64.0	69.5	71.5	29.475	29.362	29.329	29.389	60.5	79.0	69.0	69.5
26	29.376	29.286	29.253	67.5	75.5	74.0	29.273	29.163	29.133	29.190	69.0	80.0	72.5	73.8
27	29.220	29.263	29.350	68.0	59.5	59.0	29.118	29.182	29.270	29.190	63.0	49.0	54.0	55.3
28	29.220	29.263	29.350	68.0	59.5	59.0	29.118	29.182	29.270	29.190	63.0	49.0	54.0	55.3

rather than recording it carefully as Koning did, three times a day, in large hand-written records, each column perfectly ruled.

Yet in the nineteenth century, records of the sunrise and sunset, temperature, barometric pressure, and casual phenomena, once amassed and analyzed, provided the most accurate method for mapping the landscape yet known, identifying ridges and basins, the best acres of farmland and the easiest routes across the continent. In a model of Enlightenment cooperation, scientists from around the world shared data and constructed an accurate globe, with latitude and longitude recorded, and altitude pinpointed by readings from a barometer. They calculated seasonal norms and created climate zones, making the weather legible, conditions known. Within measurements of pressure, Alexander Humboldt and John Nicolas Nicollet, Peter Koning, and George Engelmann found their world transformed.

Francis H. Stuntebeck, Ignatius Panken, and John Lunemann worked alongside Peter J. Koning at St. Louis University, recording meteorological observations as part of their duties as instructors in physics, astronomy, and natural philosophy.⁹ All four of these men had been born in Europe in German- or Dutch-speaking communities, common enough among St. Louisans. Their university was the oldest and most prestigious educational institution in the city, the place where William Clark, upon returning from his explorations West, sent the son of Sacagawea and Toussaint Charbonneau for schooling.¹⁰ The instructor-priests were not monks, dedicated to seclusion, working in silence or measuring natural phenomena solely as a way to observe and understand God's creations. Their lives were those of good Jesuits, an order deeply engaged with the community and interested in intellectual inquiry.¹¹ Their weather observations were only one of the ways in which these men cared deeply about the place of St. Louis and served its populace.

Francis H. Stuntebeck is the most remembered of these four men today, having risen through the ranks to become chancellor and rector of St. Louis University, serving in academies from Cincinnati to Kansas along the way. At his death in 1898, the *St. Louis Post-Dispatch* declared him "one of the oldest and best-known Jesuits in the United States," and the *St. Louis Globe-Democrat* deemed him one of the best Jesuits the editors had ever encountered.¹² Ignatius Panken lived a long life of service, following his teaching with work as a missionary to the American Indian tribes of Wyoming in the 1890s, before retiring back to St. Louis, where he died and was buried in 1906.¹³ Neither Peter Koning nor John Lunemann saw long life; both died in their thirties, amid the Civil War and most likely because of it, succumbing to diseases acquired from attending to war wounded and the displaced.¹⁴ Yet they too left a legacy: Koning is remembered for his early

and fervent work on behalf of St. Louis's African American slaves, a community Panken also served, becoming the first pastor of the first designated African American parish, St. Elizabeth's, and remaining with that congregation for twenty-two years.¹⁵ And Lunemann left a remarkable notebook.

"Table (M): Mean Height of the Barometer in various Latitudes, reduced to the level of the sea, and to the freezing point," reads a chart in John Lunemann's lecture notes from 1856. There he listed the reference calculations for thirty locales around the globe, from London, Königsburg, and Paris, to the Cape of Good Hope and Macao, Funchal in the Madeiras, and "Reikiavig," Iceland.¹⁶ The names appear in his careful handwriting, alongside practice problems and lecture outlines; a logarithmic refraction table, to help bring pressure calculations to this standard temperature and altitude, is pasted into the front.¹⁷ As the charts suggest, the astronomical and meteorological work Lunemann set out to teach his pupils — young explorers and traders among them — had a global reach. Data came from the learned capitals of Europe and the vast reaches of the European empires, an expanse replicated on the vast territory between the American cities he listed (Philadelphia, Cambridge, Massachusetts, and Savannah, Georgia) and the western reaches of the nation's territory, in the Louisiana Purchase and the newer Mexican Cession. The scientists at St. Louis stood somewhere in the middle, in communication with both the centers of knowledge and the unknown frontier, balancing the calculations from both locales in their baseline.

At the beginning of the notes for lesson eight, Lunemann made the object of all these measurements clear, and acknowledged the source of his method. "To determine the Longitude of a place," he titled that day's lecture, which began, "The following method, which was invented by M. M. Nicolai [sic] and Bailly, . . ." ¹⁸ The life of Joseph Nicholas Nicollet spanned the global community of the barometer and intimately connected its seemingly arcane measurements to questions of nation and knowledge along the frontiers of the nineteenth-century.¹⁹ Hard at work in Paris on the paths of comets and the grand Enlightenment project of an accurate topographic map of France, Nicollet had worked with the esteemed astronomer Pierre Laplace and corresponded with the scientific polymath Alexander von Humboldt. After the July Revolution of 1830 threw his patrons out of favor and destroyed his savings, Nicollet became one of the many young men inspired by Humboldt to venture into the blank spaces of the map.²⁰ But unlike many of those enamored with the adventures and almost mystical writing style of Humboldt, Nicollet also had a solid scientific education, and could follow the intricacies of Humboldt's calculations and the nature of his postulates. Along with British astronomer Francis Bailly,

Nicollet perfected Humboldt's system for measuring altitude through the process of compound barometric leveling, also known as hypsometry.²¹

When Lewis and Clark set out from the region around St. Louis to explore the West, they carried no barometer.²² The mercury and glass contraptions were too delicate and not considered a high enough priority by the men or their patron, President Thomas Jefferson. By the time their party left the Dakota camps, all the similarly fragile thermometers had broken, leaving temperature to guesswork as they trekked out to the Pacific and back.²³ With an astrolabe, Lewis and Clark's party could make readings of latitude, and their chronometer allowed for some longitude calculations, but as for the altitude of the mountains, basins, and ridges they reported, the men resorted to guesses educated by their experience on the trail. While William Clark's map of the lands the team explored holds a remarkable *general* likeness to the West as it came to be known to further explorers, the sorts of errors it includes — the angle of the mountain range, mistaken distances between rivers or to passable valleys — would confound any traveler relying on what Lewis and Clark had sketched.²⁴

Humboldt, after decades of his own exploration into the locales most remote from his home castle in Berlin, came to understand something about these difficulties, as well as how to solve them. Study of the stars, combined with accurate clocks, could synchronize readings around the globe. If each observatory kept their chronometer set to Greenwich Mean Time, and then recorded the sunrise and sunset, or the motion of the planets, calculations would pinpoint the longitude, the angle of difference from the established meridian. Accurate thermometers and barometers placed at these reference points could provide a series of baselines for altitude measurements; if weather conditions could be recorded and accounted for, the remaining difference in a column of air would reveal how much less atmosphere pressed down at a mountain peak than at a college observatory.

Humboldt was one of the first to understand these methods, and he used his worldwide renown to launch a series of observatories around the world. Numbers poured in; men hired as computers could determine the coordinates and the topology. The German explorer set up his Western Hemisphere observatories in Central and South America, the terrain he had explored; his Northern Hemisphere knowledge was from Europe. Humboldt could map most of the world; it was left to Nicollet to map America.²⁵

So Nicollet came to the United States in 1832, equipped with a pocket barometer and a compass, just as Humboldt recommended.²⁶ Nicollet established himself in Baltimore, the scientific center closest to the capital, and befriended the necessary politicians to fund an expedition; by 1835, Nicollet had arrived in

St. Louis, to gather materials and more funds for the documentation of the Upper Mississippi basin.²⁷ During one such visit, Nicollet raised funds by using his French to pore over old documents and write a short history of the city's founding; on another, his assistant, Charleston-born John C. Frémont, met the woman he was to marry, Jessie Benton, the daughter of the state's imposing senator.²⁸ Most important, Nicollet worked to ensure the establishment of a baseline: in the summer of 1835 he installed the necessary apparatus for the Jesuit observatory at St. Louis University, and, on his return in 1837, he set up a barometer with his most capable local adherent, George Engelmann.²⁹ Nicollet later did the same upriver, working at Fort Snelling, in Minnesota, on the advice of the artist George Catlin; somewhere on the fort grounds, while Nicollet calibrated barometers, a St. Louis slave by the name of Dred Scott and his wife Harriet labored.³⁰

By the time Nicollet returned to St. Louis, amateurs could get into the measuring business. Jacob Blattner was advertising his skills as "MAKER OF MATHEMATICAL, OPTICAL, AND PHYSICAL INSTRUMENTS," allowing any interested farmer to track how storms on their farms in Illinois related to the readings they found in their correspondence, or soon saw in their newspapers.³¹

William Clark maintained a museum of scientific and anthropological artifacts in town, and interest in science even reached the level of public entertainments, with lectures at the St. Louis Mercantile Library by the noted Swiss geologist and Harvard professor, Louis



J. BLATTNER

MAKER OF MATHEMATICAL, OPTICAL
AND PHYSICAL INSTRUMENTS,
HAS removed his establishment from Ches
nut to No. 34 OLIVE STREET, where he
hopes and respectfully solicits the continuance
of that patronage and favor from his friends
and the public which has heretofore been ex-
tended to him.

