

The Orchid and the Missile

Reflections on the MX

Paul Alan Cox

As Latter-day Saints, we are fortunate to have the Book of Mormon, which consists of writings of prophets from around 600 BC to AD 400 and of Christ's teachings to inhabitants of the New World. The last of these New World prophets was named Moroni. As the lone faithful Nephite survivor of a genocidal war, Moroni spoke directly to us in our day, prophesying the conditions that would ultimately prevail: "Yea, it shall come in a day when there shall be heard of fires, and tempests, and vapors of smoke in foreign lands; And there shall also be heard of wars, rumors of wars, and earthquakes in divers places. Yea, it shall come in a day when there shall be great pollutions upon the face of the earth" (Morm. 8:29–31).

Our days and times are truly marked by wars, rumors of wars, vapors of smoke, and great pollutions. It is interesting that Moroni links smoke, fire, and pollution to warfare in these verses, because modern warfare has serious environmental consequences. Although climate change, rain forest destruction, species extinction, and degradation of clean air and clean water all represent formidable environmental challenges, these threats pale compared to the environmental consequences of modern warfare in its most vicious and destructive form—detonation of nuclear weapons.

MX: A Nuclear Shell Game

During the Cold War, both the United States and the Soviet Union aspired to maintain a rough parity in nuclear capabilities to deter provocative behavior from either side. RAND corporation strategist Herman Kahn termed this view of reciprocal deterrence "automatic mutual

annihilation.”¹ However, in the late 1970s, the U.S. Department of Defense (DOD) feared that the United States would face an extended period of strategic vulnerability beginning in the 1980s due to technological advances in Soviet weapon systems. The Soviet Union had recently deployed the SS-18 intercontinental ballistic missile. The total warhead mass of 8,800 kg it could deliver to its target was more than twice that of any comparable American missile. Furthermore, each SS-18 was armed with ten multiple independently targetable reentry vehicles (MIRV), a technology originally pioneered by the United States for use on the Minuteman III missile system. Because of the greater throw weight of the SS-18, more MIRVs could be dispatched toward targets in the United States from a single missile launch. The Soviets had also produced a medium-range missile, the SS-20, mounted on mobile launchers, which potentially could evade U.S. surveillance and preemptive or retaliatory strikes during a time of crisis. The DOD believed that there could be a one- to two-decade period of risk in which U.S. Minuteman and Titan missiles in their fixed silos could potentially succumb to a sneak Soviet first strike.

To redress this perceived strategic vulnerability, the United States proposed to produce a new category of missile named the MX, equipped with ten multiple reentry vehicles (figs. 1, 2). Each of these MIRVs would contain a three-hundred-kiloton W-87 thermonuclear warhead with the explosive power of about twenty times that of the atomic bomb dropped on Hiroshima. While the number of missiles or launchers each side possessed was limited by treaty, there was no agreed limitation on the number of silos. Therefore, in a sort of nuclear shell game, the DOD proposed shuttling missiles in specially built trucks among multiple silos to be constructed in vast regions of western Utah and eastern Nevada. The theory was that the Soviets could never know which silo contained the actual missile, so that they would not be able to destroy all the U.S. retaliatory capabilities in a sneak attack.

MX—A Defensive or First-Strike Weapon System?

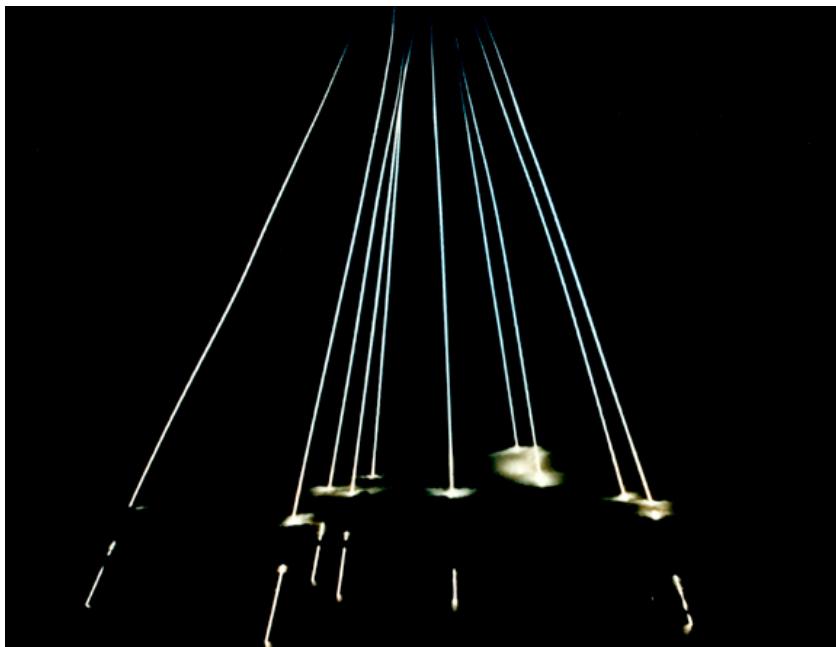
As a PhD student listening to seminars at Harvard by nuclear strategists such as IBM Fellow Richard Garwin, I became concerned about the MX missile system, which appeared to me to be deeply destabilizing to

1. Herman Kahn, *On Thermonuclear War* (Princeton, N.J.: Princeton University Press, 1960), 10; see also Sharon Ghamari-Tabrizi, *The Worlds of Herman Kahn: The Intuitive Science of Thermonuclear War* (Cambridge, Mass.: Harvard University Press, 2009), 211–12.



