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MAKING WAR ON JUPITER PLUVIUS

THE CULTURE AND SCIENCE OF RAINMAKING IN THE SOUTHERN GREAT PLAINS, 1870-1913

MICHAEL R. WHITAKER

For two weeks in August 1891, the grounds of the “C” Ranch in rural West Texas thundered with the sound of explosions, as a federal government-sponsored expeditionary force hurled hundreds of pounds of heavy ordnance against an invisible enemy. In command of this unusual operation was “General” Robert Dyrenforth, who with \$9,000 of congressional funding in pocket was doing his utmost to find out whether, as a bit of folk wisdom ran, the furious tumult and aerial concussions of battle could somehow cause rain. From tiny western hamlets to the metropolises of the East, Americans were fascinated by the sensational experiments. In magazines, newspapers, and journals, some scoffed at what they saw as a fool’s errand and an egregious waste of public

funds, while others were equally certain of the reality of the connection and regarded the potential windfall great enough to justify any expense. Scientists in particular were almost unanimously doubtful (and occasionally hostile), and made their views clear in the scholarly organs of their profession. In the end, the experiments failed to prove a definitive connection; indeed, as many had predicted all along, sober assessments of the data yielded little to suggest any causal link between explosions and rainfall. Yet, curiously, this was by no means the end of the theory. Over the course of two decades, a colorful cast of characters, from an eccentric self-titled “general” to a millionaire cereal magnate-cum-social engineer, typified a stubborn core of devoted believers. Each attempted to prove (or make practical use of) the theory by discharging various weapons and explosives at the sky, hoping that raindrops would come down in exchange.

How is it that in spite of the vehement opposition of scientific experts and the ambiguous results of field tests, the theory maintained such a durable and loyal following, and even won federal funding? This essay will attempt to demonstrate that the appeal and resiliency of the concussive

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theory of “pluiculture” stems from the fact that its foundation was cultural—rooted in social-political attitudes about the environment and progress—as much or more than it was scientific. In other words, within the United States, the theory established a devoted following and was able to withstand unanimous scientific critique and even practical failures because it originated in powerful and deeply held ideas in the American psyche of the Progressive era.¹

Foremost among these ideas was the notion of North America as a landscape that ought to be conquered and tamed by Americans as a kind of grand national endeavor—a sentiment neatly encapsulated and expressed by the phrase “manifest destiny.” In terms of the environment, this played out in a large-scale pattern of clearing away the wilderness and putting plow to earth wherever settlers wished to grow crops, with little regard to the local climate and terrain.² And where Native groups were seen as an obstacle to progress, colonists and soldiers often waged war against them. The concussion theory, then, offered the psychologically satisfying thought that the struggle to tame the environment and the struggle against the Native peoples were in fact one in the same, and accordingly might be “won” with literally the very same “weapons” and strategies—the detonation of high explosives. For this reason, as we shall see, the language and aesthetics of militarism and conquest permeated the discourse and conduct of concussionist experiments. Furthermore, inflexible determination was elevated as the attribute both necessary and sufficient for success.

The lived experience of the Civil War was another factor that contributed to the resiliency of the concussionist position. The Civil War was a conflict of unprecedented carnage and destruction, of countrymen taking up arms against one another and national unity shattered, and of profound moral questions over the institution of slavery and the status of African Americans in American society. Alongside these weighty issues, however, veterans reflecting on their war experience also very often remembered the precipitation. A rifleman who fought at Antietam, Fredericksburg, Chancellorsville, Shiloh, Chickamauga, or Gettysburg, to name only a few cases,

would have experienced a drenching rain at some point after the battle’s conclusion. So strong was the apparent connection that it became a matter of general understanding that the concussion of battle would reliably bring precipitation.³ Hence, when Edward Powers published a chronicle of Civil War battles followed by rain in his 1871 *War and the Weather*, he was not advancing a novel theory but rather putting into print a conclusion that thousands of Union and Confederate soldiers from private to general had already formed in their own minds. In this way, the concussionist theory appealed to a shared experience lodged in the minds of an enormous cohort of former fighting men.⁴ This strong reliance on experience also served to immunize the theory against criticisms based on theories of meteorology and physics.

Even before independence, many Americans had regarded westward expansion as an expression of national progress and personal liberation, a sentiment that grew stronger with the advent of the industrial revolution and its concomitant urbanization in the early nineteenth century. The Great Plains had beckoned would-be settlers from the east to escape the ceaseless toil of the big city and come west to try their hand at agriculture, filling their lungs with the refreshing air of the independent life and revitalizing the national spirit. But where railroads and land barons had promised endless tracts of fecund soil and effortless harvests, geography often failed to match expectations, and in few places was this truer than the Llano Estacado, or Staked Plains, a sprawling, bone-dry expanse of beige that could go months or even years at a time with little to no precipitation. It was in this desperate situation that Americans began dreaming up other ways to bring precious moisture to the land. Some posited that the farmer who took a leap of faith in cultivating marginal land would be rewarded with increased rainfall. As early as 1867, University of Pennsylvania geologist Ferdinand Hayden was suggesting that the mere act of settlement was improving the climate of the West, a sentiment that C. D. Wilbur later summed up in the famous mantra “rain follows the plow.”⁵ A similar idea, that the electrical current carried in railroad tracks or telegraph wires had increased precipitation in the

West, was sufficiently believed that John Wesley Powell felt it necessary to include a disproof in his 1878 *Report on the Lands of the Arid Region*.⁶ In view of these facts, the concussion theory emerges as a natural next step in a progression of ideas in which tokens of civilization and progress were imagined to have some power to affect the environment. Concussionism, however, reduced the tokenism in favor of heavy firepower, preferring realist to symbolic thinking.