He had constantly on hand a good assort-
ment of Mathematical Instruments, surveying
compasses and chains, leveling instruments,
barometers, Thermometers, spy-glasses, spec-
tacles, &c. All instruments made by him
will prove to be correct and in the neatest
order

ap6—y—w—tri w

Jacob Blattner, advertisement, *Missouri Republican*, October 19, 1841

Agassiz, and by the Cincinnati astronomer O. M. Mitchell, later a Union general.³²

Nicollet returned to the East Coast in 1841, never to see the land he was mapping again. The combination of work on the master map and his steadily worsening tuberculosis kept him overburdened; the *Map of the Hydrographical Basin of the Upper Mississippi River* was completed in 1843, but the printing in quantity occurred only after Nicollet's death that same year.³³ Nicollet's map was a grand accomplishment. It fulfilled the Humboldtian vision by providing topographic detail, and pleased his political sponsors, who could more accurately plan for the settlement on plots of land whose dimensions and character could now be systematically recorded and tracked. Nicollet's instructions allowed Frémont to pursue careful mapping on his expeditions, and the barometers he provided created a baseline and a valuable cache of continuous records (with ties that reach to the St. Louis University meteorologist today, who gives many of the local weather forecasts on the radio).³⁴

From St. Louis to the Smithsonian and the General Land Office, and later to the U.S. Weather Service, these lines of information connected the landscape the same way that the measured phenomena — a cold front, warm summer winds, a hurricane — tracked across the Plains or up the Mississippi Valley, without regard to any political boundaries.³⁵ Whether it was French or Spanish territory, over Indian tribes or American settlers, raining on Union or Confederate troops — the weather patterns were the same, the measurements the same.

St. Louis stood as a particularly sensitive place to measure which way the winds were blowing, whether political, economic, or meteorological. As the combination of racial equality and meteorology in the careers of the St. Louis University priest-scientists suggest, those who measured the weather also embodied the experience of the times, all the while recording conditions on a regular scheduled.³⁶ These literal and figurative measurements of the nation intersect most in the life of George Engelmann.

George Engelmann did not think of himself as a weather scientist; his passion was plants. "*Ich . . . besetzte mich selbst als ein Knabe leidenschaftlich mit Botanik*," Engelmann introduced himself to a new correspondent in 1868; "I . . . occupied myself even as a youngster passionately with botany," he wrote, ". . . and after having travelled all by myself on horseback through the western territory, I settled in 1835 here in St. Louis as physician."³⁷ As the town doctor in a growing community, Engelmann found a perfectly pleasing profession. But it was his avocation that drove him and caused correspondents to seek him out, whether seeking his *carte-de-visite* for an album of "all the living American Botanists"; asking him to write up the Missouri flora for a national cen-

tennial exhibition; or requesting he tell fellow co-founders of the National Academy of Sciences what should be included on their seal.³⁸ With other doctors and local dabblers, Engelmann had founded the Academy of Science of St. Louis in 1856, and served as its first president.³⁹ He became the chief scientific advisor to Henry Shaw, whose plantings became the world-renowned Missouri Botanical Garden, and together they established a school of botany at Washington University.⁴⁰ No matter which label he preferred, Engelmann was instrumental in making St. Louis a key center for scientific observation.

Given his sedentary lifestyle and dislike of the hardships of an expedition, Engelmann's special expertise — the taxonomy of cacti — might seem unlikely. "Before I continue," Engelmann confided, "let me say, that I have never seen a wild cactus except the locally growing *Opuntia Rafinesquii*! All my examination[s] have been made with cultivated or dried specimens." St. Louis was the ideal location for such work, as Engelmann was in constant contact with the explorers and scientists throughout the American West, as well as the world's experts in Washington, Philadelphia, and the capitals of Europe. "Though my practice does not permit much observation of plants in nature," Engelmann explained, "I study the copious material flowing in from friends from distant parts."⁴¹ (These connections enabled Engelmann's most toasted, if not necessarily best known, contribution to world botany: when French grapevines were endangered by the phylloxera in the 1870s, Engelmann's experience with Missouri varieties helped him craft the eventual solution — grafting all of Europe's wine grapes to American rootstock.)⁴²

Engelmann's interest in plant cultivation and his wide array of correspondents also led him to be a careful observer of meteorological phenomena and a natural conduit for barometrical measurements. He also had good teachers: "I am writing to thank you again for your erudite assistance in my research during my stay in St. Louis," Nicollet wrote after the trip on which he left Engelmann a barometer, in 1837.⁴³ The two men began an active correspondence, with Engelmann receiving technical advice, Nicollet anguishing over the painstaking calculations and the need to successfully gain and maintain federal patronage.⁴⁴ Engelmann tracked his friend in correspondence with others in Washington, and mourned his untimely death. "Our friend Nicollet has been very ill again for the last week or ten days, indeed dangerously so," Henry King reported to Engelmann on one of many such occasions. "We often talk about you and picture the beautiful things we shall do together on our return to St. Louis."⁴⁵ Nicollet's last letter to Engelmann was unanswered when news came of his death. Engelmann marked top of the letter in German script: "Nicollet died 11 Sept. in Baltimore."⁴⁶

METEOROLOGICAL TABLE FOR 1859—ST. LOUIS, MO.—By DR. G. ENGELMANN.

MONTHS.	BAROMETER, Reduced to Freezing Point.				THERMOMETER, (Fahrenheit.)				Evaporation.	Force of Vapor.	Relative Humidity.	Quantity of Rain and Snow.	Prevailing Winds.	Amount of Cloudiness.	No. of Thunderstorms.
	Mean of the observations made daily at 7, 2 & 9 o'clk.	Highest.	Lowest.	Range.	Mean of the observations made daily at 7, 2 & 9 o'clk.	Highest.	Lowest.	Range.							
Jan.	29.697	30.304	29.142	1.162	33.5	58.5	—1.0	59.5	2.8	0.139	73	2.32	W.	4.6	—
Feb.	29.526	29.925	29.050	0.875	37.8	77.0	8.0	69.0	3.0	0.166	76	5.35	S.E. & W.	5.0	4
Mar.	29.316	29.764	28.516	1.248	48.9	78.0	28.0	50.0	5.7	0.207	60	7.32	W. & S.E.	5.6	4
April	29.424	29.758	28.958	0.800	52.3	82.0	28.0	54.0	6.0	0.236	61	4.89	W.	5.2	5
May	29.485	29.818	29.169	0.649	68.9	85.0	48.5	36.5	6.6	0.481	68	6.60	E., S.E. & S.	4.7	10
June	29.544	29.965	29.350	0.615	73.3	93.5	44.0	49.5	7.9	0.522	65	11.02	S.E., S. & N.W.	4.1	6
July	29.557	29.867	29.268	0.599	80.1	98.0	53.0	45.0	8.9	0.645	64	5.54	E. & S.	2.6	2
Aug.	29.487	29.728	29.295	0.433	76.8	92.0	57.0	35.0	8.2	0.590	66	2.93	E., N.E. & N.	3.3	2
Sept.	29.544	29.900	29.211	0.689	67.1	82.5	47.0	35.5	5.7	0.469	72	4.44	W., N.W. & S.E.	5.1	6
Oct.	29.618	29.988	29.146	0.842	54.4	80.0	27.0	53.0	6.5	0.249	61	1.80	S.E. & W.	2.8	1
Nov.	29.557	29.973	29.061	0.912	47.3	75.5	15.0	60.5	4.3	0.224	69	5.43	S.E., S. & W.	5.2	1
Dec.	29.660	30.103	29.170	0.933	25.0	49.0	—3.5	52.5	1.7	0.106	79	3.76	W. & S.E.	5.5	1
1859.	29.534	30.304	28.516	1.788	55.4	98.0	—8.5	101.5	5.6	0.336	67.7	61.40	W. & S.E.	4.5	42

NOTE.—CORRECTIONS FOR METEOROLOGICAL TABLE FOR 1858, page 524:—The highest elevation of the Barometer in September was 30.179, not 30.129. The amount of cloudiness in April, May, July and September was 5.6, 6.7, 3.8 and 2.1; and not 6.6, 5.7, 3.6 and 2.2.

