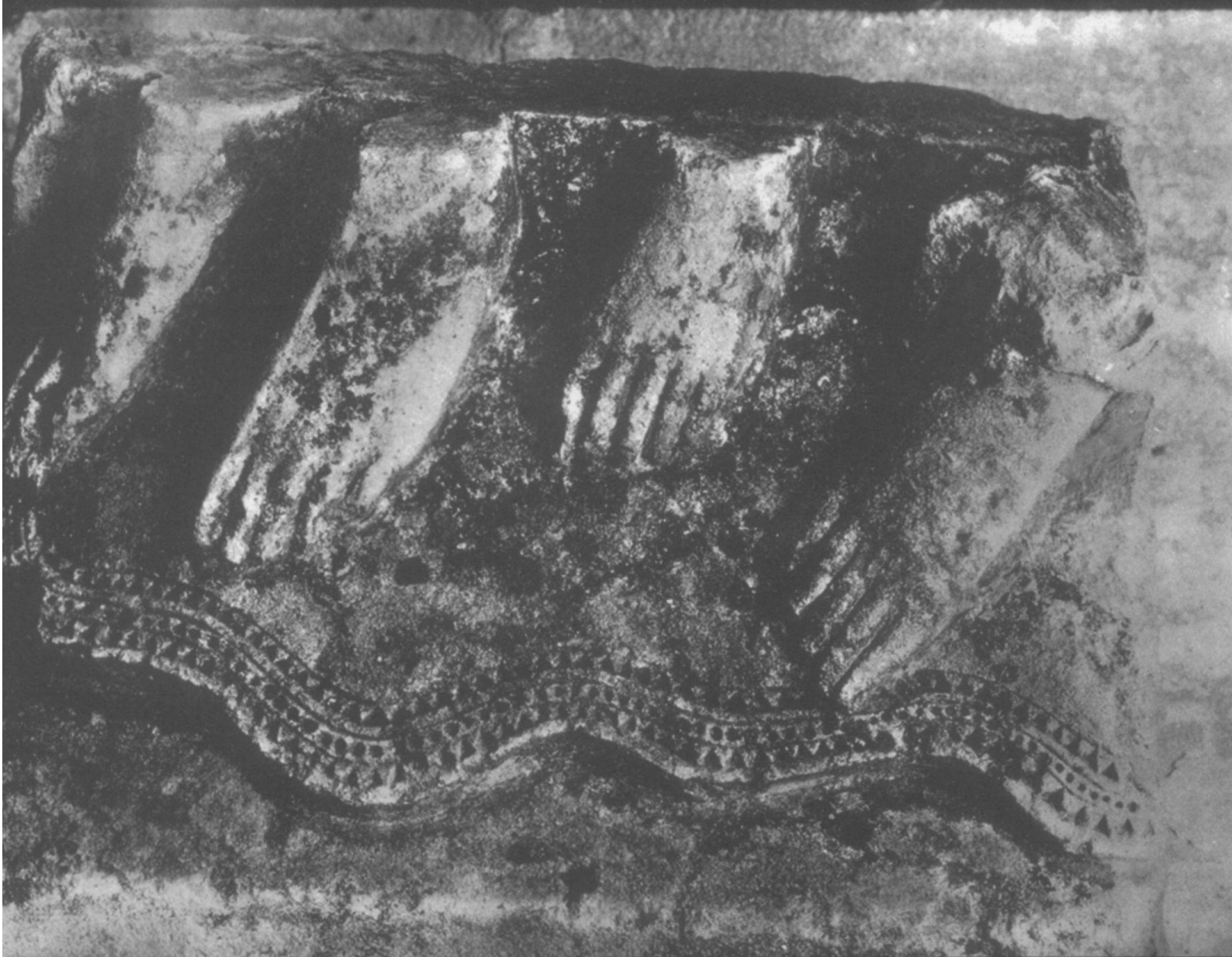


FOOTWORK



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Where was I? I was walking up the hill that divides Rodeo Valley from Tennessee Valley on the northern headlands of the mouth of the Golden Gate on the Pacific coast, in a thick fog, on a wide trail cut as a jeep road for military vehicles. Walking through the fog, alongside the chaparral hedgerow in which the cobwebs that are usually the most invisible part of the undergrowth had become the most visible: each web drenched and dripping with water that made them look like white lace handkerchiefs dropped along the way by some Hansel and Gretel hoping to return by this steep road. I stopped to catch my breath and counted my heartbeat too. And as I stopped, other quieter noises emerged out of the fog in the absence of my footsteps: birds nearby and foghorns far away. Six seconds of counting by my watch multiplied by ten: 130 beats per minute in a fog-wrapped landscape without distance. Sticky monkeyflower. Coyote bush. Bracken. Bush lupine. Wild oats. Wild strawberries. Wild radish. Brambles. Poison oak. Indian paintbrush. Rattlesnake grass. Yarrow. Fennel. Queen Anne's lace. The vine like morning glory whose name I never learned.

A path is a prior interpretation of the best way to traverse a landscape, and to follow a route is to accept an interpretation, to stalk a predecessor, as scholars and bounty hunters do, or to honor

the intent of the originator and echo it, as pilgrims do. Scholars and tourists sometimes pursue famous itineraries, such as the great wandering Jew Leopold Bloom's fictional progress through the real streets of Dublin, while Catholics symbolically trace Christ's route to the crucifixion through the fourteen Stations of the Cross. (In Christian legend, the original Wandering Jew was sentenced to wander until the Second Coming for having denied Christ a respite on his walk to death, during an apocryphal Station of the Cross; romantics found in that figure of the exiled wanderer an appealing self-image.) There's a sense that to move through the same space in the same way as another person is a means of becoming that person, and this is what distinguishes pilgrimage from the other modes of cultural walking: a pilgrimage must go to a specific site, usually along a route, and often has other requirements—that the pilgrim be barefoot, or pray at every church along the way, or set off at a particular time, or during a particular week.