SETTING THE STAGE

The single most influential text in the story of the concussionism was Edward Powers's *War and the Weather*. The book compiled a list of hundreds of battles that had been followed by rain, and the aforementioned wetness of the Civil War provided plenty of grist for Powers's mill. *War and the Weather* first appeared in print in 1871, with a second edition appearing in 1890. In the interim between the publications, Powers and others of a similar mentality had persistently memorialized Congress, the army, the navy, and several other governmental offices to contribute funding and weaponry to test the idea, and scored a crucial convert in the person of Illinois senator Charles B. Farwell. Farwell made the cause a pet project, introducing several requests for funding in the Senate, and finally gained traction with his colleagues in 1890, the same year *War and the Weather* reappeared for a new generation of readers. By that time, the rainy battles of the Civil War would not have been so fresh in the public memory as they had been in 1871, but another factor had by then emerged to renew the relevance and popularity of the theory: accelerating settlement of the Great Plains coupled with severe and recurring droughts in the late 1880s. At Farwell's behest, Congress authorized \$9,000 to be set aside for testing the strange hypothesis. As nothing of this sort had ever been attempted before, there was some uncertainty as to which branch of the government ought to handle it, but it was eventually decided that the most appropriate agency was the Division of Forestry, then within Jeremiah Rusk's Department of Agriculture.⁷ This decision would put something of a wrinkle in the proceedings;

Bernhard Fernow, chief of the Forestry Division, was adamant that his division lacked the apparatus and authority to carry out such an undertaking, and moreover, was embarrassed to be connected to what he considered rank foolishness. In his annual report to Rusk, for example, Fernow declared that any experiments "would hardly fail to be barren of results."⁸

Having made his objections clear, Fernow was relieved of his responsibilities, and the operation was redelegated to assistant secretary of agriculture Edwin Willits. Though more sympathetic to the possibility of rainmaking by concussion, Willits was in agreement with Fernow that neither the Forestry Division nor its parent department were equipped to perform the experiments. For this reason, Willits in February 1891 appointed an ad hoc special agent in the person of "General" Robert G. Dyrenforth—a Washington, DC, patent lawyer with an amateur interest in meteorology and explosives, and not incidentally, a convinced concussionist—to execute the experiments.⁹ Dyrenforth spent the next five months assembling a team of assistants, acquiring materials, and selecting a test site, eventually accepting the offer of Chicago meat packer Nelson Morris, who promised to extend the party complimentary room and board at his "C" Ranch outside Midland, Texas, while underwriting labor costs and other miscellaneous expenses. Local business concerns were similarly generous, donating gunpowder, dynamos, chemicals, and other useful goods to the effort, while the Texas and Pacific Railroad extended further assistance in the form of free transportation of personnel and material to Midland.¹⁰

In August 1891, the arrangements now sorted out, Dyrenforth and his entourage made their way by rail to the test site. Dyrenforth had decided that oversize kites carrying "rackarock" charges and hydrogen-oxygen balloons would offer a superior concussion and be easier to elevate to the desired altitude. Therefore he brought with him a balloonist and two chemists who would oversee the field production of the hydrogen and oxygen gas that would provide both the balloons' buoyant force and explosive matter. Also in the party were two guests of honor: ex-Confederate general Dan-

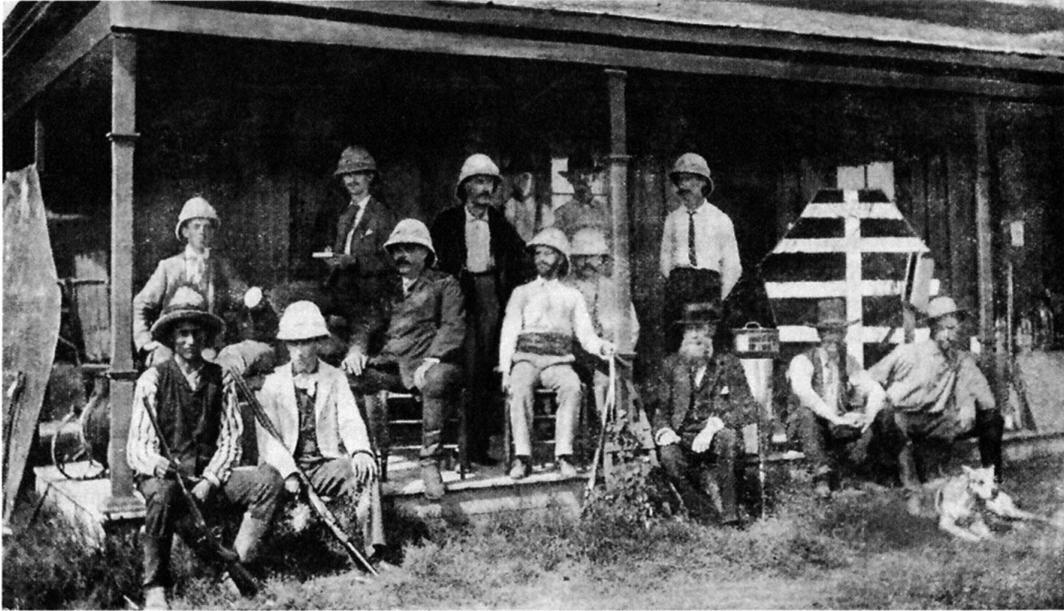


FIG. 1. Dyrenforth and party at the "C" Ranch, Texas, 1891. Dyrenforth is fifth from the left (seated in chair, hands resting on thighs).

iel Ruggles, who in 1880 had patented a method of artificial rainmaking involving balloons with attached dynamite charges, and Edward Powers, whose book had been so instrumental in transforming a folk theory into an object of serious scientific inquiry. Rounding out the investigative team was George E. Curtis of the Smithsonian Institution, a meteorologist who, like division chief Fernow, was sharply skeptical of the principle at the foundation of the endeavor.¹¹