George Engelmann, "Meteorological Table for 1859," *Transactions of the Academy of Science of St. Louis*, 1860

When Nicollet was ailing, he had worried about his legacy. "*Notre Standard Baromètre est prêt depuis trois mois*," Nicollet had written to Engelmann in 1841; "Our *Standard Barometer* has been ready for three months." But, Nicollet fretted, "I don't know how you will send it safely through the mountains. I don't dare entrust it to Mr. Frémont, who is very rushed, and who isn't used to carrying this kind of instrument." Frémont's reputation for impetuous behavior would follow him into the mountains and out again, into politics and Army service.⁴⁷ Nicollet's prescient comment suggested the ways in which Engelmann, rather than his own protégé, would do the most to carry on Nicollet's legacy.

Engelmann was recording the weather in St. Louis, three times daily, from soon after his arrival; by 1843, he was publishing his meteorological observations in the newspapers.⁴⁸ When the Academy of Science of St. Louis began publishing proceedings, Engelmann provided tables of mean weather conditions by month and year — the predecessor to today's notion of "seasonal" temperatures issued by the U.S. Weather Service.⁴⁹

In 1860, Engelmann could already look back over his work as part of a long history of measurement in St. Louis, with Nicollet's 1841 observations in "the garden of the Cathedral" continued at St. Louis University and by his own hands.⁵⁰ Engelmann published a journal article on "the exact altitude of St. Louis," an interesting fact made essential "because most of the hypsometrical measurements throughout the northern and western regions . . . took the altitude of St. Louis as

their starting point." Engelmann made it clear: the measurements of the American West, he noted, "were based to a great extent on the barometrical observations of these explorers compared with mine."⁵¹

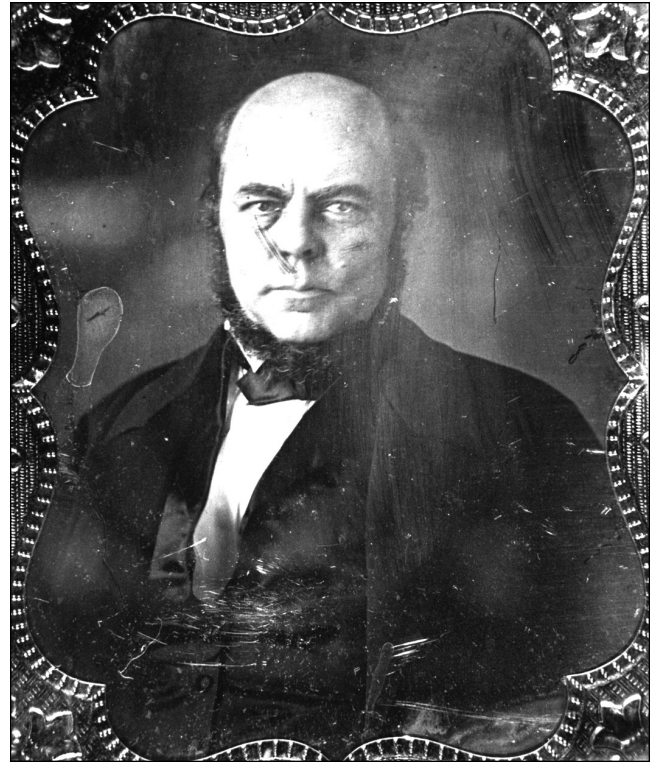
All along, Engelmann collected barometrical recordings from far-flung camps in the West along with his plant specimens. "My barometer until now has proved strong and found a kind of attachment between us," Engelmann's close friend and primary field assistant, Frederick Adolphus Wislenzus, wrote from Chihuahua, Mexico, in 1847. "I carried it over 100 miles on my back, and took care to be well served by it."⁵² Wislenzus and others worried, however, how useful their measurements would be. From a camp on the Rio Grande — somewhere — John Milton Bigelow wrote that "it is rather a difficult task to mark a locality closely when you are a *thousand mile from nowhere*," complaining that between San Antonio to El Paso "there are very few points that have a local habitation and a name."⁵³ Engelmann's correspondents had better luck as time went on, and along the continent's more northerly rivers: "We have sufficient data to obtain an excellent profile of the Country, and, our meteorological force now abundantly strong, are bringing forward excellent results," wrote Isaac I. Stevens from near the mouth of the Yellowstone River in 1853. "Elevations and depressions, river valleys ~~and~~ have been made points of observation," scratching down his comprehensiveness.⁵⁴

Engelmann continually dispensed technical advice to his loyal band of correspondents, and made connections to the newly formed national science institutions.

"You are an old meteorological observer and savant, and will therefore excuse the trouble I am about to give you now," Bigelow wrote to Engelmann, a decade into their correspondence; the question involved calibrating a wet-bulb thermometer.⁵⁵ Engelmann kept handy the charts that Alexander Dallas Bache, the great-grandson of Benjamin Franklin, had made to track the weather in Philadelphia.⁵⁶ When Bache sought out the best meteorological observations for St. Louis and points west, he wrote to Engelmann. "For a comparison of the connected profiles of the continent of North America," Bache explained, "you will greatly oblige me by filling up the accompanying blank."⁵⁷ In its first round of requests for national weather data in 1853, the Smithsonian Institution knew to ask Engelmann for "summations of the best authorities," Engelmann regularly corresponded with Smithsonian officials; on occasion, they would combine their mailings to Engelmann with those for the St. Louis Mercantile Library, where Engelmann was a life member.⁵⁸ The web of connections grew, and the analysis of national conditions came closer to fruition.

While the complex calculations of rain profiles and thermal lines were being completed, local correspondents grasped the palpable impact of patterns drawn from seemingly small, insignificant measurements. "A full year before I had any instruments, I regularly estimated the strength of the wind, cloudiness, etc. etc.," Adolph Francis Alphonse Bandelier wrote, from Highland, Illinois; Friedrich Arends sent measurements from Huntsville, Missouri, while Friedrich Brendel wrote from Peoria that "I should like to do meteorological studies, if I only could get hold of a good barometer."⁵⁹ As one of the era's many cholera epidemics crept up the riverways by means unsure — bad air? immigrants? social vices? citizens nervously wondered — Dr. Edward H. Barton, a former dean of the school of medicine at the University of Louisiana (now Tulane), wrote confidently that "In my 'Report,' I think the meteorological elements of yellow fever & cholera are stated with great precision."⁶⁰ He promised Engelmann, "I have been keeping your Barometer as well as I could," Barton promised.⁶¹ Barton and Engelmann stood at the forefront of science, assured that, "if now, we can take another fatal disease from the region of error & uncertainty, & demonstrate the actual etiological condition on which it depends for its existence," as Barton wrote, "we make another advance in true science, & promote the progress of truth."⁶²

In contrast, those in Washington often grasped at the maps and topography reports as a chance to propose grandiose plans that went well beyond the known conditions. "I amuse myself occasionally with studying the physical Geography of the great West — Alas how little of it is known to the would[-]be great politicians at the seat of government," Bigelow wrote from his home, in 1859. "I should greatly deplore the pas-



Daguerreotype of George Engelmann, n.d., Missouri Historical Society Photographs & Prints Collection.

sage by both branches of Congress any of the Pacific Railroad bills I have yet seen."⁶³

The botanical and meteorological work of Engelmann and his correspondents formed a perfect pair. Scouting and surveying parties could pinpoint locations and send back specimens and measurements; statisticians and cartographers could prepare more accurate maps, and politicians could send out further explorations to gather more detail. In Engelmann's letters, the workings of scientific knowledge are evident. Missives in English, French, and German are filled with charts of measurements, sketches of cacti flowers, arguments about differentiating species and assigning Latin names. Bearded and spectacled, the visage of George Engelmann that peers back from the requested *carte-de-visite* photograph could seem a practical embodiment of solid, scientific knowledge.

