

**THE SHADOWS
MOVING IN THE
MOON'S SKULL
EYES:
A VISION OF APOLLO XI**

PROLOGUE: THE ECLIPSE

The craters stared at me, the empty eyes of thousands of skulls. The craters were full of shadows and fierce violence. The craters stared blindly, stared into the gulf between death and life, stared into my eyes still plump and blue and pulsing with light and shapes, yet stared without recognition.

I looked into the dimness, into the huge chamber, up and down the chaotic pile of tens of thousands of bones and skulls. Many skulls held cracks or jagged holes or were shattered into half skulls. Many skulls were missing jawbones, and many jawbones were missing some or all of their teeth. Thousands of skull fragments lay scattered randomly. Many of the bones were cracked or pitted or snapped apart, leaving splinters. Rib bones and pelvis bones announced curves but abruptly canceled them. Thousands of finger and toe bones had settled to the bottom of the pile. In places, the bones had been sorted and stacked, a section of arm bones, a section of leg bones, but then the bones seemed to recognize the pretense of such order and the honesty of chaos and became a jumble of every kind of bone, pointing every direction and no direction. The skulls seemed to have ended up wherever they would fit, a few here, a few dozen there, a line of skulls here, chaos there, skulls right-side up or upside down, pointing in every direction and no direction. The craters that had once held eyes and sparkled with moonlight now conducted only dimness and bone dust.

These were the skulls and bones of 130,000 men. At least, this was the official guess. It was hard to guess when the bodies had been hit by millions of explosions and

shattered and tossed apart: skulls flew away from bodies, and bones from different bodies got mixed together only to be hit again and shattered further and separated again. Some sixty million artillery shells had landed here, digging sixty million craters large and small, deep and shallow, circular and oblong, spraying out dirt that buried men alive and filled up craters dug only minutes or hours before. A new explosion exposed dozens of bones, exposed them to the sun for a day, exposed them to the night to answer the whiteness of the moon. The explosions continued for nearly a year. The bombardment shattered bedrock that had endured for tens of millions of years and turned it into new soil. Twenty-year-old human bodies had no chance to resist; their flesh and blood and excrement made much easier soil. The 130,000 were so thoroughly shattered that no one could identify them, not even which army they had belonged to. So they were entombed together, comrades and enemies embracing, with the identities that had made them hate one another entirely erased.

Some two and a half million men had fought here, fought back and forth, back and forth, back and forth for nearly a year, and some third of a million men had died here. This number too was a guess. A hundred thousand men had simply disappeared. Had they sneaked away in the night and gone home, or had they been so thoroughly shattered and buried that no one had ever accounted for them? Every year for nearly a century, spring rains eroded from these hillsides and valleys new bones, so perhaps another hundred thousand skeletons still lay unfound. Many of the 130,000 skeletons had been unearthed by accident, by foresters digging holes to turn the barren battlefield into a forest; no one had ever systematically excavated the entire battlefield for bones.

I was in the Douaumont Ossuary atop the highest ridge at the battlefield of Verdun in France, not far from

the German border. Never in the annals of human warfare had so many given so much for so little. Verdun had defined World War One and its western front and trench warfare, where national pride and antique military tactics collided with the brutal new realities of industrialized warfare. Upon a ridgeline with only modest strategic advantages, both sides affixed their pride, their identities as superior nations, and thus neither side could bear to give ground and both sides poured in lives and arms. When the war began, these skulls had beamed with delight and certainty for the glory they would win, and these arm bones had waved hats and flags and rifles. At least they got this art-deco ossuary, with two long corridors, a chapel, an eternal flame, a grand tower (with a round top that suggests an artillery shell), and more than a dozen chambers packed with anonymous skulls. Unlike church ossuaries and catacombs, where the bones were arranged carefully and even turned into works of art, Verdun's ossuary was dedicated to chaos.

I had come here to witness a total eclipse of the sun, in 1999.