EXPERIMENTING BEGINS

Beginning on August 9, Dyrenforth and his party began unleashing their fearsome barrages against the atmosphere (initially at the "C" Ranch and subsequently at El Paso and San Diego, Texas, at the invitation of local businesses and municipal leaders), inflating and exploding several dozen oxyhydrogen balloons and detonating thousands of pounds of explosives over the course of several weeks. Dyrenforth took pains to ensure that the desert trial simulated a battle in both appearance and spirit. In terms of arrangement, the "general" arranged three parallel two-mile-long firing lines in

a formation that must have resembled a battery of artillery pieces. On the front line was a row of jury-rigged mortars that were set up as to hurl dynamite and rackarock charges skyward. Supporting the front line was a line of custom-built kites with dynamite charges attached, tethered to the earth by electrical cable that also served to transmit the detonation signal. Finally, in the rearguard of the battalion was the "main line" at which twelve-foot balloons filled with oxygen and hydrogen gas would ascend hundreds of feet in the air to be exploded, like the kites, by electrical signals from the ground.¹² But even in the superficial and the intangible details, Dyrenforth adopted a military model, sporting a pith helmet and cavalry boots throughout the investigation. The official party portrait shows the men relaxing on a porch, eight of them topped with helmets to match Dyrenforth's, and three visibly gripping shotguns.¹³

PUBLIC RESPONSE

The enormous public appetite for news on the pluviculture experiments is attested by the enthusiasm with which hopeful Americans from the re-

motest corners of the nation cried out for haste. Henry Holdes, a self-described “poor farmer” from the remote frontier hamlet of Yuma, Colorado, wrote to Secretary Rusk, earnestly offering use of his land for any experiments at no charge, and thoughtfully including a hand-drawn map of his community and a table of meteorological observations.¹⁴ In Wichita, where the droughts of the late 1880s had taken a heavy toll, the *Daily Eagle* pleaded with the secretary of agriculture: “There could hardly be a more opportune occasion for making the experiment. . . . Try it, Uncle Jerry; try it now.”¹⁵

The speed with which news from Midland appeared in newspapers nationwide further illustrates the level of national interest. On August 10, a Monday, some twelve hours after the experiment’s opening salvo, rain began to fall and an enthusiastic party member wired Senator Farwell to share the good news; by Thursday, papers from coast to coast were ready to anoint the experimenters as the saviors of national agriculture. The *Rocky Mountain News* of Denver declared “They Made Rain,” while the *Chicago Times* proclaimed that the visionary Farwell had “outdone Moses.”¹⁶ As the experiments continued, the flood of positive press continued. The front page of the *Washington Post* announced “Bombs Cause Rain to Fall.”¹⁷ “Rain Made to Order” one *New York Times* front-page headline declared, informing readers that “it began to rain immediately” after Dyrenforth exploded a balloon and a healthy dose of dynamite. Two days later, readers learned that Van Horn, Texas, had experienced its heaviest rain in years, the cloudburst attributed to the party’s weather meddling.¹⁸ Not mentioned was the fact that Van Horn is some 180 miles from Midland. Such was typical of the Dyrenforth-friendly press: determined to report successful results, and not about to let facts stand in the way of a good story. Readers scarcely heard that August generally signaled the beginning of the rainy season in the Texas plains, or that fewer than half the barrages had resulted in rain of any appreciable volume (and in at least one of those cases, the Weather Bureau had already predicted rain anyway).¹⁹

CONCUSSIONISM AS MILITARY PROXY

Clearly, Dyrenforth’s desert venture was more than some parochial sideshow. On the contrary, it resonated with cultural attitudes about the environment, and gives us a window on some prominent modes of thinking about nature and settlement. In more ways than one, the din of the battlefield was very much in the minds of those who undertook, reported on, and thought about the experiments. Dyrenforth himself was clear that his driving methodology in the desert had always been “to imitate the effects of a great battle as nearly as possible.”²⁰ In describing the proceedings, writers made frequent use of military imagery and terminology in their descriptions of elements of the experiment as well as of the entire enterprise, even when the connection was not necessarily an obvious one. “Sounding like the report of a six-inch rifle on shipboard” was the simile offered by a *New York Times* reporter, describing a trial explosion of one of Dyrenforth’s balloons in Washington, DC.²¹ A concerned citizen wrote the editor of the *Times* proposing that something similar to the undertaking in Texas be essayed in the East to relieve the ongoing drought there. “Let the forts on Governors Island, Fort Hamilton, and Staten Island, and the war vessels stationed at the navy yard commence a bombardment, and shake the heavens until the clouds yield rain. . . . Let the Department of War issue an order for a general bombardment,” he wrote, making abundantly clear his preference for heavy ordnance to less bellicose methods such as explosive hydrogen balloons or rackarock-laden kites.²² In yet another article, the writer noted that “the experimenters have maintained a continuous ‘skirmish’ at the field of operation, while the bigger ‘guns’ in the shape of oxygen apparatus and hydrogen generators were being set up.”²³ Even in the context of the experiment, the gas generators, which merely supplied the hydrogen and oxygen for the balloons, had little in common with artillery pieces in either purpose or appearance. That the writer at any rate thought of them as guns illustrates the extent to which a strong undercurrent of military power informed understandings of what was taking place on the plains of Texas.

In addition, besides the literary allusions, there were more literal factors that contributed to the view of the experiments as a military operation. The U.S. Navy supplied the party with iron turnings. Although the turnings were simply scrap metal to be used in the chemical production of hydrogen and oxygen, it is easy to imagine that someone not familiar with the term might have assumed that the navy was supplying Dyrenforth and his party with munitions. When the investigators relocated from Midland to El Paso, they met with the Major James Henton and Lieutenant S. Allen Dyer of nearby Fort Bliss, who put twenty privates from the Twenty-third Infantry at the disposal of the experimenters, which can only have reinforced the public image of the enterprise as a military undertaking.

