

HOLLOW AND HABITABLE WITHIN: SYMMES'S THEORY OF EARTH'S INTERNAL STRUCTURE AND POLAR GEOGRAPHY

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Abstract: In 1818, John Cleves Symmes (1780–1829) circulated a flyer announcing his theory of Earth's structure and polar geography. Declaring that Earth is "hollow, and habitable within; containing a number of solid concentric spheres, one within the other, and that it is open at the poles 12 or 16 degrees," Symmes solicited "one hundred brave men" for an expedition north of the 82nd parallel in search of "a warm and rich land, stocked with thrifty vegetables and animals, if not men." So began the history of American polar exploration. Symmes's idea attracted general ridicule, but it also tapped a vein of cultural patriotism, national pride, and expansionist ambition that won him a group of loyal followers. Chief among Symmes's supporters was Jeremiah Reynolds, who played a key role in obtaining congressional funding for the Great American Exploring Expedition of 1838–1842. In this paper, I recount the story of Symmes's theory and trace its influence on the establishment of a wholly American scientific enterprise and American literature and fringe culture. [Key words: John Cleves Symmes, hollow Earth, history of science.]

INTRODUCTION

In 1818, a handbill announcing itself as *Circular No. 1*, directed "TO ALL THE WORLD!" and proclaiming an original and wholly American theory of Earth's structure and geography began appearing in letter boxes throughout the United States and Europe (Symmes, 1887, p. 559). It read, *sic*:

I declare the earth is hollow, and habitable within; containing a number of solid concentrick spheres, one within the other, and that it is open at the poles 12 or 16 degrees; I pledge my life in support of this truth, and am ready to explore the hollow, if the world will support and aid me in the undertaking.—Jno. Cleves Symmes, of Ohio, Late Captain of Infantry.

N.B.—I have ready for the press, a Treatise on the principles of matter, wherein I show proofs of the above positions, account for various phenomena, and disclose *Doctor Darwin's Golden Secret*.

My terms, are the patronage of this and the new worlds.

I dedicate to my Wife and her ten Children.

I select *Doctor S.L. Mitchill, Sir H. Davy and Baron Alex. de Humboldt*, as my protectors.

I ask one hundred brave companions, well equipped, to start from Siberia in the fall season, with Reindeer and slays, on the ice of the frozen sea: I engage we find a warm and rich land, stocked with thrifty vegetables and animals if not men, on reaching one degree north-ward of latitude 62; we will return in the succeeding spring.

John Cleves Symmes (1780–1829) printed 500 copies of his circular and sent them to philosophical societies, colleges, foreign rulers and governments, American politicians, and natural philosophers throughout the United States and Europe. Despite having attached to each copy a certificate attesting to his sanity, the circular was, according to his son, Americus (Symmes, 1885, p. ix), “overwhelmed with ridicule as the production of a distempered imagination.” Undaunted, Symmes promoted his theory tirelessly over the next decade, eventually garnering a measure of respect and support that tempered the ridicule. The theory faded to the fringe of public memory after his death in 1829, but its legacy in American science and culture remains.

Symmes’s story predates the establishment of American academic geography by nearly three decades and the founding of the Association of American Geographers by nearly eight. Symmes had no direct influence on the development of geography as a discipline or profession, and Daly (1875) is one of the few geographers who have even noticed him. I suggest, however, that Symmes is worthy of geographers’ recognition for three reasons.

The first is simply historical. Inspired by explorers, especially Alexander von Humboldt, Symmes synthesized a tremendous amount of geographical information into the first fully developed and wholly American geographic theory ever proposed. It deserves recognition as such.

Second, the Symmes affair played an important role in the development of American science. Symmes and his followers popularized the idea of polar exploration and helped generate public support for federally funded exploration and scientific research. Moreover, through his correspondence and interaction with leading scientific figures of the day, he may have helped catalyze the movement away from the strident empiricism that dominated American science in the early 19th century.

Finally, Symmes’s story is noteworthy for its impact on American letters and popular culture. His ideas and efforts influenced a number of American authors and literary genres, and the hollow Earth and other alternative geographies inspired American social utopian movements, fringe belief systems, and other aspects of popular culture. These cultural threads are very much alive today. They represent unique dimensions of human–Earth relationships and, I argue, warrant geographers’ attention.