I always wonder whether the act of promenading past pictures in a gallery has its origin in the Stations of the Cross, which are sometimes remarkable works themselves in the churches from which European art descends; by expanding the fourteen stations to many thousands, museums such as the Louvre turn

the pilgrim into a wandering tourist and lead not to a culminating spiritual destination but to subjective satisfaction or dissatisfaction and to an agony of feet. Retracing a route can be carried out symbolically as well, by means of the religious mazes on the floors of churches, which compress the world or the passage to paradise into a map just large enough for one person to trace a route, its deceptions and dead ends. In prison, the Nazi architect Albert Speer walked around the world by pacing his courtyard and imaginatively engaging with all the terrain he would have traversed.

In one sense, to trace even an imaginary route is to trace the spirit of what has passed there before: this is the memory-palace technique by which the Jesuits and then the Mandarin bureaucrats they trained remembered large quantities of information. Scholars emphasize the device of the imaginary palace, in which information was distributed room by room, but one could only retrieve the stored data by walking through the rooms as a visitor would in a museum, restoring the objects to consciousness. Objects wake up the mind but the mind wakes up objects: another of the complementary paradoxes of walking and thinking. The demonstrated truth is that to walk the same route again can mean to think the same thoughts again; thoughts can be, as it were, objects in a landscape that become visible through movement. In this way, walking is thinking.

In the dense damp fog, only the rustling of small birds in the bushes indicates that I am not alone as I walk along the narrow trail sliced into the northwest side of Wolf Ridge in my waterproof coat. As I protect my hands from the

chill west wind that comes around this side of the slope, I find, in the left pocket of that coat, a ticket and an ivy leaf: a ticket for the train from Copenhagen H to Humlebaek and a leaf from the House of Honor in which the great atomic physicist Niels Bohr once lived. In fact, the last long walk I took was from the town of Humlebaek toward Helsingør up the eastern coast of Sjælland, Denmark's largest island, mimicking a walk of particular significance to me: a walking tour northward from Copenhagen, in the spring of 1924, during the course of which Niels Bohr and his fellow physicist Werner Heisenberg got acquainted. Bohr and Heisenberg interested me, perhaps because of my own walks.