If the experiments were indeed symbolic proxies for real battle, who was the enemy? The *Washington Post* typified the answer to this question, characterizing the high winds that were playing havoc with the balloon and kite operations as a “powerful and relentless enemy,” adding that Dyrenforth and company had nevertheless scored “a fitting victory . . . in their efforts to shake water from the burning winds.”²⁴ Other newspapers identified the adversary as the clouds, the sky, or the atmosphere, but the underlying idea was usually the same: that the environment, unwilling to cooperate with the settlers’ designs upon it by selfishly withholding its vital moisture, was the enemy.²⁵

“CAN WE MAKE IT RAIN?”

Another important element that emerges in literature sympathetic to Dyrenforth’s experiments is a characteristic prioritizing of experience over meteorological theory and, furthermore, a feeling that inflexible willpower, rather than scientific method, was the key to success. After all, *War and the Weather* was not much more than a compendium of battle narratives appended with a dash of tentative meteorological theory.²⁶ A letter to the *New York Times* considered the concussive theory “proven” based solely on “the testimony of many general officers engaged in the Mexican war and in the late civil war,” while another concerned

citizen opined that the results, not the mechanism, should be the main object of interest, declaring “after the thing is done we shall all be in a receptive mood for the explanation of how it is done.”²⁷ In a letter quoted in *Scientific American*, Senator Farwell explained that his belief in the rainmaking power of concussion came not in connection with any understanding of atmospheric moisture but rather from the “historical and undisputed” understanding that “that after all the great battles fought during the century, heavy rainfalls have occurred.”²⁸ The *New York Times*, in explaining the influx of rain that had accompanied the desert trials, observed that “[t]he Scientific Person has not been heard from,” but that “Gen. Dyrenforth is not a man with a [proof], but a man of ideas.”²⁹

Perhaps unsurprisingly, the “general” in command of the experiments was of a similar mentality. In October 1891, after the investigators’ explosives had fallen silent, Dyrenforth took up the affirmative position in a marquee column for the *North American Review* entitled “Can We Make It Rain?”³⁰ Besides the customary chronicle of rain-soaked battles from recent history, Dyrenforth included a battery of testimonial letters from particularly esteemed Civil War veterans to buttress his position. Among these luminaries were Joshua Chamberlain, then-governor of Maine who had been decorated with the Medal of Honor as a brevet major general in the Civil War; John McNulta, Illinois representative and Civil War general; and no less than James A. Garfield, former president and major general in the Union Army.³¹ And in his report to Congress, Dyrenforth appended his write-up with six full pages of testimonials from local eyewitnesses who had wandered by to observe the proceedings. When it came to meteorological theory, however, Dyrenforth had not much to say: in that same document, he admitted that although he had received a number of suggested theories as to the mechanism of concussive pluviculture, he was unable to understand many of them.³² But this was a small matter; crafting a rigorous theoretical basis for concussionism had always been of secondary importance. Rather, a social logic that prioritized empirical observation and bare-bones

pragmatism informed and supported the reasoning of the concussionists.

In fact, Dyrenforth-friendly literature seems to have been aware of the incompatibility of their criteria of proof—based on experience, common sense, and intuition—with those of the scientific establishment and its functionaries, as the clashing paradigms engendered a simmering but perceptible mutual enmity. When peering across this gulf, pluviculture boosters painted their opponents as elitist snobs and bureaucratic jobsworths, and took a particular relish in narrating their failures.³³ One writer, praising Dyrenforth's proactive use of the congressional appropriation mused that the \$9,000 might otherwise have been "squandered" had it instead been invested in the Weather Bureau "which, as everybody knows, is supplied *ad nauseum* with every sort of weather except the desired or expected sort." Referencing the forestry chief's antipathy for the Dyrenforth expedition, the same author scoffed, "Mr. Fernow, we regret to say, thought that Gen. Dyrenforth could not make it rain, and proved that he could not by illustrious names which we will not mortify by citing here any further than may be necessary."³⁴ A *New York Times* columnist looked forward to the inevitable "mystification of the nearest local weather sharp . . . and the forcible overthrow of all the accumulated lore and stock signs of the Signal Bureau and its observers."³⁵ The "general" himself apparently felt a similar disdain for bureaucratic naysayers. The ranch-hand cowboys, he claimed in an interview, were far more knowledgeable in weather matters than office-bound meteorologists, whom he derisively called "those special advisory agents of Providence on weather matters."³⁶

As tantalizing as the prospect of rain on demand may have been (or perhaps because it seemed too good to be true), the concussionists' doubters were many, and made their views known as loudly as the supporters. Forestry Division chief Fernow, thankful to have had the experiment taken off his hands, was nevertheless aghast at the choice of Dyrenforth as the principal investigator. "I strongly advise everybody to have his ark ready for the deluge," he quipped.³⁷ The volume of reliable information trickling out of

Texas increased, and the mediocrity of the results became more apparent. Skeptical newspapers, which probably outnumbered the faithful from the end of August onward as the smoke cleared, characterized the experiments as "absurd, not to say shameless, misrepresentation," "an utter and ridiculous failure," and other choice phrases.³⁸ The *New York Times*—which in August had published its fair share of booster columns for Dyrenforth and company—by November was now playing the experiments for laughs. As the city water reservoirs ran dangerously low, it mused that the National Guard might lend a hand by engaging in some artillery practice—but only as a "jocular suggestion."³⁹ George Curtis, the meteorologist assigned to the expedition, penned a blistering tirade for the *St. Louis Republic*, calling the experiment a "miserable farce" and its commanding general "an inexcusable bungler . . . his botchwork a burlesque on science and common sense."⁴⁰ Not fully drained of his frustration, Curtis went on the attack again in the following year, writing that to promulgate the concussionist hypothesis was "to reject the light of civilization and to retrograde to a cruder and less rational apprehension of natural phenomena."⁴¹