In this essay, I tell Symmes’s story by dissecting his *Circular No. 1* and placing it in the context of early 19th century American science. This provides a context for considering the influence that Symmes and his theory had on American science and culture.

JOHN CLEVES SYMMES OF OHIO, LATE CAPTAIN OF INFANTRY

Symmes's story has been told numerous times (most reliably by McBride, 1869; WBP, 1882; Symmes, 1887; Stanton, 1975; Curtis, 1978) and needs only be sketched here. He was born in 1780 to a prominent New Jersey family that included a namesake uncle who was a state supreme court judge, politician, and land speculator and who brokered the settlement of southwestern Ohio. Symmes grew up on his family farm and left home at 22 to join the army, as he later noted, "to merit and obtain distinction, and accumulate knowledge, which I had seldom tasted but in borrowed books" (quoted in WBP, 1882, p. 175). His career was eventful. He rose to the rank of captain, served with distinction in the War of 1812, fought a duel, learned French and Spanish, and married Marianne Longwood, a fellow officer's widow. In 1816, he left the army and settled in St. Louis with a commission to trade with the Fox Indians and supply garrisons along the Missouri River. He also conceived his theory and developed it sufficiently to issue his *Circular No. 1* in 1818. In 1820 he moved to Newport, Kentucky, just across the Ohio River from Cincinnati, which was an emerging western outpost of American Science (Greene, 1984), and where his bother, Peyton, was a prominent citizen. There, Symmes devoted himself fully to promoting his theory.

By the time Symmes died in 1829, he was deeply in debt. Speaking fees and donations from supporters covered his travel and lecture expenses, but little more. His wife and their 10 children and stepchildren scraped by on the rents from farms inherited from Symmes's uncle and Marianne's first husband, along with financial help from Symmes's brother. Despite the legacy of financial hardship and his long absences from home, Symmes's children remained devoted to their father and sought to keep his memory and his theory alive throughout their lives (e.g., Symmes, 1885; Symmes, 1887; Curtis, 1978).

The theory of concentric spheres would undoubtedly have evaporated into complete obscurity had it not been for Symmes's distinctive character and personality. He was clearly an intelligent, informed, and tireless researcher, who was absolutely convinced of the veracity of his theory, dedicated to his vision, and completely immune to the sting of critique and ridicule (Symmes, 1887). Gardner (1957) recognized these traits among the hallmarks of pseudoscience cranks that have flourished since Symmes's time. But Symmes utterly lacked the hostility toward mainstream scientific orthodoxy that Gardner identifies as their most distinctive characteristic. Symmes believed that he was correcting not only everything that was then known about Earth's geophysical structure, but also the flawed Newtonian logic on which it was based. Yet he managed to couple this astonishing hubris with an equally deep humility. He never blamed his critics for failing to see his truth; rather, he assumed the fault was his for failing to communicate it clearly and convincingly enough (Symmes, 1887).



Fig. 1. Symmes's conception of Earth as a series of hollow, concentric globes (from Symmes, 1887, p. 621). Symmes continually adjusted and refined both his theory and his evidence to make use of new information or to remove things that had become extraneous or implausible even to his supporters. By 1824, he had abandoned the idea of multiple concentric spheres (illustrated here) in favor of a single hollow shell (Symmes, 1887).

HOLLOW, AND HABITABLE WITHIN: SYMMES THEORY

The earliest known reference to his theory (Fig. 1) is in a letter from Symmes to his stepson, Anthony Lockwood, dated August 17, 1817 (Symmes, 1817). "From the curious formation of [Saturn]," he wrote, "I infer that all planets and globes are hollow." He does not elaborate, but the comment is almost certainly a reference to Jean-Jacques de Mairan's theory of the origin of Saturn's rings. Symmes had access to Rees's (1810–1824) *Cyclopedia*, which recounts Mairan's hypothesis that the ring is a remnant of an outer shell that had otherwise broken into pieces and fallen to the planet's surface (sv. "Saturn"). Astronomers had long since dismissed the proposal, but it impressed Symmes; he even proposed that the Appalachian Mountains were the remains of a collapsed ring that once encircled Earth (Symmes, 1820).