Not all of my walks were contemplative. From 1988 to 1992, I was involved in the struggle against nuclear testing that took place at the Nevada Test Site, where more than a thousand nuclear bombs had been detonated in preparation for global wars and in pointless local devastation. The way we protested was influenced by Thoreau and by the women's suffrage movement, insofar as it was civil disobedience, but whereas Thoreau and the suffragists protested primarily through immobility or inaction, we protested by walking: thousands of us walked again and again across the boundary into the Nevada Test Site and were arrested again and again; we were a little like an army and a lot like pilgrims, although our goal was not a shrine but a change: an end to nuclear testing, and by consequence to nuclear weaponry.

I began to wonder about the roots of our walking protest at the test site and found many. Among them was the history of nuclear physics, which began as a history of European atomic and quantum physicists; I found that all of the

principal physicists had had a penchant for walking, which was more common and celebrated an activity in their time. (In ours it has fractured into jogging, backpacking, driving, climbing, and other specializations of what began as a celebration of the universal amateur.) Many of the crucial developments in atomic physics—the founding of friendships, the sharing of secrets, the fine-tuning of ideas—took place on walks, and perhaps the greatest of these walkers and thinkers were Bohr and Heisenberg, who between them founded quantum theory, the discipline that called into question classical physics itself, along with many of its objectivist postulates.

They interest me as walkers because in their walking two pedestrian traditions met and merged. Niels Bohr was a philosophical walker—for him walking was a way of ordering his thoughts. A great athlete, he often went on walking tours—he and his brother Harald were walking in the German Alps when the First World War broke out, for example—but much of his walking was more local and less organized. His biographers describe how he needed to move in order to think, often by simply pacing within a room or circling the table at which his colleagues or his scribe sat, moving faster as his ideas became more urgent. More serious matters often required longer excursions, and it was on a ski slope in Norway that Bohr derived his great theory of complementarity.

Like his thinking, his most significant conversations seem to have been conducted while walking: in later years he had two literary friends—with one, he would discuss Goethe, with the other Schiller—and these discussions took place on long walks in Tisvilde, on the

northern coast of Sjælland. Walking while talking seems to have been a far more common pursuit then, and it's hard to say whether it has faded because the romantic-scholarly tradition of the friendship walk has faded, because walks have become exercise, or because many parts of the world have become far too noisy for talking while walking.

Bohr's friendship with Heisenberg is almost a catalogue of walks. They first met in Göttingen, Germany, when the thirty-seven-year-old Bohr lectured at the university there one morning in 1922, and Heisenberg, a student of twenty, challenged some of his ideas. Pleased by Heisenberg's independent mind, Bohr invited him to go walking across the Haina Mountain that afternoon, where, the younger man records, they spoke of "philosophical questions concerning atoms, the epistemological use of familiar conceptions, and the meaning of consistent 'understanding' in physics."

Heisenberg claimed that his real scientific career began that afternoon, though his walking already had a long history. During the First World War, he had belonged to an organization intended to prepare adolescent boys for wartime and for the military; both marching and hiking were among its prescribed activities. After the war, Heisenberg became the leader of a troop of boys, and the members of Gruppe Heisenberg spent much of their free time trekking in the mountains of Germany, developing a rule-bound, formalized society of their own: exclusively young, male, and elitist. One of Heisenberg's biographers criticizes the Pathfinder movement for its conscious withdrawal from politics, suggesting that its members abandoned German politics in the

Weimar era to others—including, of course, to the Nazis, who made use of the romance attached by such youth movements to mountaineering, athleticism, the distant past, and loyalty to leader and nation.