Though Curtis's critiques may have been particularly searing, his sentiment was not atypical of his profession. Publications associated with related sciences such as *Nature*, *Science*, *American Meteorological Journal*, and *Engineering Magazine*, to name a few, printed essays often laced with scornful undertones of varying degrees of subtlety, confidently asserting the impossibility of concussive pluviculture and tearing apart Dyrenforth's methodology.⁴² *The Meteorologist* declared the theory "low and degrading."⁴³ Physics professor Alexander Macfarlane, who like Curtis was an eyewitness to the goings-on, hammered out a fulminating critique for the inaugural issue of the *Transactions of the Texas Academy of Science*, peppered with phrases and terms such as "no better than the medicine man of the Indians," "useless," "impostor," "ignorance," and "so-called facts and cranky arguments."⁴⁴ The acidity of the scientists' counterattack against the concussionists underscores the epistemological and methodological differences between the two groups.

When Curtis, Macfarlane, and others like them wished to rebut the concussionists, there was no shared foundation of knowledge on which they could construct the kinds of collegial arguments they would have made against a fellow scientist in the pages of *Scientific American*.

DYRENFORTH'S SUCCESSORS

Public esteem for Dyrenforth reached its zenith in the Texas plains in August 1891 but did not maintain its lofty position for long. The Department of Agriculture declined to renew his appointment as special agent after his term expired the following summer. As concussionism's critics grew more numerous and vocal, the diehard believers, including Edward Powers, the father of the theory, wasted no time in making a scapegoat of the "general," blaming the failure of the experiments on Dyrenforth's shoddy execution. The man once dubbed "General Jupiter Pluvius" now had a new nickname: "Dry-henceforth."⁴⁵ Yet even as the champion sank into disrepute and obscurity, the cause persisted, with the hallmarks of incorporated militarism and social logic. As the government tests came to an end in Texas, a coalition of local politicians and business leaders came together to pledge to carry on the experiments on their own funding.⁴⁶ In 1894, during an especially dry summer, a group of Nebraska citizens formed the "Rain God Association," a kind of rainmaking militia that raised \$1,000 to give the concussion theory a trial of their own. The "Rain Gods" built a 200-mile line of gunpowder firing stations on hilltops along the forty-second parallel, and detonated them simultaneously, to no appreciable effect.⁴⁷ In the first decade of the twentieth century, it was not uncommon in times of forest fire for locals to petition their local army or naval base for a barrage to try to bring some rain clouds.⁴⁸ The most serious post-Dyrenforth inquiry into concussive pluviculture, however, came about twenty years after the "general" and his party had finally decamped from Texas, but it unfolded in the very same locale as the 1891 trials.

In 1910, breakfast cereal king Charles W. Post's experimental colony at Post City, Texas, had been up and running for about four years.⁴⁹ Located



FIG. 2. Charles William Post.

about one hundred miles northeast of Midland, Post and his colonists had thus far eked out meager harvests by experimenting with expensive irrigation systems, cultivating unconventional, drought-resistant crops, and employing dryland farming techniques. Post, however, saw the potential for much more in the land, and after "an exhaustive study" of rainmaking was convinced that Dyrenforth had been on the right track all along and the concussion theory had merit. "General J.G. [sic] Dyrenforth, a well-known scientist and meteorologist . . . left no doubt . . . that the rains were caused by the explosions," Post proclaimed in a special piece for *Harper's Weekly*. "[T]he world, generally, seems to have forgotten that rain could be produced artificially."⁵⁰

Between 1910 and 1912, Post conducted dozens of experiments, or "battles" as he preferred to call them, at times also employing the terms "attack upon the elements" and "fight with Jupiter"—and in so doing repeated all the characteristic elements of the previous generation's concussionists.⁵¹ For example, in conducting his trials,

Post directed his managers to try to emulate a battle, and by one account succeeded spectacularly. In 1911 a reporter for the *Beckham County Democrat* happened to pass by Post City during a “battle” and recorded his impressions:

[A]long the verge of cliffs we could see the flash, the clouds of smoke rising and with our ears pierced by the deafening reports we were with Roosevelt at San Juan Hill and were storming the block house. . . . [A]s the increased thundering of the guns seemed to rend the very air over and around us, we thought we were with General Hooker at the Battle Above the Clouds.⁵²

Like his pluvicultural predecessors, Post’s results were at best inconsistent. From the spring of 1911 to the summer of 1913, he waged about twenty-one “battles,” but only half the time did rain follow. Yet his patience for failure was virtually unlimited: after each unsuccessful effort, he would simply fine tune some variable or other and perhaps increase the tonnage of explosives (and on one occasion blame his supplier for faulty dynamite), as if the outcome of the experiment had been a tantalizing near miss. The key to this conviction can be found in a letter he wrote to his managers, castigating them for a perceived lack of interest in the project: “I want extraordinary attention given to this subject,” he insisted, “for it means a very great deal to the country at large, and all of us are included.”⁵³ For Post, then, the “battles” for rain were no less than battles for the fate of the nation, the outcomes of which depended upon man’s ability to master the environment. Though he was far too young to have fought in the Civil War, he made frequent reference to downpours that had supposedly followed the momentous clashes from that conflict, and probably imagined that just as in those battles, unwavering determination would be necessary for victory. “In these experiments we are following a practice that absolutely and unfailingly did produce rain during the Civil War,” he wrote, invoking the socially persuasive power of memory and experience. “Every man who was in battle knows that rain invariably followed the heavy concussions.”⁵⁴ Nonexperiential knowledge, by

contrast, was of less consequence: “I am not so much interested in the scientific as the practical side,” Post wrote. “I am more engrossed in the results than the method.”⁵⁵ Indeed, Post made clear his distrust of certain naysaying scientists, declaring with certainty (as many optimistic concussionists had done before him) that “the theory of artificial rain making is not the mere chimera that some scientifically inclined men would have us believe.”⁵⁶