The idea of a hollow Earth long predated Symmes's proposal. It abounds in folklore, religion, and literature, appeared as a theoretical speculation in Galileo's day, figured prominently in the work of Athanasius Kircher, and Edmond Halley's (1692) concentric spheres model was the first hypothesis to be derived from Newton's *Principia* (Kafton-Minkel, 1989; Kollerstrom, 1992, Godwin, 1996). In 1793, Benjamin Franklin posited Earth's core to be a densely compressed gas (Franklin, 1793), an

idea that persisted among a minority of geophysicists into the 20th century (Brush, 1980), and the Swiss mathematician Leonhardt Euler supposedly proposed a hollow-Earth theory as well (Symmes, 1887; cf. Griffin, in press).

Kenton (1928) suggested that Symmes could have picked up the hollow Earth idea from aboriginal mythology, and Zirkle (1942) proposed that he may have learned of Halley's theory from Cotton Mather's *Christian Philosopher*. In his *Cyclopedia*, Rees (1810–1824) described unnamed authors who supposed Earth's center to be "a hollow, empty space, inhabited by animals, who have their sun, moon, planets, and other conveniences within" (sv. Earth, Theory of the; cf. Humboldt, 1858). Symmes, however, claimed that he did not know of any other hollow Earth theories until well after he had developed his own in 1816 (Symmes, 1887). There is no evidence to suggest that his theory derived from anything other than a flawed and outmoded understanding of the science of the day, his own fertile imagination, and unflinching faith in his bold vision. He deployed this combination to expand his theory and weave seemingly everything he could observe or read into a body of supporting evidence that was, if one did not look too closely, impressively complete and compelling.

Symmes displayed a prodigious talent for devising "proofs" for his theory by shoeorning information from his extensive and often idiosyncratic readings of encyclopedias and compilations of natural history and natural philosophy, explorer's accounts, atlases and geographies, and newspapers, as well as his own observations and experiments. In the telescopic details of planetary observations, descriptions of the Magellanic clouds, the *aurora borealis*, and various components of magnetic variation, Symmes found confirmation of polar openings. Geographical and anthropological evidence—temperature distributions, patterns of wind and ocean currents, aboriginal hunting and trade practices, purported animal migrations, vegetation patterns, Pleistocene animal remains, and even the distribution of driftwood on the shores of Nova Zemlya, among other things—offered even more immediate proof. For his lectures, he used spherical bowls of sand, magnets and iron filings, and other props to demonstrate by analogy the physical principles behind his theory. And underlying everything, Symmes argued, was the economy of nature itself. Bones, veins, feather quills, stems of grass, and much else reveal a "great saving of stuff" (Symmes, 1887, p. 630). It only made sense, he reasoned, that the planets themselves should be hollow.

To his insight about the hollow structure of the planet, Symmes added a misunderstanding of the relative importance of centrifugal and gravitational forces that he thought would result in the formation of multiple hollow concentric spheres. As with the hollow Earth itself, the presumption of polar voids was established well before Symmes's day. Its roots lie in the medieval belief that waters entered the north polar opening and were expelled from the south, an idea adopted and widely promulgated by Mercator (1569) and Kircher (Godwin, 1996). But here too it appears that Symmes arrived at the idea on his own. In December 1817, Symmes saw a "comet" (meteor) explode in a way that he interpreted as indicating it was not only hollow, but open at its poles. Extrapolating from this observation, he announced in his Memoir No. III the conclusion that all planets must be thus, explaining that "the rotation which throws the matter wide from the centre, would

throw it some degrees from the poles, and thus produce polar openings" (Symmes, 1887, p. 560). He borrowed here from Laplace's theory that the centrifugal force responsible for Earth's oblate spheroidal figure would create large saucer-shaped depressions at the poles (Symmes, 1887). Symmes simply took Laplace one step farther by opening the poles and thus the possibility of an interior geography.