While Bohr appears to have walked to clear his thoughts, Heisenberg seems to have walked to escape them, to go past thought into nature and into another identity, beyond his life as a physicist. Perhaps it's that Bohr walked to confront doubt, Heisenberg, at least in his Pathfinder hikes, to escape it. For all of the peripatetic physicists who were dealing with the macrocosmic forces of stars and the microcosms of the subatomic, it seems that walking might have been a way of reestablishing a sense of human scale. Walking also provides a relative, unstable relationship to the observed, and in this it seems to provide an introduction to quantum physics. After all, the Copenhagen interpretation of quantum mechanics formulated by Schrödinger, Bohr, and Heisenberg emphasizes position, perspective, the relationship of the observer to the observed, uncertainty and complementarity. (Because contemporary cultural theory, too, is concerned with identifying the position from which one speaks and with the authoritarianism of fixed and undisclosed positions, a walker's point of view might be the perfect perspective from which to speak and see in curiosity, flexibility, responsiveness, bound by the body, but not by the view.)

Around Easter of 1924, Bohr invited Heisenberg to join him for another walk. In Bohr's institute, where Heisenberg had come to work, there was little opportunity to become further acquainted, Bohr told him, and so they took off with rucksacks for the northern end of

Sjælland. "We made for the north, sometimes hugging the coast, sometimes walking through forests and past peaceful lakes, studded with summer houses still sleeping behind closed shutters—it was early spring and the trees were only just putting out their first tender shoots," wrote Heisenberg long afterward. All we know of their walk comes from his lengthy account, in which their conversation is reconstructed so artfully that he must have had either perfect recall or a novelist's instinct. He records that they spoke about the recent war and German nationalism and about the national virtues of Prussians and Danes.

On the day I followed their traces, it was overcast and cold, mid-November, and the sky and the Baltic sea were a single, undivided horizonless gray, choppy below and smooth above, without any discernible degree of distance. Only occasionally did a glint of turquoise appear in the churning water, in its fretful short waves. With its gray road, gray gravel beaches, and black trees against the gray sky, the world in which I walked northward from Humlebaek seemed pure monochromaticity—save the occasional marigold houses, whose color struck my Californian eye as more like Guatemala than what I knew of Scandinavia. It was hard to guess what had been there seventy years earlier and what had sprung up since along the road, but in the forest park halfway to Helsingör the massive oaks were ancient enough to create a continuity of time.

Following in someone's tracks is a peculiar form of reiteration: most often we imagine and encounter those who have passed before us in terms of their uniqueness, their peculiar gifts,

but everyone walks, and to repeat others' walks is to insist on their commonality. Even Christ walked, and on the Stations of the Cross he not only walks, but slips, stumbles, and falls repeatedly; this exploration of bodily limits is the most human passage in an otherwise inimitable life, and in some way this painful progression toward redemption seems paired with the carefree sortie from Paradise: the Fall and the Falls.

Thus, a pair of physicists, whose conceptual work is difficult for the lay imagination to grasp, took a literal path along the coast from Copenhagen which is easy enough to reiterate; their metaphorical path, their lives, also lay together for some distance ahead. They reached Helsingør that evening—they were both strong walkers—and the next day they walked west with a view of the Swedish coast across the Baltic. In that scene, recalls Heisenberg, Bohr tried to explain the Danish sense of expansiveness as drawn from the sea rather than from the heights and inquired about the alpine walks that Heisenberg had taken with his youth movement. Only on the third day did they turn to physics, and thus began the collaboration that, to its credit, built the Copenhagen Interpretation and to its shame hastened the genesis of the nuclear-arms race.

The goalless stroll of pure physics unwittingly became a march too, into pragmatic physics and the arms race, in which both Bohr and Heisenberg were caught up, the former with the Manhattan Project that was centered in Los Alamos, New Mexico, the latter with German nuclear research. The only other recorded walk they took together came after the war had begun, when Heisenberg came to Copenhagen to attend

a conference. Because of their tradition, or perhaps for fear that their rooms were bugged, they talked while walking—according to some accounts, in Bohr's gardens in the Carlsberg House of Honor, according to others, in the park behind Bohr's Institute, or in the Frederiksberg Gardens, or down Copenhagen's tree-lined wharf, the Langline. Wherever they spoke, it seems that Heisenberg intended to assure Bohr—cautiously—that the German physicists would not pursue the development of an atomic bomb during the war, and history bears this out: Heisenberg, delicately balancing his patriotism and his alienation from the Nazis, made sure that nothing would be achieved on this front. Bohr, however, misunderstood him and told the Allied Forces that the Germans were developing an atomic bomb, thus egging on the efforts at Los Alamos. But none of this was foreseeable in 1924.

