

## THE TWO FACES OF RADIUM IN EARLY AMERICAN NUCLEAR CULTURE

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### Introduction

In 1903, the element radium made a spectacular debut in American culture. It had been isolated by Pierre and Marie Curie in 1896 from uranium ore, along with the less radioactive element polonium, but its discovery had attracted little public attention until the Curies and Henri Becquerel won the 1903 Nobel Prize in physics for their work on radioactivity. In the same year, Ernest Rutherford and Frederic Soddy announced their conclusion that radioactivity was, in effect, atom-by-atom transmutation of one element into another. The sudden mania for radium that resulted, presaged in American popular culture only by the craze that had attended the debut of x-rays seven years earlier, was buoyed by the prevailing sentiment that physicists and chemists had at last seized the initiative in their battle with an obstinate universe that jealously concealed its most basic principles. In the crush of newspaper articles that drove the radium fad, few real or imagined powers were not attributed to the substance (1). Readers learned from the daily papers that radium could restore sight to the blind, reveal false gemstones, or power a battleship (or explode one), among many other abilities. Headlines declaring it a “Substitute for Gas, Electricity, And as a Positive Cure for Every Disease” were par for the course, and so were encomiums to the scientists who were exploring its mysteries (2). In newspapers, in lectures, at World’s Fairs and in popularizing books, radium was cast as the

apotheosis of modern science and medicine, with a heavy emphasis on modernity.

Almost immediately, though, this presentation of radium came into conflict with another powerful framing. A broad network of commercial actors promulgated a diametrically opposed counter-narrative, in which radium and its decay products were characterized as natural rather than artificial, abundant rather than rare, mineral rather than chemical, healthful rather than medicinal. In this account, radium was the province of those closest to nature—spiritually attuned Native Americans, hardy miners, and wise naturopaths—rather than the scientists who explored it in laboratories or the privileged few physicians who used refined radium in their practice. Even as radium’s explorers were hailed as “the mighty men of these days,” a coalition including spa owners, municipal boosters, and nostrum makers advanced an alternate understanding of radium that made it both connotatively and commercially accessible to a much broader audience.

They were able to do so because radium had intruded into the American public’s awareness at a time when the professional boundaries of scientific and medical expertise had not yet solidified. Accordingly, it served as a *tabula rasa* onto which traditional ideas about the connection between health and the natural environment could be projected, notwithstanding the overtly scientific gloss it was being given by other sorts of popularizers. The apparent “vitality” of the substance, and the evident confu-

sion it had sown in scientific circles, made a naturalistic framing eminently plausible to many Americans. Against the stories of limitless energy and instantaneous cures that newspapers and lecture-demonstrators breathlessly hinted would *someday* emerge from the laboratory, the purveyors of “natural” radium offered a thing that could be purchased, touched, tasted, and tried in the crucible of everyday experience. Almost no one doubted, in the first few decades of the twentieth century, that radium was the herald of strange and wonderful (or terrible) things to come. The appeal of experiencing those wonders first-hand, and in having them explained in familiar and intuitive terms—rather than exclusively through the mediating authority of the chemist or clinician—was strong enough that this explicitly earthy presentation remained a vibrant part of early American nuclear culture for decades.

There were, therefore, two viable connotative models for radium in the early 1900s. It was simultaneously an “isotope” and a “mineral,” at once powerful and gentle, the product of clever modern artifice or ancient natural processes. It was found, depending on the model one subscribed to, in the darkest recesses of the laboratory or the mountain vale, emitting gamma rays or sunshine. It was either the tool of scientists and physicians working at the vanguard of a revolution, or the old familiar tonic of prospectors and Indians. This article will explore the construction of those dual identities, and how each affected the path of early American nuclear culture. The connotations of power and progress bound up in the framing of refined radium element as a story of modern super-science provoked attention from lay audiences, while the availability and practical uses suggested by the mineral construction of radium sustained that attention.

### Radium in the Laboratory and Clinic

The impetus behind the initial radium craze derived from the fact that its discoverers had been entirely caught off guard by the bizarre phenomena that it manifested. Science writ large had gradually been gaining currency as a cultural force in turn of the century America, but, counterintuitively, it was the failure of the scientific establishment to really understand what they had seen in radioactive substances that drew the laity’s attention. Other scientific or technological novelties of the early twentieth century had fit more easily into the established conceptual frameworks of the educated layperson. Instantaneous transmission of the human voice through radio waves, for example, could be understood by analogy to the near-instantaneous transmission of words through electrical

telegraph wires; hot-air balloons provided a point of reference when the airplane was invented. Radioactive substances, by contrast, were all the more fascinating because there had been no hint of their properties until nearly the moment of their discovery, whereupon they immediately called into question long-dormant assumptions about the nature of matter and energy.

The newspapers of the early 1900s described a scientific revolution unfolding in real time, and the near-daily coverage of every scientific congress or journal article on the subject of radium made celebrities out of the chemists and physicists at the vanguard. Becquerel, the Curies, Soddy, Rutherford, and a host of other actual or purported experts on the element were daily features in a press that had seldom before deigned to seriously report on the work of scientists. Press accounts and popularizing books explicitly framed the phenomenon and the elements that exhibited it as a triumph of modern science, and celebrated the peculiarly scientific virtues that had led the Becquerels and Curies of the world to their discoveries. In such accounts, it was Marie Curie’s “determination and patience against detail,” that had driven her to investigate why pitchblende was negligibly more radioactive than it should have been from its uranium content, and thus to isolate thimbles-full of radium and polonium through the “toilsome process” of refining tons of scrap ore (3).