A WARM AND RICH LAND, STOCKED WITH THRIFTY VEGETABLES AND ANIMALS IF NOT MEN

One of the most striking aspects of Symmes's theory was that he posited specific locations for Earth's polar openings based on patterns of isotherms, vegetation, known ice distributions, and other geographical data (McBride, 1826; Symmes, 1887). The polar openings, he reasoned, were tilted relative to the plane of the ecliptic, and the southern opening must be larger than the northern. McBride (1826, pp. 30–31) suggested visualizing the arrangement "by taking a hollow terrestrial globe . . . and insert[ing] a saw at north latitude sixty-eight degrees in Lapland, sawing obliquely through so as to come out at latitude fifty degrees in the Pacific ocean." The southern cut would begin at 34°S latitude near Madagascar and come out at 46°S latitude in the Pacific.

Such an arrangement created a number of apparent problems. First, it placed several well-explored and even inhabited locales (parts of South America, northern Asia, Canada and Alaska, Iceland, and Greenland) inside the "verge" of the openings. Second, vegetables, no matter how thrifty, need light as well as heat. Neither would be abundant inside a sphere that is open only at the poles.

Symmes resolved both of these apparent dilemmas by invoking powerful refraction, accomplished by an exceedingly dense atmosphere in the polar regions, "which like the Magician's talisman," one of his critics quipped, "seems ready on all occasions to conquer every obstacle, and to reconcile every contradiction" (Matthews, 1824, p. 10). Refraction, Symmes claimed, would bend light rays down into the planet, where reflection among the spherical surfaces would provide a soft, never-ending daylight more than sufficient to light the inner world and warm it well above freezing (McBride, 1826; Symmes, 1887). The same refracting power resolved the problem of why boreal dwellers did not notice that they lived inside the planet. According to Symmes, refraction would bend light in ways that would seem to "elevate and bring up the interior concave surface" (Symmes, 1887, p. 627). This optical illusion created "apparent verges" 18° poleward of the actual verges, beyond which "there must appear to be a gradual falling off inwardly."

Gravity posed another fundamental problem with Symmes's theory. A hollow Earth could not be massive enough to account for the force of gravity on the outer surface of the shell. The inner shell posed an even greater problem, since the gravitational attraction of the rest of the globe would pull upwards on objects in the interior. Symmes invoked centrifugal force to help offset this upward pull (McBride, 1826; Symmes, 1887). One of his more astute critics (Anonymous, 1827, p. 245) pointed out the flaw in this argument by calculating that a man in the interior world would be nearly weightless: "with the same exertion which we here use to leap four feet high, [he] could spring to the height of twelve hundred" and "might fly through

the air, with great ease, by the aid of a lady's fan." The critique did not bother Symmes much. It was based on Newtonian physics, and Symmes believed that Newton was wrong: gravity was not an attractive force related to mass, but a *pushing* force exerted by a universal ether that was itself composed of infinitesimally small hollow concentric spheres (McBride, 1826).

I SELECT . . . AS MY PROTECTORS

Symmes's choice of "protectors"—Alexander von Humboldt, Sir Humphrey Davy, and Dr. Samuel L. Mitchill—reveals much about his thought processes and the science of his day. All three men were world-renowned scientists, and Symmes borrowed something from each. He had read Humboldt's (1815) work on Latin America and sought to emulate his approach to geographical inquiry and explanation by synthesizing anything and everything he could glean from his readings and observations. Davy doubtlessly owed his place in Symmes's pantheon to his theory of volcanoes and earthquakes (Humboldt, 1858; Siegfried and Dott, 1980). In Symmes's theory, the shell of each sphere included a hollow "mid-plane space" between its inner and outer surfaces that were the functional equivalent of the large subterranean caves Davy hypothesized to be the source of volcanic and seismic activity (McBride 1826; Humboldt, 1858).

Mitchill is the least remembered of the protectors, but in Symmes's day he was America's celebrity science superstar. Trained in medicine at Edinburgh, Mitchill's work and interests spanned the full range of early natural history, including chemistry, medicine, geology, mineralogy, paleontology, botany, zoology, and geography (Hall, 1934). A man of prodigious energy, he was also a practicing physician, politician, humanitarian, editor and publisher, administrator, educator, and member of dozens of scientific organizations, both in America and in Europe (Hall, 1934).

Both Humboldt and Davy dismissed Symmes as deluded (Humboldt, 1858). But Mitchill wrote back, giving the Captain "great credit for the ingenuity and originality" of his hypothesis and noting that he "should exceedingly rejoice" if polar exploration were to prove it correct, an outcome that would earn Symmes honor as "one of the most profound theorists that ever addressed a wondering people" (quoted in Symmes, 1887, p. 630). Until then, Mitchill counseled, Symmes would have to make do with the "analogies and probabilities" he had assembled in support of his theory.