Yet lest we think that the amassers of scientific and medical knowledge fit a white labcoat image of impartiality and dispassion, Engelmann's letters also record how he and his correspondents were highly opinionated about the events around them and actively involved in political and cultural affairs. Engelmann's frank, even harsh assessments of politicians or their causes provide a window into those other sorts of measurements that can be made at St. Louis, the glimpses of local and national circumstances that guide our historical exploration.

"Toward evening a message arrived, that 5,000 American troops are marching on the Santa Fe road,"

Frederich Adolphus Wislenzus reported alongside his meteorological readings from the Mexican *estado de Nuevo México* in the summer of 1846. "Governor Armigo released a proclamation this afternoon calling all able-bodied men from 18 years up into service."⁶⁴ Though Wislenzus remarked in his next letter that "I feel a strong dislike to return to the States," the invading U.S. Army brought the boundary to him in Santa Fe.⁶⁵ John C. Frémont, Nicollet's assistant, jumped from scientific expedition to military campaign in the midst of the war, and ordered the execution of two men near San Rafael, California; his unauthorized action led to a court martial, which Wislenzus followed closely, along with the resulting damage to Frémont's political stature.⁶⁶

When Wislenzus returned to Washington to lobby for funding to publish his studies, he wrote to Engelmann about the dramatic news from Europe: the aftermath of the war in the West was combining with the "springtime of the peoples" in Europe to turn the year 1848 into a global watershed.⁶⁷ "I am in a state of revolution, and every new message hits me as with electrical shocks," Wislenzus wrote of the news from his homeland, his veins pulsing with a desire to fight.⁶⁸ Yet like Nicollet before him, Wislenzus found his plans deferred by the need to court funding and prepare reports.⁶⁹ "My money obligations lie upon me like a nightmare," he wrote, anguished; "If I were free from them I would be already on European soil."⁷⁰ While in Wislenzus's case scientific exploration and publishing conflicted with his political aims, science could just as easily grease the wheels of patronage. "P.S. Can you not gratify Capt. Whipple by naming someone of our new *Opuntiae* [cacti] after the Hon. Secretary of War Jeff. Davis?" Bigelow wrote to Engelmann in the fall of 1855, mentioning the patron of the transcontinental railroad surveys and future president of the Confederacy. Engelmann complied, and the namesake, Davis' hedgehog cactus (*Echinocereus viridiflorus* Engelm. var. *davisii*) is still on the books.⁷¹

With the coming of the Civil War, Engelmann's own voice came to the fore, his reactions preserved in letters to his medical school classmate, Alexander Carl Heinrich Braun, in Berlin. Living through the war in St. Louis, Engelmann found that "in spite of all the great principles trumpeted it is a horrible war of suppression." He was astounded that "Lincoln's declaration of emancipation of the blacks was proclaimed!" He chafed at the "substitution of poor southern Negroes and Europeans, living under all sorts of abuse, and then forced into the Army to take the place of Yankees," who were "purchased . . . by agents dealing in human flesh," an irony in a fight turned against slavery. To Engelmann, the whole war effort seemed treachery. "No state put up fewer troops than Massachusetts," he claimed, "and none has put up more falsehood and deceit."⁷²

Engelmann's son, a student at Washington University, held similar sentiments. "We have a reign of terror," George Julius Engelmann wrote in his diary in February 1862. In January 1863, after the Emancipation Proclamation was declared, his allegiances were on his sleeve: "I wore Confederate buttons on my coat at drill to day," the younger Engelmann wrote. "Our yankee teacher Stone, immediately noticed it. . . . I was told that if I wore them again, I should not see the inside of the school again."⁷³ His father worried for him, writing to Braun that "I will send you my George if the age of conscription is lowered from 20 to 18!"⁷⁴ Both Engelmanns endured the war in St. Louis, unsure of the nation's direction.

After the Confederate surrender, the senior Engelmann continued to keep Braun current on the bitter ironies of Reconstruction. "Here some of our firmest radicals are in part those who 4 years back stood on the other side," he wrote. Noting the policies of the new president, he cheered "Johnson, may he be great, but what he wants is definitively a fight with the radical Congress."⁷⁵ The end of the war meant the reopening of scientific as well as commercial and cultural projects, a renewal of exchanges with "Lindheimer from Texas and Chapman from Florida" — though with "much denying now, that they had ever any sympathy for the South."⁷⁶

Engelmann's letters tracked the uncertainty and the advances, focusing at times on how national events would impact the fortunes of St. Louis. They mentioned in passing the concerns that were the focus of cultural, political, and economic wrangling, and will appear later in the book: "Two separate railroads to the Pacific Ocean are being constructed now, one from Chicago, the other from here," Engelmann explained, while Wislenzus recorded the slogan that "Seymour and Blair! is now the solution."⁷⁷ Braun reported from Berlin how Bismarck threatened Napoleon III and war seemed likely.⁷⁸ In 1869, Wislenzus told Engelmann that the transcontinental railroad path he Engelmann helped to chart would soon be complete. "The Great Pacific Railroad has only 6 more miles to construct," he wrote at the start of May 1869. "It is supposed to be very defective, but, when finally completed, it will become better," he hoped.⁷⁹

The world seemed once again on the precipice of change. "Nobody trusts the financial weather," Wislenzus advised Engelmann at the start of the 1870s, assured his fellow scientist would understand the pun. Wislenzus's son was then at Washington University, where he graduated valedictorian; in the student newspaper, Jacob Blattner advertised his barometers and thermometers, still for sale.⁸⁰ At the height of Reconstruction, the political situation seemed to spiral toward farce: "These are golden times for political adventurers and cheaters of every kind!" Wislenzus wrote, noting how "last week the nomination of this

cunning demagogue and carpetbagger” — Carl Schurz — “who has lived only 1½ years in Missouri, passed in caucus.”⁸¹ Faced with such choices, Wislenzus declared, “If I were forced to sympathize I would prefer the dictator Grant to the criminal element.”⁸²

“I shall never cease to respect the (in his happy moods) good Dr. Engelmann,” John Milton Bigelow wrote in 1856, working to resolve one of their periodic arguments. Engelmann could be temperamental. His wit and passions could spill over into anger. But his close friends understood it all streamed from his dedication to the cause.⁸³ One wonders whether Engelmann sorely missed the opportunity in 1871 to discuss the weather — in all seriousness — at the twenty-fifth anniversary celebration for the St. Louis Mercantile Library, an event he attended but fellow invitee Father Francis H. Stuntebeck, S.J., had to decline.⁸⁴ Engelmann died in 1884, about halfway between the two pairs of Jesuit brothers who shared his meteorological passions. Soon after, his son George J. Engelmann wrote to one of his father’s colleagues how “correspondence was his life — his pleasure. . . . At his desk he had his chat — his entertainment — by writing to his friends.”⁸⁵

Engelmann was devoted to close measuring, whether cacti specimens, meteorological conditions, or the turbulent times in which he lived. He rarely saw cause for boosterish exaggeration or rhetorical flourish. Engelmann measured what he saw, and took pride in his exactness. This was a lifelong passion, and one that allowed him to build a community of interested individuals from across the spectra of region, politics, or language.

Having spent fifty years in St. Louis, Engelmann witnessed the dramatic transformation of the city and the nation. He participated in its advances, commented on its conflicts, and measured its impact — the rise and fall of Manifest Destiny and St. Louis. Along with science, Engelmann and his barometer saw competing national visions at play in St. Louis, data points marking the tensions around Manifest Destiny and the cultural civil war ablaze in St. Louis and the nation.

NOTES

Thanks to David Blight, Joanne Freeman, John Mack Faragher, John Waide, Mary Burke, Andrew Colligan, and Rebecca Rosenthal.