Such hagiographical reports, which were often shot through with undigested technical jargon, paid dividends for the scientists who were their subjects. Rhapsodizing on the unprecedented enthusiasm of the laity for news of radium (even as he catered to it), a popularizer wrote in 1905 that “The fact that the general public have been so widely interested in radium, and so deeply impressed by it, is a remarkable testimony to the high position held at present by science, since the public have had to rely, for the most part, on their faith in the teachings of scientific men” (4). But that faith was not taken for granted by its beneficiaries; rather, it was actively reinforced by scientist-popularizers who were determined to reap the benefits of public attention while correcting the more sensational claims made in the newspapers. William Hammer, a respected American chemist and engineer, made radium popularization his full-time occupation when, in 1903, he managed to acquire some refined element directly from his friends the Curies. The professional and personal benefits of doing so were quickly apparent: his lawyer wrote of his confidence in this regard to Hammer, saying, “[y]ou confirm by every address your high standing as a scientist. I believe the reputation you

are thus gaining is even more valuable than your lecture fees. ...I am inclined to think that you will get some valuable consulting work as a result of your lectures" (5). This proved to be the case. Others saw the benefits, too: Hammer was soon receiving letters from other colleagues who were hoping to do the same, and looking to borrow some of his radium with which to do it (6).

Hammer's lectures were didactic and cautious in the claims they made, but this did not dampen the enthusiasm with which they were received, so high were the expectations for a radium-based revolution in science. The same was true of books like Frederick Soddy's *The Interpretation of Radium* (1909), a dense but elementary survey of the state of the field that went through dozens of printings. The effect of these scientist-authored popularizations was to brand radium as a thing born of chemistry and raised in the laboratory. This was a deliberate strategy: it was not a coincidence that the American Chemical Society was among the earliest of the disciplinary organizations to formally institutionalize its outreach and popularization efforts (7). In an era that also saw widespread electrification, aviation, radio, relativity, and many other genuine scientific and technological fads seize the attention of the lay public, chemists had a priority claim on the most popular attraction of them all.

Mindful of the theoretical wreckage that radium was leaving in its wake during those first years, scientists and popularizers often spoke of the element's energies in destructive terms. Henry Adams, in his *Autobiography*, saw something blasphemous and terrifying in the tiny specks of radium he had observed by 1907: it "denied its God," by which Adams meant the predictable world of the Victorian scientist, and in its maddening inscrutability, "happened to radiate something that seemed to explode the scientific magazine" (8). The language Adams uses to describe the rays was invariably that of violence: it was a "metaphysical bomb" that brought about a "cataclysm" simply by virtue of its existence. It was not only laypersons like Adams who struck this tone. Pierre Curie often obliged interviewers with ominous remarks about the potential dangers of radium's energies: for instance, that a single gram, properly applied, would suffice to kill everyone in Paris (9). Frederic Soddy's otherwise didactic bestseller, *The Interpretation of Radium* (1909), speculated that a civilization advanced enough to master the energies poured out by radioactive elements would probably destroy itself with those same energies, a speculation that in turn became the inspiration for the first atomic war novel, H. G. Wells' *The World Set Free* (10).

At the same time that radium's destructive physical effect was being established in this way, it was also being described as an inherently vital thing, with similarities between its energies and that of living things. As Luis Campos has noted, scientists had, from the start, used language to describe radioactivity that reflected its seeming liveliness: radium had a *half-life*, underwent *decay*, and was the *parent* of its *daughter* elements; in other contexts, radiochemists spoke of radioactive life cycles, extinction, habitats, and families (11). The first round of radium-popularization took its cue from these initial characterizations and presented the substance in starkly vitalistic terms. *Harper's Weekly* put the question bluntly: "If anything in the world is alive, is not radium alive?" For the medical doctor who wrote those words, radium represented the first hint at a third way between the equally fruitless "old materialism" and "old vitalism" (12). The news in 1905 that John Burke of the Cavendish had apparently produced life in sterile bouillon by seeding it with radium commanded a great deal of commentary in the popular media. Even the eminent chemist William Ramsay's gentle refutation of Burke's initial findings was softened by the comment that "no one would rejoice more" if further study were to reveal that Burke's intuitions about radium's literal vitality were correct (13). In the press, comic articles and cartoons played with the idea of humans being energized by radium directly. A cartoon by Albert Levering titled "The Wonders of Radium, Practically Applied" demonstrated in eight panels what the careful application (with tongs) of a glowing hunk of radium might accomplish: reviving tired messenger boys, cramming more people onto streetcars, stupefying bill collectors, and so forth (14). The wit of such cartoons derived from the popular assumption that radium would act as a sort of all-purpose intensifier of whatever it was applied to, which itself reflected the relentlessly hyperbolic nature of its public profile.

Because radium was perceived as being bound up with vitality and living processes, medical doctors were flattered by association with it just as chemists and physicists were. There was enough refined elemental radium, in quantities rarely exceeding half a gram, to allow a few wealthy and well-connected doctors to offer experimental radium therapy in which tiny glass ampoules of refined radium were taped to tumors near the surface of the body, or implanted surgically. Given how few hospitals had access to such a supply of refined element, and that only one patient could be treated at a time, it was not a viable route to prestige and wealth for individual physicians. Nevertheless, the medical community in the late 1900s and early 1910s, in the midst of its rhetorical and practi-

cal turn towards scientific medicine, collectively basked in the glow of this new icon of scientific modernity. In 1913, when a New Jersey congressman's grave cancer prognosis was temporarily improved by the administration of highly refined radium, the *New York Times* exulted that "[t]he news of scientific effort is overshadowing all other news. More significant than a change of ministry in France or the issue of a Balkan war is the announcement a Soddy or a Ramsay may make tomorrow about the loosening of forces in groups of atoms." Such scientists, and the physicians who developed treatments using radium, the editorial continued, "are the mighty men of these days. They have done much, and they promise more" (15).