That a man of Mitchill's standing took the time to respond to the wild claims of an unknown frontier philosopher like Symmes is less surprising than it may seem. Mitchill was a fierce and patriotic believer in Jeffersonian democracy and was exceedingly generous with his time and his assistance (Hall, 1934). Generosity and egalitarian spirit alone would likely have sufficed to differentiate his response from those of his European peers, but Mitchill shared with Symmes an enormous appetite for geographic information, fed necessarily with explorers' and travelers' reports, as well as a penchant for bold and speculative theorizing.

Appetite for geographic fact was a hallmark of the early national period in America, its most expansive expression being the Lewis and Clark expedition and

the success of Jedidiah Morse's *American Geography* books (Brown, 1941). This fascination with geographic inventory was part of a broader empirical turn. With Thomas Jefferson as its foremost advocate, American science had reacted to the romantic excesses of Enlightenment speculation by retreating to a home-grown Baconianism, which Daniels (1968, p. 65) interpreted as "a kind of naïve rationalistic empiricism." The heart of science, from this viewpoint, lay in exploration, collection, description, and taxonomy; theories and hypothesis were best ignored, and analogical reasoning and induction beyond observable fact were to be avoided at all costs. (Daniels, 1968; Greene, 1984). In this environment, bold and speculative theorists were few and far between.

Mitchill worked both with and against these currents. The nascent scientific community indulged "the Doctor" in his forays into theory because his vast energies were contributing so much to the advancement of American science, including its empirical program. His peers may have privately laughed at his "septon and alkaline" theory of disease and cure, but they publicly applauded and sought to emulate his descriptive works on ichthyology, geology, and other topics (Hall, 1934).

Mitchill's moral support and encouragement must have been tremendously important to Symmes, but the doctor's assistance went beyond mere encouragement. According to Elmore Symmes (1887, p. 630), Mitchill also "presented Symmes to many of the scientific men of the day, and gave him letters of introduction to his friends in the New England cities." Mitchill's word opened doors that would otherwise have been locked to a frontier philosopher whose greatest claim to fame was having been the butt of a thousand jokes.

TO EXPLORE THE HOLLOW . . . IF THE WORLD WILL SUPPORT ME

The bipolar response of Symmes's three protectors to his theory was echoed in the scientific community as a whole. Individual reactions depended on the way in which one's knowledge of physical science and personal proclivities meshed with the contradictory nature of Symmes's personality and style. While traveling through Ohio in 1823, Symmes met and traveled for a time with Major Thomas H. Long, one of America's foremost military engineers, on the first leg of his expedition to the Northwest Territory. The party's natural historian, Thomas Lay, described what seems to have been a common reaction to Symmes (Keating, 1825, pp. 44–45):

The partial insanity of this man is of a singular nature; it has caused him to pervert to the support of an evidently absurd theory all the facts which, by close study, he has been able to collect from a vast number of authorities. He appears conversant with every work of travels from Hearne's to Humboldt's; and there is not a fact to be found in these which he does not manage with considerable ingenuity to bring to the support of his favorite theory.

Upon other subjects he talks sensibly and as a well-informed man. In listening to the expositions of the concavity of our globe, we felt that

interest which is inevitably awakened by the aberration of an unregulated mind, possessed, probably, of a capacity too great for the narrow sphere in which it was doomed to act. . . .

Major Long, on the other hand, responded positively to Symmes. The two men struck up a friendship that later played a critical role in Symmes's success (Symmes, 1887).

Public response to Symmes was similarly divided and generally followed mirthful treatment of his theory by the press. Ridicule became especially keen in the wake of a satirical novel, *Symzonia*, written under a pseudonym and published in New York in 1820 (Seaborn, 1820, but see Lang and Lease, 1975; Everett, 1821). In the West, however, where the press and the public had access to the good Captain and his engaging personality, rather than just his writings, his ideas were beginning to gain respect. The movement began among prominent Cincinnatians whose patriotism and regional boosterism was a great deal stronger than their understanding of natural history and philosophy (e.g., McBride 1826). It spread in the wake of Symmes's frontier lecture tours and the favorable press reports that they elicited. By 1823, Symmes's enthusiasts had hosted benefits and even began organizing logistics for "Captain Symmes Polar Expedition," while others in Ohio, Kentucky, Pennsylvania, and South Carolina had petitioned Congress and the Ohio Legislature to fund the mission (Symmes, 1887; Stanton, 1975).