1. Sheet for April 1861, Saint Louis University Archives, Saint Louis University Historical Records, Meteorological Records, Observations, Volume for 1861–1866, DOC REC 001 015 004.
2. Adolph Francis Alphonse Bandelier, Highland, Ill., to George Engelmann, January 2, 1862, George Engelmann Papers, Missouri Botanical Garden Archives, typescript page 1. Translation by Edgar Denison, 1988.
3. Koning’s initials appears atop the Sheet for April 1861, DOC REC 001 015 004.
4. Volume for 1861–1866, DOC REC 001 015 004. Faherty describes the St. Louis University observations and says that from 1857 they were done “at the request of the United States

Government”; he says “these meteorological observations were, of course, only a peripheral aspect” of the University. William Barnaby Faherty, *Better the Dream: Saint Louis: University & Community* ([St. Louis]: St. Louis University, 1968) 113, 115; see also 152.

5. For a metaphorical connection between weather and the politics of the Civil War, see the speculations of Eduardo Cadava, *Emerson and the Climates of History* (Stanford, Calif.: Stanford University Press, 1997). Cadava searched Emerson’s allusions to weather for signs of the political strife, “read[ing] the features of this world in the traces it left in Emerson’s language,” from the frost of the mind to the thunder of words. This chapter takes the literalization of the “climates of history” one step further — reading politics not just in weather imagery, but in the collection and interpretation of the era’s weather. In doing so, I build my project in accord with the metaphors Cadava suggested. Cadava, *Emerson and the Climates of History*, 8.

William B. Faherty takes a similar approach in describing the approach of American interests to French Catholic St. Louis as “A small cloud on the northeastern horizon soon threatened to blacken the entire sky,” in a chapter titled “Grey Skies Over Saint Louis.” Faherty, *Better the Dream*, 95.

6. For a history of meteorology that considers its mission as the socially relevant science, in this case in Britain, see Katharine Anderson, *Predicting the Weather: Victorians and the Science of Meteorology* (Chicago: University of Chicago, 2005). For a history of American meteorology, see James Rodger Fleming, *Meteorology in America, 1800–1870* (Baltimore: Johns Hopkins University, 1990).
7. For a discussion of the history of meteorological science in St. Louis, see St. Louis University Department of Earth and Atmospheric Sciences, “EAS Department History,” <http://www.eas.slu.edu/Department/history.html> Accessed March, 2006; Martha Coleman Bray, *Joseph Nicollet and His Map* (Philadelphia: American Philosophical Society, 1980); Daniel Goldstein, “Midwestern Naturalists: Academies of Science in the Mississippi Valley, 1850–1900” (Ph.D. Thesis, Yale, 1989), 4–7, 36–38, 115; Michael Long, “Enterprise and Exchange: The Growth of Research in Henry Shaw’s St. Louis,” in *St. Louis in the Century of Henry Shaw: A View Beyond the Garden Wall*, ed. Eric Sandweiss (Columbia: University of Missouri, 2003), 146, 151. Using a taxonomy of science developed by George H. Daniels, Goldstein argues “The measurement of temperature is much closer to the baconian ideal of purely objective observation than is the analysis of a plant” Goldstein, “Midwestern Naturalists,” 4. As my argument in this prologue suggests, if this is true, it is in only the most superficial way. For the characteristics of Baconian science, see George H. Daniels, *American Science in the Age of Jackson* (New York: Columbia University, 1968).

For its place among the sphere of science in mid-nineteenth-century St. Louis, see Goldstein, “Midwestern Naturalists”; Walter B. Hendrickson, “Science and Culture in the American Middle West,” *Isis* Vol. 64, no. 3 (1973): 326–340; John R. Hensley, “Transacting Science on the Border of Civilization: The Academy of Science of St. Louis, 1856–1881,” *Gateway Heritage* 1986–7, no. 3 (1987): 18–25; Mary J. Klem, “History of Science in St. Louis,” *Transactions of the Academy of Science of St. Louis* vol. 23, no. 2 (December 29, 1914): 79–128; Long, “Enterprise and Exchange”; Michael Long, “George Engelmann and the Lure of Frontier Science,” *Missouri Historical Review* vol. 89, no. 3 (1995): 251–268.

8. For more about the politics, economics, and culture of the Civil War Era from St. Louis, see Adam Arenson, *The Great Heart of the Republic: St. Louis and the Cultural Civil War* (Cambridge, Mass.: Harvard University, 2011).
9. The initials of each appear on weather sheets, and their names are listed on the inside cover, Volume for 1861–1866, DOC REC 001