The medical profession in the early twentieth century was in the process of reinventing itself under the rubric of "scientific medicine." Physicians embraced the tools and techniques and ethos of the lab bench, but even more enthusiastically its trappings. Radium not only presented physicians with an opportunity for methodological innovation—the history of radiology's first two decades is fairly characterized as a sustained trial-and-error campaign to resolve dosages and tolerances—but also a chance to associate themselves and their profession with the prestige that had attached to such an unimpeachable symbol of modern science. Addressing a group of Yale Medical School alumni in 1904, the radiological pioneer Robert Abbe warned his colleagues not to turn their noses up at the maddeningly audacious claims being made in the press for medical radium: their patients certainly would not, and would be expecting fantastic things of their scientific physicians. It would be better to know what was therapeutically possible, he concluded, so as not to unnecessarily disillusion them about the miracles that modern doctors could perform (16).

Yet because radium's rarity (and hence its cost) were also among the hyperbolic characteristics that newspaper articles dwelt upon, there was no immediate expectation on the part of patients that radium-based medical care would become commonplace. Until the mid-1910s, when new American refineries began to substantially increase the supply of concentrated radium, to be treated with radium required access to the highest reaches of elite medicine. Even Marie Curie was obliged to travel to the United States in 1922, on behalf of her Radium Institute, to accept a donation of a single gram from an American refinery. So much had been made of radium's extraordinary scarcity and cost, in fact, that the few physicians who had access to some worried about being labeled extortionists (17). Cancer was, as one of them put it, a

poor man's disease; refined radium was so scarce that it would necessarily be the rich man's cure (18). Absent a far greater supply of the refined element, it was clear that none of the hoped-for miracle cures or cheap sources of energy could be made widely available.

### Radium as a Nature Cure

There was one exception to the general rule of radium's scarcity. In 1903, J. J. Thomson reported that water from very deep wells in England contained a radioactive gas (19). The subsequent discovery of natural radioactivity in springs all over the United States, and in particular in the West, immediately suggested that the cause of the long-suspected benefits of "taking the waters" had been found. The federal government, which administered the waters at Hot Springs, Arkansas, had them tested in 1904, and other spas and resorts followed suit. By the middle of the 1910s, thermal springs were undergoing a renaissance as places not merely to take the waters, but to take the radioactivity (20).

Accordingly, advertisements for the spas quickly began to prominently feature radioactivity as a selling point. The Hot Springs, Arkansas Chamber of Commerce ran a series of ads in eastern and midwestern newspapers trumpeting both the springs' radioactivity and the involvement of the federal government, including the endorsement of several Surgeons General (21). In them, a cartoon Uncle Sam spoke of "recaptur[ing] vitality in my 46 fountains of youth" because "the medical properties of these steaming hot Radio Active waters have a way of ridding your system of rheumatic, high blood pressure, etc., and making you feel ten years younger" (22). It was not only established health resorts that benefited: the cold, sulfurous waters of Claremore, Oklahoma were tested for radium in the early 1900s by an enterprising local doctor, and the radium health industry quickly came to dominate the local economy. Bathhouses and bottling operations sprang up, and operated well into the 1930s. The town adopted the motto "Where the World Comes to Get Well" and enlisted favorite son Will Rogers to endorse the waters in explicitly radioactive terms (23). Following the pattern of soft-pedaling the science and playing up the naturalness of the waters' virtues, the pamphlets pointedly eschewed a "detailed chemical analysis" but explained at length that the radium that reached the Claremore bathhouses had been "assembled centuries ago by Nature's Alchemy" and was "one of Nature's greatest gifts to man" (23). Though most advertisements for Claremore and other springs made

mention of radioactivity, very few discuss or even refer to its physical properties. Instead, radioactivity was represented exclusively in terms of its restorative ability, the mechanism for which was never referred to except in broadly naturopathic terms.

This hazy vitalism was an effective marketing technique, and its lack of specificity was probably inevitable, as there was no real consensus among doctors of any stripe as to the cause of the springs' salubrious effects—although many entirely orthodox physicians believed that the waters' radioactivity was a cause of those benefits. Nevertheless, the presentation of radium in these terms contrasted sharply with the language used in other channels of the public discourse about radioactivity. The trace “radium emanations” were not spoken of as powerful, or as panaceas; they did not even have the energy to make a watch-dial glow. Instead, they were presented as the last piece of a puzzle; as a sort of nutrient that worked subtly in concert with other natural processes to restore the body to its natural state.

Notwithstanding the apparent appeal of this framing, most health-conscious Americans simply did not have the time or money to go to the spas. The waters could be bottled and shipped, a solution some spa owners adopted, but there was an unforeseen problem with these bottled waters: by the time they reached their destinations, they were no longer radioactive. In transit, within a few days, the dissolved radon gas that was responsible for most of the measurable radioactivity would either escape or decay. A solution arose in the form of radium emanators: devices that introduced some amount of low-grade radium-bearing ore into contact with water, usually by simply adding ore to an earthenware water jug. The infinitesimal (but detectable) amounts of radon gas that escaped from the decay of the radium then went into solution in the water.