Symmes's most important convert was an ambitious Ohio newspaper editor whose obsession with the vision of polar exploration drove him to become, in turn, the Captain's protégé and greatest supporter, his rival, and the bearer of his legacy. Jeremiah N. Reynolds had a gift for publicity, and he recognized that Symmes's grand designs were not going to be realized from the western frontier. Only with support from the more populous and prosperous East would a ship ever sail or a sleigh ever move toward the pole (Symmes, 1887; Stanton, 1975).

Despite Symmes's failing health, Reynolds convinced him of the need for a national speaking tour. So in the fall of 1825 the two men and Symmes's stepson, Anthony Lockwood, set out for the East. After a fitful start, the tour gained momentum as it moved through Ohio, Virginia, and Pennsylvania. Audiences packed halls expecting high amusement from a madman. They went home wondering if Symmes might not be right after all. Interest and support mounted as the team moved toward Philadelphia, which proved to be the apogee of Symmes's career (Symmes, 1887; Stanton, 1975).

During their travels, Major Thomas Long informed Symmes that Count Romanoff, Chancellor of Russia under Czar Alexander, was planning a polar expedition, had heard of Symmes's theory, and had requested the captain's services (Symmes, 1887). Symmes balked at the chancellor's terms, but turned the negotiations to his advantage by pointing out to his Philadelphia audiences and the press, as Elmore Symmes (1887, p. 565) described, "that he was pledged to Count Romanzoff [*sic*], Russian Chancellor, for an exploring expedition unless his countrymen sent him north on their own account." The ploy tapped a fierce streak of nationalism and bought Symmes—dubbed "the Newton of the West"—a new degree of legitimacy and popularity that boosted lecture attendance, earning the

team enough to commission new globes and charts for their demonstrations (Symmes, 1887; Stanton, 1975).

Despite, or perhaps because of, these successes, the partnership between Symmes and Reynolds began to unravel. Tensions between the two men came to a head when Reynolds publicly acknowledged that the idea of a habitable interior, and even the theory itself, might be wrong (Symmes, 1887). The two men fought, and Reynolds left, taking the new globes and diagrams with him to New York (Stanton, 1975). Symmes followed his wayward protégé, and for a time, both he and Reynolds lectured and fought out their differences in the New York papers. After a few weeks of public wrangling, Symmes and Reynolds made their peace, but the partnership was over. Reynolds remained in New York where he continued promoting a polar expedition. Symmes continued on his way, lecturing throughout New England and into Canada.

Mitchill's support doubtlessly won Symmes invitations to lecture at northeastern colleges and scientific societies, while his success in Philadelphia and the Romanoff affair paved the way for more serious treatment by the public and the press. Students at Harvard embraced the new theory—to the alarm of the faculty, who held special lectures to dispel them of their enthusiasm—and he apparently fared well at other colleges and learned societies as well (Symmes, 1887). Respectful, if not enthusiastic, press coverage followed in his wake, and public interest in the poles gradually expanded. Symmes was finally receiving the respect and attention he had sought for so long (Symmes, 1887).

Symmes's glory was short-lived. The stomach problems that had plagued him since his army days became unbearable late in 1827. He returned to New Jersey where friends and relatives cared for him for two years. In February 1829, almost four years after Symmes left home to win his glory, a longtime supporter from Cincinnati traveled to New Jersey to bring him back to Ohio. He died three months later, his dream of polar exploration unrealized. Public interest in Symmes's theory waned along with the Captain's health, but his lasting impact was only beginning to be felt.

SYMMES'S IMPACT ON AMERICAN SCIENCE

If Symmes had any influence on the conceptual course of American science, it would have been by providing a model of a way of thinking that went beyond empiricism toward explanations of the unknown. His influence may have been quite direct.