- 015 004. It seems that the men mostly worked one after another on the observations, rather than together.
- For the positions held, see their biographies and obituaries, listed below.
10. On Jean Baptiste "Pomp" Charbonneau's attendance, see Susan M. Colby, *Sacagawea's Child: The Life and Times of Jean-Baptiste (Pomp) Charbonneau* (Spokane, Wash.: Arthur H. Clark, 2005), 94.
 11. For a history of the Jesuits, highlighting perceived weaknesses as well as successes, see Jonathan Wright, *God's Soldiers: Adventure, Politics, Intrigue, and Power: A History of the Jesuits* (New York: Doubleday, 2004).
 12. "FATHER STUNTEBECK'S DEATH: Well-Known Jesuit Died at the St. Louis University," [*St. Louis Post-Dispatch*] n.d., Saint Louis University Archives, Saint Louis University Historical Scrapbooks, Jesuit Scrapbook, p. 2, DOC SCR 001 0003 0001, and "DEATH OF FATHER STUNTEBECK: The Aged Jesuit Priest Dies of Internal Cancer," *Globe-Democrat*, December 11, 1898, n.p., Scrapbook 3, p. 5, DOC SCR 001 0001 0003. For a brief sketch of his life see Faherty, *Better the Dream*, 152–155; Walter H. Hill, "Father Francis H. Stuntebeck," *Woodstock Letters* 28 (1899), 138.
 13. "FATHER PANKEN'S NOTABLE CAREER: Priest Nearly 50 Years," *St. Louis Globe-Democrat*, March 25, 1906, n.p.; "PRIESTLY HELPER OF NEGROES DEAD," *St. Louis Republic*, March 21, 1906, n.p.; "Well Known Missionary Dead," *Western Watchman* [March, 1906], n.p., in Jesuit Scrapbook, p. 12, DOC SCR 001 0003 0001, and John Ernest Rothensteiner, *History of the Archdiocese of St. Louis in Its Various Stages of Development from A.D. 1637 to A.D. 1928* (St. Louis, Mo.: [Printed by Blackwell Wielandy], 1928) 2:491–492..
 14. On Lunemann, obituary in *Missouri Republican*, September 15, 1864, p. 2.
On Koning see Gilbert J. Garraghan, *The Jesuits of the Middle United States* (Chicago: Loyola University, 1984), 3:561. Peter William Koning is alternatively listed as Peter John Koning and William Koning in some documents. David Miros, of the Midwest Jesuit Archives, says these are the same man.
 15. "PRIESTLY HELPER OF NEGROES DEAD," *St. Louis Republic*, March 21, 1906, n.p.; "Well Known Missionary Dead," *Western Watchman* [March, 1906], n.p., in Jesuit Scrapbook, p. 12, DOC SCR 001 0003 0001, and Judy Day and M. James Kedro, "Free Blacks in St. Louis: Antebellum Conditions, Emancipation, and the Postwar Era," *Missouri Historical Society Bulletin* Vol. 30, no. 2 (1974): 123; Garraghan, *The Jesuits of the Middle United States*, 3:561, 563; Rothensteiner, *History of the Archdiocese of St. Louis in Its Various Stages of Development from A.D. 1637 to A.D. 1928*, 2:490–492.
 16. John H. Lunemann, "Application of Analysis to Astronomy" Notebook, Saint Louis University Archives, Saint Louis University Historical Records, Jesuitica, Lecture Notes, 1856, n.p., DOC REC 0001 0002 0076.
 17. The page says "Dr. Young's Refractions... From page 19 of Vol. 1st of Pearson's Practical Astronomy." The texts referred to are William Pearson, *An Introduction to Practical Astronomy* (London: Printed for the author, 1824); J. R. Young and John D. Williams, *Mathematical Tables: Comprehending the Logarithms of All Numbers from 1 to 36,000: Also the Natural and Logarithmic Sines and Tangents, Computed to Seven Places of Decimals, and Arranged on an Improved Plan: With Several Other Tables, Useful in Navigation and Nautical Astronomy, and in Other Departments of Practical Mathematics*, Rev. and corr. ed. (Philadelphia: Hogan and Thompson, 1839).
 18. Lunemann, "Application of An alysis to Astronomy" Notebook, n.p.
 19. The authoritative biography of Nicollet is Bray, *Joseph Nicollet and His Map*. See also Nicollet's own accounts of his time in the West J. N. Nicollet, Edmund C. Bray, and Martha Coleman Bray, *Joseph N. Nicollet on the Plains and Prairies: The Expeditions of 1838–39, with Journals, Letters, and Notes on the Dakota Indians* (St. Paul: Minnesota Historical Society, 1993).
 20. Bray, *Joseph Nicollet and His Map*, 26–46. For how Humboldt's example affected American explorers, see Aaron Sachs, *The Humboldt Current: Nineteenth Century Exploration and the Sources of American Environmentalism* (New York: Viking, 2006).
 21. Bray, *Joseph Nicollet and His Map*, 55–61. An excellent explanation of mountain barometers and the process of hypsometry can be found on the website of an amateur enthusiast: Bob Graham, "John C. Fremont," www.longcamp.com, accessed June 2006.
For a sense of the mix of science, exploration, and personal and governmental initiative at work in these ventures, see Peter J. Kastor, *William Clark's World: Describing America in an Age of Unknowns* (New Haven: Yale University, 2011), and William H. Goetzmann, *Exploration and Empire: The Explorer and the Scientist in the Winning of the American West* (New York: Norton, 1978).
 22. This fact was confirmed in conversation with Carolyn Gilman, Missouri Historical Society, July 2006. For the scientific books and instruments carried by Lewis and Clark, Donald Dean Jackson, "Some Books Carried by Lewis and Clark," *Missouri Historical Society Bulletin* vol. 16, no. 1 (October 1959): 3–13.
 23. Meriwether Lewis and William Clark, et al., *History of the Expedition under the Command of Captains Lewis and Clark, to the Sources of the Missouri: Thence across the Rocky Mountains and Down the River Columbia to the Pacific Ocean: Performed during the years 1804-5-6: By Order of the Government of the United States* (Philadelphia: Bradford and Inskeep, 1814), 1: 439.
 24. For a discussion of William Clark's map, see Kastor, 14; Goetzmann, *Exploration and Empire*, 2–24.
 25. Information on the East Coast of the United States was available to Humboldt from the observatories mentioned below; it was just the American West where Humboldt, and everyone else, had no established observatories.
 26. Bray, *Joseph Nicollet and His Map*, 30.
 27. *Ibid.*, 64–77, 133–163.
 28. *Ibid.*, 142–147, 255; see also Adam Arenson, *The Great Heart of the Republic: St. Louis and the Cultural Civil War* (Cambridge: Harvard University, 2011), 34.
Bray believes the history was written in 1835 or 1836, but mention of the 1841 destruction suggests at least a later revision. The history was first published in the 1843 *Report*, and the French manuscript appears in the Nicollet papers in the Library of Congress. Joseph Nicholas Nicollet, "Sketch of the Early History of St. Louis," in *The Early Histories of St. Louis*, ed. John Francis McDermott (St. Louis: St. Louis Historical Documents Foundation, 1952), 132.
 29. On Nicollet delivering these barometers and the years, Bray, *Joseph Nicollet and His Map*, 148; Long, "Enterprise and Exchange," 146.
See also Nicollet's mention of the St. Louis University meteorologists in J. N. Nicollet, Baltimore, to Peter John De Smet, St. Louis, March 12, 1841. Midwest Jesuit Archives, IX De Smetiana, AA, pp. 637–640, and Bray's source, Joseph N. Nicollet et al., *Report Intended to Illustrate a Map of the Hydrographical Basin of the Upper Mississippi River* (Washington: Blair and Rives, 1843).
 30. On Nicollet's movements Bray, *Joseph Nicollet and His Map*, 158, 164–166. On the presence of Dred and Harriet Scott at Fort Snelling before 1842, Don Edward Fehrenbacher, *The Dred Scott Case, Its Significance in American Law and Politics* (New York: Oxford University, 1978), 244–247.
 31. On Blattner, *Missouri Republican* October 19, 1841; the text indicates he is in a new location, so it may be possible to find evidence of an earlier date for his presence. On farmers, see cor-

respondents in the George Engelmann Papers, Missouri Botanical Garden Archives.

On newspapers, Nicollet wrote to Engelmann, "I would like you to get me a copy of every issue of the paper [Fr. Journal] in which you publish the meteorological observations you make in St. Louis. I will pay what it takes, if there is something to pay. Send me the entire series from the beginning. You know how much this subject interests me." Nicollet, Washington, to George Engelmann, 4/16/1843, p. 2, George Engelmann Papers. Translation by James A. Long, University of St. Thomas, Minnesota, June 1993. Given the fact that the Academy was not yet formed, and I have anecdotally seen weather records in the paper, I assume this is what Nicollet refers to, though I am unsure of the start date for these reports.

32. On Clark's museum, John Francis McDermott, "William Clark's Museum Once More," *Missouri Historical Society Bulletin* Vol. 16, no. 2 (January 1960). On the appearances of Agassiz in 1853 and Mitchell in 1858, see the list of lectures, Betty Boyd Walker, "The History of the Saint Louis Mercantile Library: Its Educational, Social and Cultural Contributions" (Ph.D. thesis, Saint Louis University, 1986), 164–171.

Twenty years later "a course of Astronomical lectures" by Richard A. Proctor, followed directly after Harriet Beecher Stowe, and were arranged "under the auspices of Mercantile Library Association and Washington University with price of admission within the reach of all desiring to attend." While Stowe's lecture provided net receipts of \$32.15, the course of six lectures from Proctor averaged \$166.67 in profits every night. For receipts, St. Louis Mercantile Library Association Board of Direction, Minutes Book 3, meetings November 4, 1873, February 3, 1874, and March 3, 1874, pp. 70, 78, 79, St. Louis Mercantile Library Association Archives, M-117, Book A-1-3.

33. Nicollet wrote to Engelmann, "Such a long sedentary life, after years of travels, is killing me. My health is deteriorating, and nevertheless I can't be busy taking care of it. . . . The West, I hope will give me back life when I can see it again, and I will see it as soon as I have finished." Joseph Nicholas Nicollet, Washington, to George Engelmann, August 8, 1840, George Engelmann Papers. Translation by James A. Long, University of St. Thomas, Minnesota, June 1993.
34. St. Louis University established the first geophysics depart in the Western Hemisphere in 1925, which took control of the university's existing meteorological and seismological observatories. Faherty, *Better the Dream*, 283. For a full overview, "EAS Department History," St. Louis University Department of Earth and Atmospheric Sciences, <http://www.eas.slu.edu/Department/history.html>, accessed March 2006.

Ben Abell, professor of meteorology in St. Louis University's Department of Earth and Atmospheric Sciences until a few years ago held the position descended from John Lunemann; he taught classes in meteorology and delivered the weather on KWMU, the latest station in his 40 years of delivering the weather on St. Louis radio stations. See "SLU Professor Ben Abell Named to St. Louis Radio Hall of Fame," St. Louis University press release, <http://www.slu.edu/readstory/more/6392>, accessed July 2006.

35. For a history of these efforts, see Marcus Benjamin, "*NOAA History: Tools of the Trade/Weather Prediction & Detection/Meteorology*," NOAA Central Library, http://www.history.noaa.gov/stories_tales/meteorology.html, accessed August 2006.
36. See my comments in note 5.
37. George Engelmann, St. Louis, to F. A. C. Weber, January 18, 1868, George Engelmann Papers, page 1. Translation by Edgar Denison, 1988. See also Enno Sander, "George Engelmann," *Transactions of the Academy of Science of St. Louis* 4 (1886), 1–18; Patricia P. Timberlake, "George Engelmann: Scientist at the Gateway to the American West, 1809–1860" (Master's thesis, University of Missouri-Columbia, 1984).
38. Henry P. Sartwell, Penn Yan, New York, to Engelmann, Novem-

ber 15, 1865; Thomas Allen, Office of the State Board of Centennial Managers, St. Louis, to Engelmann, November 22, 1875; Frederick Augustus Barnard, Washington, to Engelmann, May 20, 1864, George Engelmann Papers. For a discussion of another request for a photograph from Engelmann, see Goldstein "Midwestern Naturalists," 29.