THE SPIRIT OF AMERICAN RAINMAKING

In 1894, Mark W. Harrington, chief of the Weather Bureau, completed an essay for the Smithsonian Institution’s annual report. Titled “Weather Making, Ancient and Modern,” he identified three classes of weather-making efforts from human history, which corresponded to a civilization’s stage of advancement. The first and most primitive of these was the class of superstitious efforts, which originated in formal or organized religious belief. Following this was the class of folklore remnants, which were said to be fragments and vestiges of the first type, yet maintained “a curious persistency in civilized countries.” Finally, the class of physical methods, which Harrington proclaimed was “mainly American and intensely practical,” appealed to objective physical laws rather than psychic impulses as the first two did.⁵⁷ Harrington sorted Dyrenforth’s escapade into the third category, but as we have seen, a great deal if not most of the logic behind it spawned from social expectations and beliefs. Although its adherents claimed scientific legitimacy, this was more a vulnerability than a strength, as it demanded testable and falsifiable grounds for inquiry. Its great resiliency and durability—its “curious persistency,” to borrow Harrington’s term—came from the fact that it appealed to intuitive and obvious ideas that were firmly anchored in contemporary notions of nature and the “rightness” of the American conquest of North America.

In his *Harper’s Weekly* essay, Post perfectly encapsulated the spirit that had motivated both him and concussionists past:

In the spring of 1911 crops on the ranch began to need rain. There were no signs of nature that pointed to any immediate conclusion of the drought. There was no method by which I could run irrigation ditches in time to alleviate conditions. It was under the stress of these conditions that I resolved to carry the war into the country of Jupiter Pluvius and bombard him until he surrendered enough rain to save the crops.⁵⁸

CONCLUSION

Post and the settlers had come to the West with the intention of conquering and reshaping what they found there to suit their needs. When something stood in the way of that vision, whatever it was, Americans relied on their will and strength to smash through the obstacle.

In Post's experiments, we can discern distinct echoes of the very same driving forces that informed the mentality of the previous generations of concussionists. Where Dyrenforth sported cavalry boots and bestowed upon himself a lofty military rank, Post conducted "battles" and made sure that the Civil War was never far from anyone's mind in the process. Like-minded Americans picked up on these threads, which we see played out in the frequent and occasionally strained allusions to weapons and battles in contemporary literature. From this we can understand that the prevailing mentality of dominating the continent from the 1890s to the 1910s tended to conflate conquest of the natural world with military conquest.⁵⁹ As well, from the publication of *War and the Weather* in 1870 onward, a powerful social logic worked behind the scenes to provide a convincing and durable foundation for the belief—a logic that drew on intuitive and experiential knowledge while downplaying abstract and objective scientific principles.

The persistence of concussionism in the national consciousness illuminates a mechanism by which nonexpert theories about the environment can ostensibly root themselves in "science" yet can withstand both material counterevidence and adamant opposition from the scientific establishment—a phenomenon with clear contem-

porary relevance. Concussionists from Powers to Post made gestures toward the laws of meteorology and physics but in the main traded in social logic, grounding their arguments in appeals to subjective experience, common sense, folk knowledge, intuition, and the like.

The concussionism craze also illustrates the fundamental contingency of the climate change denial movement. About a century ago, when the socioeconomically Progressive ethos of continual growth and improvement demanded that rain come to arid regions of the country, settlement boosters assembled a quasi-scientific narrative to support the belief that weather was something that could be easily controlled and manipulated through artificial means. However, when the prospect of climate change has shifted from advantageous to potentially catastrophic, followers of a similar conservative doctrine now find it prudent to deny the possibility that human activity could be the cause of climate change, or that such a phenomenon could even exist. The idea common to both cases is that the invisible hand of economic progress will reshape the environment for the benefit of producer and consumer. In this way we see that the latter-day aversion to the possibility of climate change is in no way an essential facet of the American conservatism, but rather is contingent upon the perceived consequences that climate change itself is seen to engender.

NOTES

1. Clark C. Spence and James R. Fleming have contributed probably the most thorough treatments of the subject of "scientific" rainmaking in the United States. To answer the question of why the theory persisted, Spence points to a wave of sympathetic news coverage that immediately followed the first desert volleys. See Spence, "The Dyrenforth Rainmaking Experiments: A Government Venture in 'Pluviculture,'" *Arizona and the West* 3, no. 3 (Autumn 1961): 232. While Spence is correct, there are reasons to doubt that the impact of favorable press could have been so great. Consider the not insignificant volume of skeptical press published during the same period, the brevity of the wave (not longer than two weeks), and the fact that the press was almost unanimously against the idea thereafter. Fleming argues that the experiments should be un-

derstood within the pattern of “pathological science,” propelled not by pure inductive reasoning but rather by tacit (and often unconscious) political, social, and cultural norms. See Fleming, *Fixing the Sky: The Checkered History of Weather and Climate Control* (New York: Columbia University Press, 2010), 9, 74–75. I believe Fleming’s notion a good one, especially in that it helps explain the surge of positive press noted by Spence. In this essay, I take a position similar to Fleming, but locate and examine the particular historical factors that were in play in the late nineteenth and early twentieth century that lent sticking power to the concussive theory of rainmaking. I support this position through recourse to known contemporaneous cultural attitudes and analysis of relevant literature such as newspaper articles and magazine features. Furthermore, I attempt to trace a connection between the mindset of the concussionist stalwarts and the modern anthropogenic climate change denial movement, in order to offer some insight into the mentality behind the latter.