Verdun was not my first choice from where to watch the eclipse. I had studied the eclipse map, with its narrow band of totality running across Europe, and I noticed that it included Ulm, Germany, the birthplace of Albert Einstein. Einstein seemed the perfect patron saint for an eclipse. Out of his cradle, out of his brain had unfolded the geometries of the universe, of space and time and forces strange and powerful, including the geometries the planets and moons trace out. In a 1919 total solar eclipse, British astronomer Arthur Eddington observed Mercury crossing the sun and confirmed that Einstein's general theory of relativity offered a more accurate map of gravity and planetary motions than Isaac Newton's theories, lifting Einstein out of the cloister of physics and making

him an international celebrity. Part of the news sensation was that not long after British and German troops had been killing one another, a British scientist was elevating a German scientist above his own national icon, Isaac Newton. In a world exhausted from nationalism, astronomy had risen higher.

At Ulm, totality would last two minutes and five seconds. I imagined myself standing on some cobblestone street outside the house where Einstein was born, where he had first been wonderstruck by the night sky or the mysteries of magnets. But as I investigated further, I learned that Einstein's house was no longer there. His street had been bombed during World War Two. The bombardier probably didn't notice that his bombs were falling according to Einstein's gravity and not Newton's. I decided that Einstein's ghost house would still work, but when I got to Ulm I found that his street was narrow and sky-obstructed, so I decided to watch the eclipse from the nearby, huge plaza in front of the Ulm cathedral, with the world's tallest cathedral spire pointing skyward. Ulm seemed even more appropriate when I discovered that its fourteenth-century city hall held an elaborate astronomical clock, including lunar cycles.

I had several days before the eclipse, so I set off on a cultural tour of this region of Germany. I visited Weimar, where Goethe contemplated humankind's Faustian spirit and fate, where Schiller offered his Ode to Joy, and where Nietzsche considered whether humans without God would become supermen or madmen. I drove up the ridge, not many miles, within smoke-sniffing distance, to where the Nazis had built the Buchenwald concentration camp for Germany's political, scientific, religious, and cultural elite (including Elie Wiesel). It was to Buchenwald that Werner von Braun went to find prisoners better qualified to build rockets than the common laborers at his Peene-

münde prison camp; the SS transferred 636 prisoners to von Braun. It was on the hillsides around Buchenwald, the same hillsides where Goethe had sought nature's inspiration, that the boy von Braun had attended school and become possessed by the idea of traveling into space. At the end of the war, American generals, shocked by what they were discovering inside the concentration camps, ordered that 1,200 residents of Weimar be marched up the ridge to Buchenwald to see the piles of corpses, the ovens, and Nazi "souvenirs" like shrunken heads and skin tattooed with German knights.

I visited Bayreuth, where the annual Wagner festival was underway, loudly glorifying German gods and heroes and warrior valor, drawing tens of thousands of pilgrims from around the world, even Jews carrying the still-bold idea that the universe is ruled by benevolence.

The day before the eclipse, the time for me to head back to Ulm, I began studying the weather forecasts. For days the sky had been overcast, sometimes rainy. The forecasts predicted more clouds and more rain for eclipse day. For hours I watched the morning television newscasts, switching from channel to channel, from country to country, from language to language, none of which I could understand, studying the maps to get the best information and to make the best decision about where to go. I would need to decide this morning and make a run for it, but which way? If I headed east into Austria I'd be getting into mountains and probably worse weather, and the mountain roads would offer less flexibility for making a last-hour chase for a break in the clouds. France seemed to offer a lower chance for rain, if still too much. I got out my eclipse map and studied the path of totality in eastern France, and I saw that it included Verdun. I didn't know much about the geography of France, but I knew that generals everywhere liked to take and hold the high

ground. A bit of high ground might be helpful, not only for viewing the sky but for seeing the lunar shadow moving across the land. I thought of American Civil War battlefields, public places with miles of roads and open fields; if Verdun was similar, I wouldn't need to trespass on some farmer's field or driveway. I headed for Verdun.

I did not know that Verdun was one of the rainiest places in France, with rain about half its days. When I woke up the next morning, I didn't need to peek outside my tent to tell there was no sunshine. The eclipse was going to start in three hours, at 9:10 a.m. I drove to the battlefield and found that plenty of other people had decided it was a good place for seeing the eclipse. In front of the ossuary was a large plaza facing the sun, the would-be sun, and a crowd was gathering, some with telescopes and sophisticated cameras. On the lawn sloping below us, 16,142 crosses marked the graves of soldiers who had been identified, but only French soldiers.