39. For the history of the Academy of Science of St. Louis, see Ibid., 106–154; Hensley, "Transacting Science on the Border of Civilization: The Academy of Science of St. Louis, 1856–1881"; Klem, "History of Science in St. Louis."

Engelmann also had founded the Western Academy of Science in 1830s, though it had collapsed; Walter B. Hendrickson, "The Western Academy of Natural Sciences of St. Louis." Goldstein notes, among other reasons for its success, that the second organization could profit from the influx of European-trained and often German-born doctors in scientists after 1848. Goldstein, "Midwestern Naturalists," 64, 141.

40. Long, "Enterprise and Exchange."
41. Engelmann, St. Louis, to F. A. C. Weber, January 18, 1868, George Engelmann Papers, pp. 1–2. Translation by Edgar Denison, 1988.

For a discussion of the "naturalist's exchange economy," including specimen collection in a variety of disciplines, as well as a monetary element, see Goldstein, "Midwestern Naturalists," 27–38.

42. On phylloxera Primm, *Lion of the Valley: St. Louis, Missouri, 1764–1980*, 3rd ed. (St. Louis: Missouri Historical Society, 1998), 195–196. For Engelmann's ongoing interest in and service to Missouri wine growers, see for example the discussion of grape rot in Isidor Bush, Bushberg, Missouri, to Engelmann, August 3, 1879, George Engelmann Papers.
43. Nicollet, steamboat Maryland on the Ohio River, to Engelmann, November 27, 1837, George Engelmann Papers. Translation by James A. Long, University of St. Thomas, Minnesota, June 1993.
44. "The lack of assistance and money for financing has thrown all this immense work on Mr. Fremont and myself and it's only been two weeks since we could seriously begin our large map," Nicollet wrote in 1840. Nicollet, Washington, to Engelmann, August 6, 1840, p.1, George Engelmann Papers, Translation by James A. Long, University of St. Thomas, Minnesota, June 1993. See also Nicollet, Washington, to Engelmann, August 6, 1840; Nicollet, Washington, to Engelmann, June 7, 1841; Nicollet, Washington, to David W. Goebel via Engelmann, n.d. [June 7, 1841?]; Nicollet, Washington, to Engelmann, April 16, 1843. See mention in Bray, *Joseph Nicollet and His Map*, 283
45. Henry King, Washington, to Engelmann, August 5, 1843, George Engelmann Papers. For other similar mentions, see King, Washington, to Engelmann, December 25, 1841; King, Washington, to Engelmann, April 2, 1842; King, Washington, to Engelmann, January 14, 1843; and, after Nicollet's death, King, Washington, to Engelmann, December 3, 1843. Comments on Nicollet were almost always mentioned at end of letter, clearing addressing a mutually dear friend.
46. Notation on Nicollet, Washington, to Engelmann, April 16, 1843, George Engelmann Papers.
47. Nicollet did continue, however "I will speak to him again about it, as he is perfectly willing to take care of it. But he would be so sorry if anything terrible happened!" Nicollet, Washington, to Engelmann, June 7, 1841, George Engelmann Papers. Translation based on James A. Long, University of St. Thomas, Minnesota, June 1993.

For a description of the difference between standard barometers and mountain barometers, see Graham, "John C. Fremont" website.

For more on the sense of how Frémont failed Nicollet, see where Martha Bray recounts how the efforts of William H. Emory — another frequent correspondent of Engelmann's — made the printing of a portable version of the map possible. Bray concludes,

"Thus, in the end, Emory and not Frémont was Nicollet's last true disciple" Bray, *Joseph Nicollet and His Map*, 270.

48. A report on the 1875 meeting of the Academy of Science noted that "Dr. George Engelmann (meteorologist, as well as botanist and physician) reported on the city's weather since 1834 [or 1835, when Engelmann arrived], giving the results of his observations in 1874 on temperature, windstorms, rainfall, etc. His readings for temperature were taken, I think, three times daily." William A. Kelsoe, *St. Louis Reference Record: A Newspaper Man's Motion-Picture of the City When We Got Our First Bridge, and of Many Later Happenings of Local Note* (St. Louis: Von Hoffmann, 1927), 55.

Kelsoe notes elsewhere that an article by John H. Tice on St. Louis storms "relied for his data for St. Louis weather before the opening of the government weather bureau here on the daily record kept for thirty years and more by Dr. George Engelmann at his residence in the western part of the city." Kelsoe, *St. Louis Reference Record*, 129.

On weather in the newspapers, see note 28.

49. George Engelmann, "The Mean and Extreme Daily Temperatures in St. Louis for 47 Years, as Calculated by Daily Observations," *Transactions of the Academy of Science of St. Louis* Vol. 4, no. 3 (November 1883): 496–508. See also the annual charts in the *Transactions*: Volume 1 for 1856–1859, Volume 2 for 1861–1864, and so forth.
50. George Engelmann, "Elevation of St. Louis above the Gulf of Mexico," *Transactions of the Academy of Science of St. Louis* Vol. 1, no. 4 (1856): 663.
51. Ibid.
52. Frederick Adolphus Wislenzus, Chihuahua, to Engelmann, March 7, 1847, p. 3; George Engelmann Papers. Translations from German by Edgar Denison, St. Louis, November 1987.

For more on their relationship, see the reminiscences of Engelmann's son, see George J. Engelmann, "Frederick Adolphus Wislenzus," *Transactions of the Academy of Science of St. Louis* Vol. 5 (1892): 464–468.

53. John Milton Bigelow, camp near the mouth of the Cañon of the Rio Grande, 60 miles below San Elceano, TX, to Engelmann, June 18, 1852, George Engelmann Papers. For a similar sentiment, see Frederick Adolphus Wislenzus, Santa Fe, to Engelmann, July 2, 1846, p. 3.
54. Isaac I. Stevens, Camp Cushing near Fort Union, mouth of Yellowstone, to Engelmann, August 6, 1853, George Engelmann Papers.
55. John Milton Bigelow, Office of Northern & Northwestern Lake Survey, Detroit, to Engelmann, March 27, 1863, George Engelmann Papers.
56. Engelmann's copy of Alexander Dallas Bache, *Discussion of Magnetic and Meteorological Observations Made at Girard College Observatory, Philadelphia, in 1840, 1841, 1842, 1843, 1844, and 1845* Washington, D.C.: [s.n.], 1859–1864, with an autograph bookplate, is still held in the archives of the Academy of Science of St. Louis. Thanks to Mary Burke and Mistii Ritter for their help in finding this volume.
- For more on Bache's observations in Philadelphia, see Jon M. Nese and Glenn Schwartz, *The Philadelphia Area Weather Book* (Philadelphia: Temple University, 2002).
57. Alexander Dallas Bache, Superintendent, U.S. Coast Survey, Washington, to Engelmann, November 21, 1859, George Engelmann Papers. For similar requests, see Howard Stansbury, Washington, to Engelmann, August 28, 1851; John C. Frémont, New York, to Engelmann, December 27, 1855.
58. Louis Blodget, Smithsonian, to Engelmann, June 6, 1853, George Engelmann Papers.

Engelmann and Wislenzus are listed as the official observers of the Smithsonian in Joseph Henry et al., *Results of Meteorological Observations, Made under the Direction of the United States Patent Office and the Smithsonian Institution from the*

Year 1854 to 1859 (Washington: Government Printing Office, 1861), 6.

Engelmann supplied alcohol and other preservation materials to Academy of Science member Charles P. Chouteau's traders, and then shipped the specimens to Baird at the Smithsonian. Goldstein "Midwestern Naturalists," 141 note 80. Spencer F. Baird, Assistant Secretary of the Smithsonian Institution, Washington, to St. Louis Mercantile Library, November 6, 1852, and Joseph Henry, Secretary, Smithsonian Institution, Washington, to Sir, July 25, 1855, both mention items enclosed for George Engelmann. Archives of the St. Louis Mercantile Library Association, M-117, Executive Letter Book 2, Incoming, 1846–1857, A-3-6, pp. 162, 288.

On life membership, see Archives of the St. Louis Mercantile Library Association, M-117, Board of Direction, Minutes Book 2, meeting May 6, 1862.