The rutted dirt path along the steepest face of Wolf Ridge meets an old army road at the crest, a single lane of asphalt running up to the Nike missile radar station at the peak, an octagon of fencing inside which odd structures decay—the bastard descendants of technologies generated indirectly by Bohr and Heisenberg. In a walker's geography, these ruins of nuclear-weapon defenses along America's Pacific coastline, lying on a path from Copenhagen via Los Alamos and the Nevada Test Site, and my path past them are part of a cobweb of intersecting lines previously trodden by a huge host of people—the local Miwok Indians, the Japanese poet Bashō, conquistadors, romantics like John Muir and Dorothy Wordsworth, the pioneering American activist Peace Pilgrim who walked more than

25,000 miles for peace, various Buddhist monks and nuns, innumerable foot soldiers, some physicists, a legion of ghosts—enough to make it crowded up here.

As I step up the Pacific Coast Trail to the road along the crest, the wind picks up. Brightness shines through the fog, but I'm heading downhill now, alone, toward the coast and the west deeper in the fog. On days like this you can walk almost to the edge of the cliffs without seeing the drop-off, but the sound of the ocean comes through long before, and the foghorns and ringing buoys with it. The road itself has collapsed here like a bad interpretation: the leveling cuts undermined the integrity of the hill's chaparral-covered surface, opening it up to rainwater that has turned it into a sodden, crumbling mass. I have watched it fall, a little more every year, into the cliffs down to the sea, and have taken wider and wider detours around this unstable siding and its road to nowhere. After having joked to a friend the last time I was here that you never step onto the same path twice, sure enough when we got to this juncture, we found an entirely new trail blasted into the hillside rock, with a staircase down the steepest parts of the detour and more paths closed off due to the erosion created by feet.

Down toward the coast, I stop at the grove of Monterey cypresses and eucalyptus trees, which so condense the fog that it drips off their leaves like rain. It's the kind of day when it rains only under the trees and, when I stop, I can hear the drops hit the concrete. The trees frame one of the entrances to the labyrinth of Battery Townsley, a rabbit warren of subterranean concrete rooms opening onto loading doors and gun mounts on both sides of the hill. After Pearl Harbor, the

rooms were occupied by soldiers in a state of constant preparation against invasion, but nothing ever happened here but building, training, marching, drilling, decommissioning, abandoning, converting, decaying, and the return of the place to the public, walking, biking, bird-watching, graffiti-ing, photographing, looking off across the sea that gleams like worn silver to the western horizon and the city of San Francisco to the south.

But today, the horizon and the city are obscured, and the sea appears one inlet at a time. Down at the beach, where visibility stretches a little further, three surfers, seals in black wet suits, are paddling out to the crest of the waves. I crunch across the gravelly sand of the beach, slowed by its yielding surface and automatically beachcomb: a rare red starfish, as red as the beaks of the cygnets in the lake by the Louisiana Museum in Humlebaek, daisies and ferns dropped as though a wedding party had passed by out of season, the tattered remains of seagulls, the long tangles of seaweed. In the lagoon I pass on the last leg of my walk, a blue heron flies away in mild alarm and a flock of seagulls follows, but a white egret and a white heron stay, stepping along the shallows, and pelicans pursue their routines with profound indifference. A horse trail rises upward alongside the lagoon and through its willow groves, upward past the Nike launching pad, the eucalyptus and cypress, toward my truck parked by what was a chapel, during the army's stay here, but is now a visitor center full of books and maps and exhibits, a secularized temple for the secularized western culture that has for two centuries considered walking—by certain people in certain ways—a cultural act.