The rain started. I took shelter in the ossuary. I stared into eyes whose sun had been eclipsed long ago.

The battle was eighty-three years ago, so a few of these skulls could have been alive today, sitting on porches and telling tales. These skulls had been capsules heading toward the future on paths not as reliable as 9:10 a.m. planetary orbits but still capable of carrying them for a century. These skulls would have glowed with women's faces and children's joy and Christmas lights. But all these capsules had crashed here, stopped tree-ringing here. All these bones rising toward the future became the broken and fallen columns of a ruined city. The skulls told me how they had cared about nation and domination more than they valued life itself.

The rain let up, but the clouds did not. I went for a walk through the battlefield. It remained miles of craters, a million craters. The farmers who had owned this

land made little effort to reclaim it after the war, for it remained too rough to plow or plant and held thousands of still-unexploded artillery shells and too many corpses. Who would want to buy food juicy with the blood and gore of dead soldiers? Some hilltops held the ruins of cement forts and the traces of trenches and tunnels. When I wandered off the pathways and into the fields and woods, my boots quickly clotted with mud, mud no doubt rich with lost blood and pulverized flesh.

Interpretative panels held many photos of the battlefield soon after the battle, cratered landscapes that resembled the moon. More than one soldier was quoted comparing the battlefield with the moon.

Now the moon would descend here again. A landscape of craters would come; a landscape without life would come; the shadow of death would invade Earth again.

At the time the eclipse was supposed to begin, when the edge of the moon first touched the sun, the sky was still thoroughly cloudy. It seemed we were going to miss the eclipse. We waited, ten minutes, twenty minutes, thirty minutes, but the clouds remained. We waited. The whole eclipse, from first contact until last, would last nearly three hours. We waited as only Earth could wait, not as a moon that had waited four and a half billion years without even knowing it was waiting, counting time only with the hourglasses of boulders decaying into dust. We waited as only life could know the passage of time and the coming of events, metabolizing time into feelings, into hope and plans and worry for the future, into recognition of the motions of forces far larger than life, into awe at the workings of the universe.

The sky and the ground were unusually dark: was this because the clouds were hopelessly thick, or because the advancing eclipse was blocking the light?

Forty-five minutes before totality, the clouds began to thin and break. We caught glimpses of a sun with a large slice covered. (Glimpses, of course, through protective glasses, for even in an eclipse the sun remained far more powerful than us, more powerful than eyes that without thanks used the sunlight to mark their territories and aim their artillery shells). Then the clouds parted, like curtains opening. We saw a huge arc of clear sky. The crowd cheered. As totality approached, clouds occasionally crossed the sun, but totality itself would be entirely clear. Only after the eclipse ended did the clouds move back in, covering the sky for the rest of the day. We would be among the few in Europe to see the eclipse. The crowd cheered, and not just for the gift of good weather.

The ground and the air held an unusual dimness and glow, not from the weather but entirely from the eclipse. The moon continued advancing, too slowly for human eyes to see it moving from moment to moment, but minute-hand fast enough to notice it advancing from minute to minute. The moon, the expert on phases, showed the sun how to be a crescent, four-fifths whole, two-thirds whole, a half sun, less than half. Slowly, steadily, the clockwork solar system revealed how it kept giant balls rolling in perfect motions, perfect orbits; silently, so silently, the music of the spheres played its massive harmonies. For once, I could feel the ground beneath me rolling through space, synchronized with the moon and sun. Occasionally I took my eyes from the sky and looked at the ground and saw it growing dimmer, its color changing, more silver, or sort of grey, or maybe blue. I noticed the grass and trees glowing oddly, and I held out my hand and saw it too glowing oddly, which of course only revealed the strangeness we had possessed all along but refused to notice. I noticed my shadow fading away, merging into the greater shadow, the cosmic night, to which we had belonged all along.

As the light faded, all the plants around me, the grass and trees and cemetery flowers, began going hungry—an ancient, deeply rooted hunger. The energy flowing within them slowed, and their biological looms began shutting down their merging of water and air and soil into molecules and cells and plant forms. Tricked into thinking night was arriving, they began relaxing their leaves and fading into sleep.