59. Adolph Francis Alphonse Bandelier, Highland, Illinois, to Engelmann, January 2, 1862; Friedrich Arends, Huntsville, Missouri, to Engelmann, August 17, 1855; Friedrich Brendel, Peoria, Illinois, to Engelmann, March 7, 1855, George Engelmann Papers. For a discussion of Brendel's scientific activities, see Goldstein, "Midwestern Naturalists," 6.

60. Edward H. Barton, New Orleans, to Engelmann, February 24, 1859, George Engelmann Papers.

Barton had been the chairman of the New Orleans Board of Health Sanitary Commission during the 1853 yellow fever crisis and was also a member of the New Orleans Academy of Science; see Ibid. 92. Barton died in 1859; this work was to expand upon Edward H. Barton, *Report to the Louisiana State Medical Society, on the Meteorology, Vital Statistics, and Hygiene of the State of Louisiana* (New Orleans: Davies, Son & Co., 1851).

For the fears of cholera and other mid-nineteenth-century diseases, see Robert Wilson, "The Disease of Fear and the Fear of Disease: Cholera and Yellow Fever in the Mississippi Valley" (Ph.D., Saint Louis University, 2008).

61. Barton, New Orleans, to Engelmann, April 15, 1854, George Engelmann Papers. Engelmann discusses sending Barton a barometer, to perfect his measure of altitudes along the Mississippi, in Engelmann, "Elevation of St. Louis above the Gulf of Mexico," 664–665.
62. Barton, New Orleans, to Engelmann, February 24, 1859, George Engelmann Papers.
63. John Milton Bigelow, Lancaster, Ohio, to Engelmann, January 27, 1859, pp. 2–3; George Engelmann Papers. See also Bigelow, Lancaster, Ohio, to Engelmann, August 26, 1855.
64. Frederick Adolphus Wislenzus, Santa Fe, to Engelmann, July 2, 1846, George Engelmann Papers. Translations from German by Edgar Denison, St. Louis, November 1987. Wislenzus was in fact illegally in Mexico, and collecting while in custody; see Goldstein, "Midwestern Naturalists," 110.
65. Frederick Adolphus Wislenzus, Chihuahua, to Engelmann, March 7, 1847, George Engelmann Papers. Translations from German by Edgar Denison, St. Louis, November 1987.
66. Frederick Adolphus Wislenzus, Washington, to Engelmann, February 12, 1848, George Engelmann Papers. Translations from German by Edgar Denison, St. Louis, November 1987.
67. On 1848 around the globe, see Bruce C. Levine, *The Spirit of 1848: German Immigrants, Labor Conflict, and the Coming of the Civil War* (Urbana: University of Illinois Press, 1992); Michael Paul Rogin, *Subversive Genealogy: The Politics and Art of Herman Melville* (New York: Knopf, 1983); Jonathan Sperber, *The European Revolutions, 1848–1851*, 2nd ed. (New York: Cambridge University, 2005); Shelley Streeby, *American Sensations: Class, Empire, and the Production of Popular Culture* (Berkeley: University of California, 2002). Rogin coined the phrase "American 1848" and Streeby has provided one of the most helpful analyses, which I have expanded to consider as a global 1848 here.

68. Frederich Adolphus Wislenzus, Washington, to Engelmann, April 23, 1848, George Engelmann Papers. Translations from German by Edgar Denison, St. Louis, November 1987. Wislenzus writes in this letter that “the republican army seems to move into the field only now, and will still need heads and arms in a few months.”
69. For the agony over the delays and competition in publishing maps and scientific papers see Frederich Adolphus Wislenzus, Washington, to Engelmann, December 28, 1847 p. 1; Frederich Adolphus Wislenzus, Washington, to Engelmann, January 20, 1848, p. 2; Frederich Adolphus Wislenzus, Washington, to Engelmann, February 12, 1848; Frederich Adolphus Wislenzus, Washington, to Engelmann, April 23, 1848; George Engelmann Papers.
- For what these tense negotiations of politics and personality meant for nineteenth-century American science, see Kastor, forthcoming.
70. Frederich Adolphus Wislenzus, Washington, to Engelmann, April 23, 1848, George Engelmann Papers. Translations from German by Edgar Denison, St. Louis, November 1987.
71. John Milton Bigelow, Lancaster, Ohio, to Engelmann, September 21, 1855, George Engelmann Papers in Arenson, *The Great Heart of the Republic*, 69.
- For a further discussion of the species differentiation and naming, see John Milton Bigelow, Lancaster, Ohio, to Engelmann, October 4, 1855 and March 17, 1856. For Engelmann’s classification work, see Goldstein, “Midwestern Naturalists,” 123–212. For *Echinocereus viridiflorus* Engelm. var. *davisii*, see Natural Resource Conservation Service, *Plants Profile: Echinocereus Viridiflorus Engelm. Var. Davisii (Davis’ Hedgehog Cactus)* (United States Department of Agriculture, <http://plants.usda.gov/java/profile?symbol=ECVID>, accessed May 2006. Thanks to Andrew Colligan for helping to confirm this connection.
72. Engelmann, St. Louis, to Alexander Carl Heinrich Braun, fragment, n.d. [1865; mentions “after four such years of devastating war”], George Engelmann Papers. Transliteration by Denison 1994, Westin 1996, Eliasson 1997, Taubel 1997; translation by “SGE.”
- For another correspondence that reveals Engelmann’s opposition to the war, see his letters with Asa Gray. {Goldstein, 1989 #249@143}.
73. George Julius Engelmann, “Civil War Diary of a Washington University Student,” transcript pages 6a Insert and 20, February 18, 1862, and January 20, 1863, George Julius Engelmann Papers, Missouri Historical Society, St. Louis. Thanks to Carmen Brooks for mentioning this incident.
74. Engelmann, St. Louis, to Alexander Carl Heinrich Braun, fragment, n.d. [1865], George Engelmann Papers, Missouri Botanical Garden Archives. Transliteration by Denison 1994, Westin 1996, Eliasson 1997, Taubel 1997; translation by “SGE.”
75. Engelmann, St. Louis, to Alexander Carl Heinrich Braun, fragment, n.d. [spring/summer 1866; mentions “the Fall elections may bring pacification”], George Engelmann Papers. Translation by Edgar Denison, January 1988.
76. Engelmann, St. Louis, to Alexander Carl Heinrich Braun, March 18, 1866, George Engelmann Papers. Translation by Edgar Denison, January 1988.
- For a discussion of the seizure of an herbarium by the Union Army, and speculation about Alvan Wentworth Chapman and other Southern scientists during the war, see {Goldstein, 1989 #249@52–54}.
77. Engelmann, St. Louis, to Alexander Carl Heinrich Braun, June 18, 1867, George Engelmann Papers.
- Translation by Edgar Denison, January 1988. Frederich Adolphus Wislenzus, St. Louis, to Engelmann, July 23, 1868.
78. Alexander Carl Heinrich Braun, Berlin, to Engelmann, April 3, 1867, p. 9, George Engelmann Papers. Translation by Edgar Denison, December 1987.
79. Frederich Adolphus Wislenzus, St. Louis, to Engelmann, May 1, 1869, George Engelmann Papers. Translation by Edgar Denison, January 1988.
80. Information on his son from *Irving Union* 2.5 May 1870, 5. He later became a tutor at the school; *Irving Union* 2.6 September 1870, 4; for Blattner, *Irving Union* 3.10, December 1871, 8.
81. Frederich Adolphus Wislenzus, St. Louis, to Engelmann, January 18, 1869, George Engelmann Papers. Translation by Edgar Denison, December 1987.
82. Frederich Adolphus Wislenzus, St. Louis, to Engelmann, March 21, 1869, George Engelmann Papers. Translation by Edgar Denison, December 1987.
83. John Milton Bigelow, Lancaster, Ohio, to Engelmann, November 17, 1856, George Engelmann Papers.
84. Engelmann, to John T. Douglass, January 7, 1871 and F. H. Stunteback, President, St. Louis University, to John T. Douglass, January 11, 1871, Archives of the St. Louis Mercantile Library Association, M-117, Letter book 4(b) 1870-1871, A-3-9, pp. 229 and 233.
85. George J. Engelmann to C.C. Parry, February 15, 1886, George Engelmann Papers, quoted in Goldstein, “Midwestern Naturalists,” 39–40.



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