By the time Symmes set out on his final lecture tour, American science was drowning in great piles of collections, descriptions, and facts that had stubbornly refused to yield up their secrets unbidden as the empiricists had promised. Daniels (1968) noted that Francis Wayland provided a way out of this empirical morass in an influential Phi Beta Kappa lecture in 1836, in which he outlined a systematic account of the principle of analogical reasoning. His address essentially provided well-reasoned permission to move beyond direct observation and draw conclusions about the unknown by making analogies with the known. Wayland had heard Symmes lecture in 1826 at Union College and had been much impressed (Clark,

1873). Symmes's inductive leaps about the great planetary interior and polar unknowns, arrived at by analogy from his magnets and iron filings and spinning bowls of sand, must have piqued Wayland's attention indeed.

There is no way to know exactly how Symmes might have influenced Wayland and others in their thinking, but his influence on the development and public funding of institutional science was direct, effected through the hard work of Jeremiah Reynolds. William Stanton (1975) has masterfully reconstructed the strange story of how this impact evolved.

Once he was free of Symmes and the obligation to support the Captain's theory, Reynolds adopted different rationales for an expedition, deftly shifting between the benefits of scientific discovery to national glory or to commercial gain, depending on the audience. He also rendered it more palatable by supplanting the theory of polar openings with the more conservative hypothesis of open polar seas (Wright, 1953).

In 1828, Reynolds met President Adams and Secretary of the Navy Samuel Southard, and with their support he lobbied Congress for a publicly funded expedition to the south Pacific. States-rights opponents feared linking government and science and thus opposed the expedition. The House approved a compromise resolution asking President Adams to send one of the Navy's ships to explore the south Pacific if it could be done within the current budget. Southard appointed Reynolds a special agent of the Navy Department and tasked him with planning the expedition. He threw himself at the task, gathering geographic information from sea captains, recruiting the scientific team and crew, and overseeing the rebuilding of an old Navy sloop, the *Peacock*, whose launching fanned public enthusiasm for the expedition. However, political infighting within the Navy Department and states-rights supporters in the Senate killed the expedition early in February 1829, just as Symmes began his final trip back to Ohio.

Senate Democrats had argued that geographic exploration, like commerce, was best left to the private sector. Reynolds put the proposition to the test, using his connections with New England sealing captains to organize a private venture, the South Sea Fur Company and Exploring Expedition, which set sail in three ships for the south Pacific in October 1829. This voyage, too, was doomed to failure. It proved to be too much of a commercial venture to accomplish much science, yet too much of a scientific journey to return much profit. The crews mutinied and the ships returned to New York, leaving Reynolds to wander through Chile for two years. He returned home in 1834 with a few chests of specimens and notebooks of stories he had collected, and set to work agitating again for a federal expedition, this time within the Jackson administration.

In 1836 Reynolds delivered an eloquent and impassioned address to the House of Representatives in support of an expedition that would win the United States a place of honor among nations by expanding the frontiers of geographic discovery and scientific knowledge. The Senate had already approved an expedition and recommended an appropriation to pay for it. Reynolds' eloquence and the inspired rhetoric of Ohio representative Bellamy Storer—the man who had introduced Symmes's first public lecture in Cincinnati a dozen years earlier—overcame the opposition of anti-intellectual southern Democrats, and the bill passed. Jackson

supported the expedition, and in August 1838, after more than two years of political sniping, maneuvering, back stabbing, and foot dragging, the Great United States Exploring Expedition finally set sail under the command of Lieutenant Charles Wilkes. Reynolds remained behind.

In its four years at sea, the expedition surveyed nearly 300 islands and more than 1500 miles of coastal Antarctica, establishing that it is, indeed, a continent. It constructed more than 200 charts, which became the base of the Hydrographic Office's collection, and collected thousands of specimens of biological, geological, and anthropological material that contributed to the nucleus of the Smithsonian Institution's collections.