Emanators took a wide variety of physical forms, and were sold under dozens of brand names (24). The Radium Ore Revigator Company, the largest maker of emanators, claimed at one point that they had sold 500,000 of them, a figure that might at least be taken as a safe estimate for the total number of emanators produced by all manufacturers (25). Some doctors sold them on commission: physicians were often as susceptible as the layperson to the health claims that were made on behalf of radioactivity, and were certainly, as a class, interested in the profit that came with referring or reselling the devices (26). They were also sold door-to-door and through catalogs.

The fact that low-grade ore was available for such a purpose in the United States was a result of the domestic radium industry coming online. Until about 1915, some of the scarcity of pure radium compound in the United States had to do with the fact that the country was largely dependent on imports from European mines and refineries. Press reports of an overseas “radium trust,” if somewhat inaccurately conspiratorial, were effective in spurring commercial interest in a domestic radium industry. So too were emotional appeals by prominent doctors, pleading in Congressional hearings for the government to act to bring more ore to market (27). The resulting increase in the flow of pure radium from the new refineries built in Pittsburgh and Denver also created a much larger glut of mildly radioactive tailings, from which the emanators and a host of other “radium” products were made.

In spite of the fact that some orthodox physicians sold emanators, the overall language of the brochures, the advertisements, and their discussion in the popular press were carefully designed to rhetorically divorce them from any connection with the medical establishment. “IMPORTANT,” a typical disclaimer read: “RADIOAK is not a medicine in the general acceptance of that word. It is absolutely not a drug” (28). Rather, the emanators were presented as a mineral-for-mineral recreation of the waters at the world's famous health spas. That sort of characterization made this sort of radium therapy palatable to potential customers who mistrusted orthodox medicines, of which refined radium was certainly one. (Not insignificantly, it also ensured that the product escaped regulation under the Pure Food and Drug Act.) The marketing of these devices did not simply rely on consumers to know that those healing waters were out there; they actively made the connection and, in fact, educated the public about them—simultaneously creating a demand for their product and reinforcing the understanding of radium as a natural medicine.

Revigators were promoted as “a perpetual health spring in your home,” and references to the famous health resorts of the western United States and Europe were made profligately in the advertisements for all emanators. “Don't drink [Revigator water] with the attitude that you are trying something new,” one manual cautioned, but “accept it as the blessing it is, for the famous springs of the world such as Gastein, Hot Springs Ark., Vichy, France, have performed health miracles for centuries. And it is now agreed that this is due to the high radioactivity of the water. *The Revigator truly duplicates the radio-activity of these springs*” (29). Another Reviga-

tor ad told of Estreyes, “a lucky town in France: ...No one in the town ever has cancer or dies of that fearful disease. There is a highly radioactive spring in the town and everyone drinks the water from it—apparently the water PREVENTS the cancers” (30).

By framing radium as a beneficial part of the landscape, the spa owners and emanator vendors paved the way for other kinds of purportedly radioactive health products ranging from impotence cures to veterinary medicines, and the marketing for these products hewed closely to the naturalistic depiction of radium’s virtues. “Radium makes things grow,” asserted advertisements for the Radium Fertilizer Company’s products, and plants needed radium “because they need food, just as people need food” (31). Radior brand beauty products continued the association between radium and natural growth with its claim that “Radium Rays are, in fact, ‘accepted by the human system as harmoniously as sunlight by the plant’” (32). Another advertiser explained the sun-like means by which radium—which was not a “chemical” or a “metal” but “life itself” in mineral form—worked on the body (33):

If your blood could be frequently taken from your body, exposed to the sunlight and then put back, your physical troubles would disappear and you would remain strong and healthy to a very old age. Radium emanation has the same effect upon the blood as exposing it to sunlight. But, while sunlight is unable to penetrate beyond the skin, radium emanation penetrates entirely through the body, reaches the farthest blood cells and tissues and restores them to life.

Promoting radium’s “rays” as akin to sunlight served several purposes for entrepreneurs. Not only did it call to mind other nature-cures popular at the turn of the century (alpine heliotherapy, in particular), but it also invited consumers to compare the light of the mineral radium with other contemporary healing lights: heat lamps, Finsen lamps, and especially x-rays. The devices that generated such rays were expensive, ostentatiously technological, closely associated with orthodox medicine, and inherently intimidating to many patients (34). Radium, by contrast, could be characterized as a simple mineral supplement as easily as it could be discussed in the context of its chemical and physical properties, and those who sold it almost always chose the former. Radithor, a genuinely radioactive patent medicine sold by commercial impresario William Bailey, traded heavily on the fact that radium could be construed as a sort of sunlight-infused mineral, rather than a manufactured drug. Its advertisements blared that Radithor “puts the sunbeams in your bloodstreams.” “Perpetual sunshine”

(or “internal sunshine”) was the slogan of the innumerable pamphlets and brochures Bailey produced to sell Radithor. More sunlight, the Radithor literature reminded the reader, made plants grow faster, let chickens lay more eggs, and accounted for the “splendid physical condition and virility” of “South Sea Islanders,” at least until they adopted sun-shielding Western dress. Radium was, in Bailey’s reckoning, “an entirely unique and revolutionary means of using rays to *replace the lack of sun rays*,” even more conveniently and thoroughly than could be done by x-ray or quartz light treatment, or other methods reminiscent of the modern clinic that “permit only the application of the rays externally.” Bailey carefully clad Radithor in the garb of the nonmedical restorative tonic—“not a drug, not a patent medicine,” as the advertisements disclaimed, but “the water of life direct from *Nature’s* laboratories” (35).