2. Neil Maher’s essay “‘Crazy Quilt Farming on Round Land’: The Great Depression, the Soil Conservation Service, and the Politics of Landscape Change on the Great Plains during the New Deal Era,” *Western Historical Quarterly* 31, no. 3 (Autumn 2000): 322–24, demonstrates this same ethos at work in the federal rectilinear land allocation program, which until the New Deal imposed a simple grid system on the land west of the Mississippi, deliberately ignoring local topography. Maher shows that one effect of this system was to symbolically flatten and homogenize the terrain of the American west.

3. “Not only has it been my experience that rain follows soon after every heavy cannonading,” wrote a former Union general “but that this was very generally conceded and understood in the army.” Qtd. in Robert G. Dyrenforth and Simon Newcomb, “Can We Make It Rain?” *North American Review*, no. 419, October 1891, 390.

4. Connected to this, we might also consider the special fondness some Americans have for their constitutional right to bear arms. A hypothesis that firearms could be used as a tool for improving climate would only have further empowered the Second Amendment and thereby struck an appealing chord for a great many Americans.

5. Chris J. Magoc, *Environmental Issues in American History* (Westport, CT: Greenwood Press, 2006), 187.

6. Louise Pound, “Nebraska Rain Lore and Rainmaking,” *California Folklore Quarterly* 5, no. 2 (April 1946): 131. For a primary account of this theory, see Frank H. Spearman, “The Great American Desert,”

Harper’s New Monthly Magazine, vol. 77, July 1888, 232–45.

7. Spence, “Dyrenforth Rainmaking Experiments,” 207, 211–12.

8. *Ibid.*, 212.

9. Dyrenforth usually styled himself “general,” a title reproduced by most contemporary sources, though others prefixed his name with different ranks such as major or colonel. Spence notes: “Dependable biographical information on Dyrenforth is scarce and complicated by his own fertile imagination and the fact that for purposes of simplification he dropped the ‘St.’ from his name and changed the spelling of the family name from ‘Dyhrenfurth.’” Both variations and some other renderings of his surname occasionally appear in contemporary accounts. See Spence, “Dyrenforth Rainmaking Experiments,” 214n24. Nevertheless, it seems probable that Dyrenforth did indeed serve in the Civil War as a Union major, but no higher. See Fleming, *Fixing the Sky*, 65.

10. Spence, “Dyrenforth Rainmaking Experiments,” 216–17.

11. *Ibid.*, 216.

12. Dyrenforth and Newcomb, “Can We Make It Rain?” 395–96.

13. “Experiments in Production of Rainfall,” Senate Executive Document No. 45, 52nd Cong., 1st sess., 18f.

14. Henry Holdes to J. M. Rusk, undated but probably early 1891, RG 95 (Records of the Forest Service), entry 123, box 1, National Archives, College Park, MD.

15. “Uncle Jerry Rusk Is Missing a Mighty Fine Opportunity,” *Wichita Daily Eagle*, August 1, 1891.

16. Qtd. in Spence, “Dyrenforth Rainmaking Experiments,” 217–18.

17. “Bombs Cause Rain to Fall,” *Washington Post*, August 13, 1891, 1.

18. “Rain Made to Order,” *New York Times*, August 20, 1891, 1; “A Heavy Rain Fell,” *New York Times*, August 22, 1891, 5.

19. Fleming, *Fixing the Sky*, 67.

20. Dyrenforth and Newcomb, “Can We Make It Rain?” 396.

21. “Attempts to Make Rain,” *New York Times*, June 24, 1891, 3.

22. “Why Not Have Some Rain Here?” *New York Times*, August 25, 1891, 8.

23. “Rain Called at Will,” *New York Times*, August 26, 1891, 1.

24. “And There Was Rain,” *Washington Post*, August 28, 1891, 3.

25. The trope of “environment as enemy” was already a deeply entrenched one by the 1890s. The

case of the U.S. Army Signal Office provides a good example of this. In 1870 the federal government established the first national weather reporting service from the remnants of the army's Signal Corps. The goal of the new Signal Office—still under the jurisdiction of the War Department—was largely a continuation of its wartime function of providing intelligence on enemy movements as rapidly as possible, with the difference being that in 1870 the enemy was now weather patterns that threatened to disrupt agriculture, transportation, and commerce in general. Explained its chief signal officer in 1870: "The telegraph can announce meteorological observations, statistics, and reports giving the presence, the course, and the extent of storms . . . and their probable approach, as it would, in time of war, those of an enemy." James Rodger Fleming, "Storms, Strikes, and Surveillance: The U.S. Army Signal Office, 1861–1891," *Historical Studies in the Physical and Biological Sciences* 30, no. 2 (2000): 318–19.

26. The article "Producing Rain Artificially" in the British periodical *Symons's Monthly Meteorological Magazine*, vol. 26, issue 36 (July 1891), 81, described it as "chiefly composed of accounts of battles followed by thunderstorms and more or less heavy rain—with a few pages of theoretical matter."

27. E.M.L. "For the Rain Makers" *New York Times*, September 6, 1891, 20; "The Rain-Compelling Emissaries," *New York Times*, August 10, 1891, 4.

28. "The Artificial Production of Rain," *Scientific American*, December 20, 1890, 390.

29. "Man-Made Rain," *New York Times*, August 28, 1891, 4.

30. The esteemed astronomer Simon Newcomb of Johns Hopkins University took the negative position: "A thousand detonations can produce no more effect upon the air, or upon the watery vapor in it," he wrote, "than a thousand rebounds of a small boy's rubber ball would produce upon a stone wall." Dyrenforth and Newcomb, "Can We Make It Rain?" 401.

31. *Ibid.*, 390–91.

32. "Experiments in Production of Rainfall," S. Doc. No. 45, 4, 53–59.