The same incompetence, political wrangling, and other problems that had beset the planning phase of the expedition plagued the description, classification, and disposition of its specimens and the publication of its reports. Despite the resulting delays in disseminating its findings, the Wilkes Expedition and the scientific work that issued from it established the ability of the United States to make world-class scientific contributions and set a precedent for federal support for scientific exploration and research. It also established a tradition of U.S. polar exploration. Symmes's son, Americus, remained steadfastly devoted to his father, and made every effort to continue his legacy as a part of that tradition (Curtis, 1978). And in some small way, he succeeded. In 1860–1861, Dr. Isaac Israel Hayes carried with him a copy of Symmes's account of the polar openings (Stanton, 1975), as well as the Wilkes' Expedition's flag. A decade later, another unlettered but determined Cincinnati visionary, Charles F. Hall, carried the same flag north on the ill-fated *Polaris* expedition in a bid to reach the North Pole (Loomis, 1971). At a reception before his departure, Hall shocked members of the American Geographical Society by announcing his belief in Symmes theory and his determination to find it (Daly, 1875).

SYMMES'S INFLUENCE BEYOND SCIENCE

The idea of a hollow Earth existed in literature long before Symmes's time, but it flourished in American fiction thanks to his and Reynolds' efforts. *Symzonia* (Seaborn, 1820) was the first American work of utopian fiction, and Symmes's expansive geography fired the imaginations of Edgar Allan Poe, Jules Verne, H. P. Lovecraft (Godwin, 1996), Henry David Thoreau (1862), Edgar Rice Burroughs (1963), Thomas Pynchon (1997), and countless others. Symmes's story touched Herman Melville, too, in the form of an article Reynolds wrote for the leading literary monthly of the day. It recounted an old sailor's tale he had collected in Chile and was called "Mocha Dick, the White Whale of the Pacific" (Stanton, 1975).

Symmes has continued to occupy a place in American popular culture beyond the literary realm. Arctic expeditions in the latter half of the 19th century prompted a wave of magazine and newspaper articles, and a book that introduced Symmes and his story to a new generation (e.g., Clark, 1873; Fry, 1873; Madden, 1882; Symmes, 1885; Symmes, 1887). As a result of this revival, a new wave of theorists took up Symmes's banner beginning in 1871 (Curtis, 1978; Kafton-Minkel 1989). Their publications mark the beginning of a diversification and evolution of the

hollow Earth theme that also expanded to include flat, cylindrical, and even a tetrahedral Earth (Kenton, 1928; Gardner, 1957).

Symmes's was the only hollow-Earth theory that received widespread attention from the mainstream media. All of the others have existed in the gray literature of self-published books and pamphlets, mimeographed and then photocopied newsletters, and other ephemera. Few libraries kept copies of these works, and there were few venues through which disparate believers and theorists could find one another. Still, the idea managed to grow and evolve, sometimes merging with New Age mysticism, UFOs, Nazi survival myths, and other fringe beliefs (Kafton-Minkel, 1989; Godwin, 1996). The advent of the Internet has broken that isolation, and the hollow Earth is thriving. There is now an International Society for a Complete Earth (ISCE), which uses a photograph of Symmes's globe in its logo (ISCE, 2004). Moreover, two expeditions, one using a chartered Russian icebreaker and the other a specially outfitted seaplane, are currently planned to find polar openings into the inner world.

CONCLUSIONS

John Cleves Symmes was able to develop a complex and imaginative geophysical and geographical theory and promote it to national prominence because he comfortably occupied the frontiers of early 19th century America. Socially and economically, he eschewed the opportunities that family connections afforded his brothers, instead using his inheritance to follow his vision (Symmes, 1887). Intellectually, he was deeply versed in the scientific knowledge of his day, but he had never been indoctrinated into the Newtonian system and was, therefore, free of the constraints it imposes on imagination. Thus unfettered, he was able to romp through cyclopedias and geographic compendia and synthesize what he found there in ways that best served his own design. Geography itself conspired to unshackle Symmes's mind: at home on the western frontier he was free to engage in the dubious practice of constructing theories and making hypotheses, because he did not know it was unfashionable to do so in Boston and Philadelphia.

When Symmes walked onto the national stage, the polar regions were still empty spaces on the maps and Earth's deep interior was an absolute mystery. Symmes, who seems to have always been more comfortable at the margins of things than at their centers, filled the blank spaces on the maps with holes, banished the center altogether, made all the world a periphery, and envisioned a frontier more wildly expansive and strange than anybody else ever dared to imagine. His strange vision provoked laughter, but it also fired imaginations and paved the way for the emergence of the United States as a fair contributor to the world's store of knowledge and discovery.

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