Other manufacturers of radium products went even further in their emphasis on radioactivity as a natural phenomenon, explicitly promoting their products as means by which consumers could in some way restore a connection with the natural world that had been severed by technological modernity. The Curie Radium Company of America, whose emanator was variously known as the “Stone-Filtered Radio-Active Regenerator” or the “Liquid Sunlight Re-Generator,” warned customers that “something is missing in water” that city dwellers drank: specifically, the “radium gas” that was the difference between the “pure, live, healthful freshness” of spring water, and “stale” municipal water (36). Yet radium did more than provide a connection to nature absent in the modern world, according to many of its suppliers: it also relieved the excesses of artificiality. Colorado’s Radium Hot Springs resort blamed the accumulated “toxins” and “poisons” of “drug residues” for ill health. Radium waters, superior to the “artificial rays” deployed in clinics, reversed the accumulated ills of modern living by “radiat[ing] outward, as if the sun were shining out from inside” (37).

Where the inherent vitality and naturalness was sufficiently stressed, no further explanation was needed for consumers. For example, Degnen’s Radio-Active Lenses, wire-rimmed glass spectacles coated with an opaque greenish film, capitalized on the perception that mere proximity to radium would have a potent (and holistic) revivifying effect on the flesh to which it was exposed. A similar logic applied to the many brands of pads and compresses purportedly filled with radium ore (38). No elaboration as to how the ore would work was offered; their sellers trusted that the general belief in radium’s

uncanny connection with the processes of life, so often reiterated in popular treatments of the subject, would suffice to recommend a product that (allegedly) contained it.

In the advertisements for radium-based products, the substance's earthy pedigree was stressed at the expense of any reference to its alter ego, the chemical element that was the emblem of scientific modernity. Radium's effects might be magical, but it was the magic *mineral* in the advertising literature of Claremore Radium Water (among others) (39). This framing departed sharply from the clinical gloss that radioactivity was receiving in the science journalism and popularizing books of the early twentieth century, which tended to rhetorically situate the element in the laboratory or the university hospital. Radioactive springs, too, clothed themselves in pastoral mythologies, the better to profit from the contrast with the enervating modern lifestyle. A Colorado spa, pointedly noting the many nearby radium mines and "strongly radio-active rocks," invoked the folk wisdom of the miners who had settled the area: "The old prospector used to cure all his ills in these waters. He didn't know how or why, but he knew there was something wonderful about them. Today we know that the marvel of these waters is that powerful and elusive quality known as Radio-Activity" (40). This was commercial myth-making, but it may have had some basis in fact. The *Chicago Chronicle* introduced radium to its readers by claiming that Montana miners had carried what they called "medicine ore" and "rheumatism rock" in their pockets for years, as a means of curing that and other illnesses (41). Indeed, when, in 1904, a prospector hoped to interest an investor in radium ores, but could not immediately send samples, he cited the fact that the waters flowing through the claim had cured several illnesses as proof of their radioactivity (42). Three decades later, radium ore miners with perfect complexions populated the advertisements for Adium skin cream, whose (purported) radium content "proves as beneficial as when fresh from the mines" (43).

Another common form of the trope replaced miners with Native Americans, by then stereotypically regarded as nature-conscious and innocent of modern technology's depredations. Hot springs from Arkansas to Montana repeated the same apocryphal legend of warring tribes who observed a truce at the sacred healing waters. Idaho Springs of Colorado, named after the (probably apocryphal) Chief Idaho, published brochures in which he offered these words of native wisdom across the centuries to potential health tourists: "Happy the rheumatic that takes Radium baths and is benefited, but more happy is the one that takes a Radium bath every month and never

has rheumatism" (44). Lest anyone think their spa was not equally desirable, the letterhead of the nearby rival Radium Hot Springs resort also prominently featured a stylized drawing of a Native American complete with feathered headdress, along with guarantees that their waters were "highly radio-active" (45). Emanator manufacturers elaborated on this theme, claiming that Indians had never presumed to fight over Arkansas' Hot Springs, "even in their most deadly wars. THE INDIAN MEDICINE MAN KNEW WHAT HOT SPRINGS WOULD DO" (46). When Claremore, Oklahoma's booming radium-water-bottling industry took a potshot at the ubiquity of such claims by cheekily confiding that "there is no historic legend back of Claremore's famous Radium Water—no mystic past linked with early Indian life," it was a backhanded acknowledgement of the potency of such prelapsarian endorsements (47).

The sum effect of the naturalistic framing of radium as *ore* or *mineral* or *earth*, rather than a *chemical* or an *element*, was to democratize its appeal. By taking radium connotatively out of the realm of elite science and medicine, even if only through the sale of fraudulent or non-radioactive products, its commercial promoters provided a means by which the broader American public's engagement with nuclear culture could be sustained. In the absence of progress towards the marvels that science popularizers had touted—radium-powered cities and glowing panaceas in every doctor's cabinet—the perception that radium was abundant in the unspoiled places of the earth and capable of working quiet miracles, in ways still hidden even from the great names of the age, was sufficient to capture the attention of the consumer public.