33. This could well be regarded as a particular manifestation of a broad public dismissal of meteorology that prevailed in the late nineteenth century, which regarded the young science as a needless hyperdisciplinization of something simple, intuitive, and obvious. After all, what could a sling hygrometer (or any equally abstruse widget) possibly reveal about the weather that a quick glance out the window or the aching of an arthritic joint could not? Within this schema, the title of "professor" was sometimes applied, usually

mockingly, to meteorologists. Bernard Mergen, *Weather Matters: An American Cultural History since 1900* (Lawrence: University Press of Kansas, 2008), 7–8.

34. "Man-Made Rain," *New York Times*, August 28, 1891, 4.

35. "The Rain-Compelling Emissaries," *New York Times*, August 10, 1891, 4.

36. "His Statement Doubted," October 7, 1891, RG 95 (Records of the Forest Service), entry 123, box 1.

37. Qtd. in Spence, "Dyrenforth Rainmaking Experiments," 214.

38. "Gen. Dyrenforth's Alleged Success," n.d., and "His Statement Doubted," October 7, 1891, RG 95.

39. "Still No Rain Falls," *New York Times*, November 16, 1891, 8.

40. "The Rain-Making Fiasco," *New York Times*, November 16, 1891, 5.

41. George Curtis, "The Facts About Rain-Making," *Engineering Magazine*, July 1892, 550.

42. These pieces are, respectively, George E. Curtis, "Rain-Making in Texas," *Nature* 44, no. 1147 (October 22, 1891): 594; Lucien I. Blake [professor of engineering and physics, University of Kansas], "Can We Make It Rain?" *Science* 18, no. 460 (November 27, 1891): 296–97; William Morris Davis [professor of physical geography, Harvard University], "The Theories of Artificial and Natural Rainfall," *American Meteorological Journal* 9 (March 1892): 493–502; and George Curtis, "The Facts about Rain-Making."

43. John Tice, "Do Battles Cause Storms?" *The Meteorologist*, vol. 1, June 1876, 140.

44. Alexander Macfarlane, "On Rainmaking," *Transactions of the Texas Academy of Science*, vol. 1, November 1893, *passim*.

45. Spence, "Dyrenforth Rainmaking Experiments," 228; Jeff A. Townsend, "Nineteenth and Twentieth Century Rainmaking in the United States" (MA thesis, Texas Tech University, 1974), 33.

46. "To Be Well Tested," *New York Times*, August 31, 1891.

47. Louise Pound, "Nebraska Rain Lore and Rain Making," 135. See also Everett Dick, "The Great Nebraska Drouth of 1894: The Exodus," *Arizona and the West* 15, no. 4 (Winter 1973): 338; Nebraska State Historical Society, "Rainmakers," July 1999, <http://www.nebraskahistory.org/publish/publicat/timeline/rainmakers.htm>; Jim McKee, "Drought Brought Out New Rainmaking Theories and Quacks," *Lincoln Journal Star*, September 12, 2010, http://journalstar.com/news/local/article_eec0838c-bc66-11df-b037-001cc4c03286.html?mode=story.

48. Clark C. Spence, *The Rainmakers: American "Plu-*

viculture" to *World War II* (Lincoln: University of Nebraska Press, 1980), 46.

49. Charles William Post had built an empire of food products throughout the 1890s, propelled by the nationwide success of products such as Grape Nuts, Post Toasties, and Postum (a cereal-based, caffeine-free coffee alternative).

50. Dyrenforth was, generously, a meteorological dilettante, and certainly had no formal training or professional experience in the field; to describe him as "a well-known scientist and meteorologist" is so grossly misleading as to be essentially the equivalent of a lie, especially in light of the fact that Post claims earlier in the article to have done "exhaustive study" and "years of research" on the topic. Furthermore, if Post did indeed research the topic as thoroughly as he claimed, he cannot possibly have missed the deluge of literature in both newspapers and scientific periodicals that declared the experiments a failure.

51. Post's "battles" were larger and costlier than any undertaken by Dyrenforth's party, with hundreds and often thousands of pounds of dynamite (at a total cost of about \$2,500) exploded in each trial. Charles Dudley Eaves calculates that Post expended the formidable sum of \$50,000 over three years before his death in 1914 and also had plans to continue his battles indefinitely. "Charles William Post, the Rainmaker," *Southwestern Historical Quarterly* 43, no. 4 (April 1940): 436.

52. Qtd. in Charles Dudley Eaves and C. A. Hutchinson, *Post City, Texas* (Austin: Texas State Historical Association, 1952), 131. Dyrenforth's and Post's

experiments rarely failed to draw sizable crowds of bemused and bewildered onlookers, and there can be no doubt that they were spectacular shows for those lucky enough to witness them. But while the amusement factor certainly drew in crowds, it seems doubtful that the show itself was responsible for the tenacious persistence of the concussionist position over the span of years and decades. Indeed, not all those who watched were convinced of the wisdom of what they were seeing. An eyewitness to a 1911 experiment thought the director a little "teched in the head." Qtd. in Eaves, "Charles William Post, the Rainmaker," 429.

53. Eaves, "Charles William Post, the Rainmaker," 428, 435-36.

54. Eaves and Hutchinson, *Post City*, 130.

55. *Ibid.*, 127.

56. C. W. Post, "Making Rain While the Sun Shines," *Harper's Weekly*, February 27, 1912.

57. Mark W. Harrington, "Weather Making, Ancient and Modern," *Annual Report of the Smithsonian Institution, 1894*, 249.

58. Post, "Making Rain While the Sun Shines."

59. Fleming has observed that the militarist dimension of weather modification continues today, having persisted through the twentieth century and grown stronger during the Cold War, as Pentagon scientists dreamed up methods and devices to weaponize the weather at the cost of "declaring war on the stratosphere." James R. Fleming, "The Climate Engineers," *Wilson Quarterly* 31, no. 2 (Spring 2007): 48-49, 60.