Birds stopped singing and some darted about in apparent confusion, perhaps heading home to their nests; these birds were the descendants of birds that had once fled the thunder of cannons. Insects too went quiet. I looked at a couple of pet dogs in the crowd and they too appeared a bit nervous, perhaps from the same instinctive animal sense of normality and violation that set humans imagining dragons devouring the sun and set them banging drums and performing magic to defend the sun.

As the moon advanced, the air grew noticeably cooler. The coldness of space was reaching through and touching our faces.

The intercepted sunlight, the light that would have been nourishing the life of Earth, was now falling onto a world of nothing but rock and dust, craters and lava and rubble. The light was not meeting any air that mellowed it into a pleasant day and unfolded its secrets into a colorful sky, into rainbows or sunsets; now the light meant intense heat. The light did not sparkle with the energy of oceans and rivers and lakes nor inspire them to rise into clouds and rain. The only greenness the light found was in specks of volcanic glass. The light found mostly greyness. The light created only crude shadows, for it found only crude shapes. The light set the molecules of the dust buzzing with energy but the dust lacked the forms and skills to do anything with this energy and only threw it away. The dust didn't know the secrets of using the light to turn formless-

ness into form, to weave land and water and air into coral reefs and forests and dolphins. Energy that would have become the galloping of horses and the flapping of wings had nowhere to go. Light that would have set eyes aglow was not seen by anyone. Light that would have become the light of consciousness, that would have glowed with wonder at the cycling of Earth and moon and sun, ended up as more littered energy in a universe of chaos and obliviousness.

The whole universe is like the moon, chaotic and lifeless and mindless. This is a universe of craters, of planets and moons saturated with craters, craters within craters, craters atop craters, craters ruining other craters. This is a universe of rubble thrown out of craters, of boulders and fragments and vast plains of dust. This is a universe of rocks attacking one another, of asteroids and comets colliding with one another and with planets and moons. This is a universe of gas, of huge clouds of gas and planets of gas. This is a universe of ice. This is a universe of too much cold and too much heat, too much darkness and too much radiation, too much overcrowded matter and far too much emptiness. This is not a universe of life, not much of it, only isolated specks of it, not a universe where life should regard itself as normal or inevitable or safe. The universe is enormously talented at blocking and extinguishing life. Throughout the universe, intelligent species have watched helplessly as a rogue star wandered toward them, turning tides into tsunamis, cracking tectonic plates and setting volcanoes flowing, ruining ancient cities. Civilizations have watched nearby stars going supernova, watched nearby black holes growing larger and more energetic. Worlds full of life have been engulfed and burned to dust, and their planets have entirely disappeared. Worlds long full of life have been severely disrupted by asteroid impacts, by mobs of volcanoes filling the

atmosphere with poisons, by climates deteriorating.

So why is it that in an ungenerous universe of craters, where Earth had been set free from the curse of craters, why is it that I am surrounded by a million craters? Why has the life of Earth chosen to inflict upon itself the chaos of the universe? To paste upon Earth the deadness of the moon? Why have humans devoted so much talent and energy to cramming supernovas into little packages that we can drop upon ourselves?

It was because of the way we defined “ourselves,” or failed to define it. We didn’t perceive ourselves as simply “life,” the same rare force wearing many different forms and faces. We defined ourselves by our separateness, by the varied packages into which we had been divided. We defined ourselves by where we had been born, by differences in appearance or tribal stories or how we shaped sounds, by our favorite foods or music, by our passion for being different. We had inflicted upon ourselves the craters in our own identities. The chaos of the universe, of crashing worlds and exploding stars, had manifested itself in a new way, as a dysfunctional orbit of imagination. When you combine our failure to identify ourselves as life, our antibody-like impulse of hostility toward alien forms, our preference as social animals for identifying ourselves with the roles of societies and hierarchies, and our valuing status, pride, power, and domination more than we care about being alive, it leaves humans far too ready to destroy life, including our own lives.

The moon continued moving across the sun; the sky and ground darkened more noticeably; the air continued cooling. Strange pulses of light flickered across the ground and upon the ossuary tower as the last rays of sunlight were filtered by Earth’s atmosphere. When the sun was nearly covered, nearly a black disc, its edges held a few flickers of light, beams of light flowing through deep