### The Long Half-Life of the Radium Craze

In a 1934 medical treatise on radiation injuries, the authors, physicians S. Russ and H. A. Colwell, admitted that they were puzzled by the "widespread tendency in the public mind to regard everything connected with 'rays' as on that account conducive to health and vitality," notwithstanding the abundant evidence that radiation could far more easily harm than heal. This irrational but persistent belief, they concluded, was "undoubtedly" the result of the much-publicized successes of radium therapy, orthodox and otherwise. "The argument in this appears to be that because radium is employed successfully in cancer, and because cancer is notoriously intractable—and when intractable fatal—therefore radium must be a panacea for all the ills that flesh is heir to" (48).

Notwithstanding Russ and Colwell's consternation that medical frauds were exploiting ray-crazed patients, the perception of radium as a cure-all was quickly fading by the mid-1930s. By then, the laity knew of the dangers that radiation presented to patients: indeed, medical irradiation in the form of enormous x-ray machines and carefully monitored radium-filled ampoules had become something most patients regarded as simultaneously a triumph of modern medical science and as something chaotic and dangerous. In short, they had become, at best, "heroic" medicines—inherently harmful, but, under certain dire circumstances, preferable to inaction. This perspective was actively encouraged by the American Medical Association, which hoped to establish a professional monopoly on the use of those energies. "Gamma rays cure because they kill," a 1932 magazine article promoted by the AMA proclaimed, and alpha particles were "not only murderous... but treacherous." The photographs accompanying the article showed white-coated physicians and nurses carefully manipulating intricate mechanisms that stored and applied medical radium; they also showed the complicated mix of laboratory equipment used to refine radium ore and to siphon off the radon its decay produced (49). The unmistakable message of this and many similar entries in the AMA's own popular magazine, *Hygeia*, was that radium could be brought to heel only with the utmost efforts of expert clinicians.

That was a message its audience, health-conscious consumers in the early 1930s, was largely willing to hear. A series of tragic events of the late 1920s and early 1930s had soured the public sentiment towards radium. They began in 1925, when news broke that dozens or hundreds of women employed as luminous watch-dial painters had been poisoned by accidental ingestion of radium. Their obituaries were treated as news items for years, and laid out in gruesome detail the pain, disfigurement and hopelessness that the painters had to suffer through because they had accumulated infinitesimal amounts of radium in their bones (50). Worse, for those who sold radioactive medicines, some radium tonic consumers had suffered a similarly ghastly fate. In November 1935, the United States Department of Agriculture's weekly radio program opened with a bulletin announcing the seizure of fraudulently labeled "radioactive" cosmetics, but lamenting the FDA's inability to seize injurious yet properly-labeled radioactive products. The announcer proceeded to retell the story of Eben Byers, a steel baron who had famously fallen victim in 1932 to Radithor's "internal sunshine." "Like many ill people, he was willing to try anything that offered a cure," the announcer declared. "Perhaps he reasoned that if Radithor didn't

cure him, at least it wouldn't do him any harm. But the medicine killed him. It literally disintegrated the bones of his head" (51). By the time Marie Curie died in 1934, universally characterized as a "martyr" to radium, the reference to death by radium exposure was a familiar one.

In the climate of opinion that was generated by that kind of rhetoric, radioactive merchandise was difficult to sell, and had mostly disappeared from the market by 1940. Yet radium's long connotative tenure as a thing of the mountains and springs, rather than the refineries and laboratories, has had a persistent effect on American nuclear culture going forward. Whereas x-rays and other forms of electromagnetic radiation that had caused alarm in patients during their early clinical use were generally understood by the 1940s to have been "domesticated"—transformed by the gradual refinement of the technology that generated them into reliable and safe servants of medical science—radium remained rhetorically the wild child of nature, only barely controllable and fundamentally untamed. When radium "escaped" into the floorboards and pipes of hospitals, it was stalked by "radium hunters," whom the press treated as lion tamers in lab coats (52).

To the extent that radium had retained its aura of health and vitality up to that point, it was because it had been successfully portrayed as a natural phenomenon, free of the connotations of materialism and moral ambiguity that sometimes attended scientific medicine. Those who traded in "radium" products also appealed whenever possible to the sun whose energy they mimicked, the water they could infuse with energy, the mountains from which they were mined, or even the plants they could revitalize. The ubiquitous language on ersatz radium nostrums asserting that they were a "natural cure" and "not a drug" was not simply there to escape regulation or signal allegiance to a particular healing sect, but also to encourage the belief in the fundamental wholesomeness of energies whose magnitude might otherwise be cause for alarm. The more that orthodox medicine became "scientific," both in philosophy and in the patient's impression, the less that the pamphlets for emanators and ointments and spas traded in the argot of the scientist. And even when they did, it was almost always the language of the natural historian that they used: radium tonics spoke of essential minerals and of stimulating cells and tissues, but rarely of alpha particles or ionization. Consumer radium products, relentlessly associated by their advertisers with healing nature and often pointedly contrasted with the artificial, more vividly technological manifestations of medical irradiation, thus served as a



bulwark of positive associations for radioactivity. Thus, even in the midst of newspaper stories about chemists killed by long exposure to the radioactive substances they researched, the manufacturers of the Ra-Tor Radium Mineral Water jar could characterize the traces of radium it contained as “a natural product brought to you straight from the treasure vault of Nature—a God-given, healing substance for suffering mankind” (53).

The association between radioactivity and vitality has lasted even into the post-Hiroshima era: one can still pay to descend to the bottom of a mine shaft in Montana to breathe in radon gas, and homeopathic doses of natural radioactivity are once again regarded favorably by some alternative health practitioners. Furthermore, radioactivity was indelibly established as a part of the physical landscape by two decades of advertisements, a fact that was omitted by the tourist brochures of later decades, but not easily forgotten—especially as nuclear testing in the postwar era brought new kinds of radioisotopes to the western United States, and points downwind.

### References and Notes

Archival materials referenced more than once below are abbreviated as follows:

- AMA: Historical Health Fraud Collection of the American Medical Association.
  - CRI: Consumers’ Research, Inc. Collection, Box 448, Folder “Radium Nostrums and Radium Water Machines — Misc., 1930-1939,” Rutgers University Special Collections.
  - Hammer papers: William Hammer papers, American History Museum, Smithsonian Institution
1. To take one measure of the sudden public interest, between 1896 and 1902, the *New York Times*, the *Chicago Daily Tribune* and the *Los Angeles Times* printed 15 articles dealing with radioactivity, compared with 170 in 1903 and 254 in 1904.
  2. “Radium as a Substitute for Gas, Electricity, And as a Positive Cure for Every Disease,” undated news clipping. Hammer papers. For the other claims mentioned here see for example “She That Was in Darkness Tells How by Radium She Saw the Light,” *New York American*, Aug. 24, 1903; “The Discoverers of Radium Can Detect False Diamonds by Its Use,” *Syracuse Telegram*, Feb. 25, 1904; “Handful Would Destroy London,” *Springfield [Massachusetts] Union*, Nov. 29, 1903.
  3. C. Moffett, “The Wonders of Radium,” *McClure’s Magazine*, Nov. 1903, 5.
  4. W. Hampson, *Radium Explained: A Popular Account of the Relations of Radium to the Natural World, to Scientific Thought, and to Human Life*, Dodd, Mead and Company, London, 1905, 1.
  5. James Beck to William Hammer, Oct. 29, 1903. Hammer papers, Box 2, Folder 9.
  6. Dayton C. Miller to William Hammer, Nov. 5, 1903. Hammer papers, Box 2, Folder 9.
  7. D. Rhees, *The Chemists’ Crusade: The Rise of an Industrial Science in Modern America, 1907-1922*, Ph.D. thesis, University of Pennsylvania, 1987, 210.
  8. H. Adams, *The Education of Henry Adams: An Autobiography*, Houghton and Mifflin, Boston, 1918, 381.
  9. This language is taken from a 1926 draft *Encyclopedia Americana* article by radium lecturer William Hammer. Hammer papers, Box 17:8. It is rendered in his surviving lecture notes from circa 1903 as “Curie in room containing kilo of radium,” suggesting that Hammer found the story compelling enough to tell for more than twenty years.
  10. F. Soddy, *The Interpretation of Radium, Being the Substance of Six Free Popular Experimental Lectures Delivered at the University of Glasgow, 1908*, John Murray, London, 1909, 244-245. H. G. Wells, *The World Set Free*, Collins’ Clear-Type Press, London, 1921.
  11. L. Campos, “The Birth of Living Radium,” *Representations* **2007**, 97, 1-27. See also his dissertation, *Radium and the Secret of Life*, Ph.D. thesis, Harvard University, 2006.
  12. C. W. Saleeby, “Radium and Life,” *Harper’s Weekly*, July 1906, 226.
  13. “Can Life Be Produced by Radium?” *The Independent*, Sept. 7, 1905, 556.
  14. This appears in a magazine clipping, untitled and undated (circa 1904), Hammer papers.
  15. “Shifted Emphasis in News,” *New York Times*, Dec. 28, 1913, 14.
  16. R. Abbe, “Radium and Radioactivity,” reprint from the *Yale Medical Journal*, **June 1904**, 2.
  17. E. Daland, “Radium Therapy—Use and Abuse,” *New England Journal of Medicine* **1928**, 198(19), 1005.
  18. “Dr. Kelly to Confer with Congressmen,” *Baltimore Sun*, Jan. 14, 1914.
  19. J. J. Thomson, “Radio-active Gas from Well Water,” *Nature*, **1903**, 67, 609.
  20. Carolyn Thomas de la Peña has observed that, at the turn of the twentieth century, the prominent Fordyce Bath House at Hot Springs, Arkansas, successfully melded a sleek, ostentatiously modern aesthetic with the traditional understanding of a spa cure, appealing to patients’ desire for the potential revivification that impressive hydrotherapeutic and electrotherapeutic equipment promised while allowing a veneer of the traditional bucolic setting to blunt the anxiety that attached to new technology in general at the time. Where radioactivity was concerned, however, the rhetoric of modernity is seldom found. Advertisements dwelling on the radioactive virtues did not use words like “balneology” and “hydrotherapy,” but typically invoked science only in the person of the geologist or chemist that had certified a place’s waters to be radioactive. C. Thomas de la Peña, “Recharging at the Fordyce: Confronting the

- Machine and Nature at the Modern Bath,” *Technol. Cult.* **1999**, 40:4, 746-769.
21. For example, Rupert Blue’s characterization of the “amazing curative properties” of radium springs [“Discusses Closed Spas,” *New York Times*, Sept. 17, 1914, 8], or George Henry Torney’s commendation of the Arkansas hot springs in “Fordyce Bath House,” [advertising pamphlet, undated (c. 1910), Oak Ridge Associated Universities Health Physics Historical Instrument Collection, Oak Ridge, Tennessee].
  22. Hot Springs National Park [advertisement], *Minneapolis Journal*, Jan. 12, 1931. The second excerpt is from an ad reproduced in Hot Springs Chamber of Commerce, Garland County (Ark.) Historical Society, Box 30, binder labeled “Chamber of Commerce, Paid Advertising, 1929-1934.”
  23. Claremore Chamber of Commerce, advertising pamphlet, undated, CRI.
  24. A 2008 report to the Nuclear Regulatory Commission, drawing largely on the collection assembled by Paul Frame of the Oak Ridge Associated Universities, identified almost fifty brands of emanators sold in the United States before 1945. M. A. Buchholz and M. Cervera, “Radium Historical Items Catalog,” August 2008. <http://pbadupws.nrc.gov/docs/ML1008/ML100840118.pdf>. Last accessed July 22, 2014.
  25. Radium Ore Revigator Agency, New Orleans, advertising pamphlet, undated (circa 1930), ORAU. The relevant text reads, “There Are Now Over 500,000 Satisfied Revigator Users,” followed by a list of consumers local to the New Orleans area.
  26. The AMA received many letters of inquiry from patients whose doctors had recommended (or sold) emanators to them. They are collected in AMA, Box 723.
  27. “Bust Radium Trust—Lane to Congress,” photocopy, *Denver Times*, Jan. 26, 1914. Forbes Rickard Papers, WH333, Box 1. Denver Public Library Special Collections.
  28. Radioak, advertisement, c. 1925. AMA, Box 720, Folder 19.
  29. Radium Ore Revigator, owner’s manual, c. 1926. AMA, Box 723, Folder 2.
  30. Radium Ore Revigator Company, advertisement, c. 1925. AMA, Box 723, Folder 1.
  31. Radium Fertilizer Co. of Pittsburgh, “Radium Makes Things Grow,” advertisement, *Washington Post*, April 25, 1915. ORAU.
  32. Radior Toilet Requisites, “Radium and Beauty,” copy of newspaper advertisement, n.d. (circa 1925), ORAU.
  33. American Radium Company, “Radium, the Master Key to Health, Youth and Beauty,” advertising folio, circa 1925. AMA, Box 719, Folder 8.
  34. On the impression made by medical x-ray machines, see M. Lavine, “The Early Clinical X Ray in the United States: Patient Experiences and Public Perceptions,” *J. Hist. Med. Allied Sci.*, **2012**, 67(4), 587-625.
  35. Radithor advertising materials survive in several archives, including those curated by Paul Frame of the Oak Ridge Associated Universities, and the Historical Health Fraud Collection of the American Medical Association.
  36. Like all of the many commercial products that used the word “Curie” in their brands, it had no connection with the discoverers of radium. See W. Kolb and P. Frame, *Living With Radiation: The First Hundred Years*, 2<sup>nd</sup> ed., self-published, 2000, 32.
  37. Radium Hot Springs, advertising flier, July 3, 1930. Denver Public Library Special Collections.
  38. Radium Appliance Co. of Los Angeles, advertisement, circa 1930, AMA, Box 719, Folder 1. The Deggen line also included radioactive appliances specifically designed to be applied to the nose, ears, prostate, uterus, and throat; other manufacturers made appliances worn on the gums, insoles, or in trusses.
  39. Cf. S. Hopkins, *The Great American Fraud*, P. F. Collier & Son, 1905, 93.
  40. Radium Hot Springs, “Rheumatism Cured,” advertising flier, 1929. Denver Public Library Special Collections.
  41. “Medicine Ore of Montana: Radiumite, Which Occurs in the Mines, Effects Cures,” *Chicago Chronicle*, Sept. 25, 1904.
  42. Leopold Biddle to George F. Kunz, July 5, 1904. George Kunz papers, Center for Southwest Research, Albuquerque, New Mexico.
  43. Adium Products Company, advertisement, CRI, Box 448, Folder “Radium Nostrums and Radium Water Machines –A-Z, 1930-1939.” Like a great many other makers of allegedly radioactive nostrums, the Adium Products Company was subjected to USDA fines and forfeitures several times during the 1930s on misbranding charges when their products failed to contain any measurable amount of radium.
  44. E. M. Gillette, *Idaho Springs: Saratoga of the Rockies: A History of Idaho Springs, Colorado*, Vantage Press, New York, 1978, 6.
  45. Correspondence from Radium Hot Springs is archived in the Special Collections Department of the Denver Public Library, file M634.
  46. Radium Ore Revigator Company, “The Perpetual Health Spring in Your Home,” advertising brochure, c. 1925. AMA, Box 723, Folder 1.
  47. Claremore Chamber of commerce, advertising pamphlet, undated. CRI, Box 448, Folder “Radium Nostrums and Radium Water Machines – Misc., 1930-1939.”
  48. H. A. Colwell and S. Russ, *X-Ray and Radium Injuries: Prevention and Treatment*, Oxford University Press, London, 1934, 185.
  49. M. Mok, “Radium, Life-Giving Element, Deals Death in Hands of Quacks,” *Popular Science Monthly*, July 1932, 9-11ff. Emphasis in original. The AMA sent reprints of this article to laypersons who inquired about unorthodox radium treatments.
  50. See C. Clark, *Radium Girls: Women and Industrial Health Reform, 1910–1935* (Chapel Hill, NC: University of North Carolina Press, 1997).

51. United States Department of Agriculture, "Uncle Sam at Your Service," transcript, USDA Radio Service Bulletin #9630, Nov. 16, 1935. CRI.
52. See for example "Radium Detective Uses Electric Bloodhound," *Popular Science*, Oct. 1940, 100-101; "Hospital Drama," *Philadelphia Record*, Aug. 8, 1938.
53. Ra-Tor Radium Mineral Water, ad.

### About the Author

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