FIGURE 1 (left). The MX missile carried ten multiple reentry vehicles, each of which could be independently targeted. Courtesy U.S. Air Force.

FIGURE 2 (below). An early MX test at Kwajalein Atoll in the Pacific Ocean; tracks are from ten reentry vehicles carried by a single missile. Courtesy U.S. Air Force.



the strategic balance. First, unlike the United States, the Soviet Union's nuclear deterrent was largely dependent on fixed, land-based missiles that were inherently much more vulnerable to a first strike than U.S. systems since the U.S. nuclear deterrent included B-52 bombers and Polaris submarines. Since a portion of these were always in the air or out at sea, they were not as vulnerable to a Soviet first strike as U.S. land-based missiles such as the Titan and Minuteman III. In addition, significant U.S. advances in guidance systems resulted in unprecedented accuracy for the MX. Unlike the large Soviet warheads, the W-87 and submarine-borne W-88 thermonuclear warheads were miniaturized, being about the size of a large footlocker. Although they were of significantly less explosive yield than the Soviet warheads, the MX missile's accuracy, rumored to be within three hundred feet, guaranteed destruction of hardened targets housing Soviet command and control centers as well as Soviet missile silos.

What the U.S. defense community termed a counterforce strategy based on the MX system—allowing the U.S. president the option of retaliating against Soviet command and control facilities rather than civilian populations—could from Soviet eyes be perceived as a first-strike system. At the time, I wondered why we would want to threaten destruction of the very Soviet leaders the United States would need to negotiate with to prevent or curtail nuclear exchanges during a crisis. I could not find good answers to these concerns and wondered if more thought had been given by U.S. military planners to launching a nuclear war than in stopping one if we got into trouble with the Soviet Union. I feared that the MX system would paradoxically reduce the national security of the United States, since during a crisis it would encourage Soviet leadership to be the first to launch their missiles on a “use them or lose them” basis. The U.S. nuclear arsenal had successfully deterred nuclear war since the Soviets tested their first atomic weapon at the Semipalatinsk test site in Kazakhstan on August 29, 1949, including during periods of tension between the two superpowers such as the Cuban missile crisis or the installation of the Berlin Wall. The United States had never officially renounced first use of nuclear weapons during a conflict with the Soviets. Not only did our strategic nuclear deterrent threaten the Soviet Union's survival, but our defense of Western Europe against the numerically superior Warsaw Pact forces depended on advanced deployment of smaller tactical nuclear weapons to our European allies. It did not seem to me to be in our national interest to indirectly threaten the Soviets with an American first strike by developing the MX missile system.

Nuclear Weapons and the Restored Church of Jesus Christ

Like most Latter-day Saints, I pay close attention to statements from modern-day apostles and prophets of the Church. There seemed to me to be a strong historical sentiment of Church leaders against total warfare² in general, especially the use of nuclear weapons.

“Of one thing I am sure,” the prophet Brigham Young said. “God never institutes war; God is not the author of confusion or of war; they are the results of the acts of children of men. Confusion and war necessarily come as the results of the foolish acts and policy of men; but they do not come because God desires they should come.”³

“When the nations have for years turned much of their attention to manufacturing instruments of death,” Brigham Young said on another occasion, “they have sooner or later used those instruments. . . . From the authority of all history, the deadly weapons now stored up and being manufactured will be used.”⁴

A later prophet, Joseph F. Smith, said that the gospel “is being preached in power to all nations, kindreds, tongues and peoples of the world, by the Latter-day Saints, and the day is not far distant when its message of salvation shall sink deep into the hearts of the common people, who, in sincerity and earnestness, when the time comes, will not only surely register their judgment against a false Christianity, but against war and the makers of war as crimes against the human race.”⁵

“We are a warlike people,” President Spencer W. Kimball warned,

easily distracted from our assignment of preparing for the coming of the Lord. When enemies rise up, we commit vast resources to the fabrication of gods of stone and steel—ships, planes, missiles, fortifications—and depend on them for protection and deliverance. When threatened, we become antienemy instead of pro-kingdom of God; we train a man in the art of war and call him a patriot, thus, in the manner of Satan’s counterfeit of true patriotism, perverting the Savior’s teaching: “Love your enemies, bless them that curse you, do good to them that hate you, and

2. Total warfare is a military conflict in which a nation mobilizes all available resources in an effort to destroy another nation’s ability to wage war. It may involve means considered unethical or immoral and may not distinguish between military and civilian targets.

3. Brigham Young, in *Journal of Discourses*, 26 vols. (Liverpool: F. D. Richards, 1855–86), 13:149 (July 11, 1869).

4. Brigham Young, in *Journal of Discourses*, 8:157 (August 26, 1860).

5. Joseph F. Smith, “Editor’s Table: The Great War,” *Improvement Era* 17, no. 11 (September 1914): 1075.

pray for them which despitefully use you, and persecute you; That ye may be the children of your Father which is in heaven" (Matt. 5:44–45).⁶

Most Latter-day Saints Favored the MX Project

With a few notable exceptions, such as University of Utah law professor Edwin Firmage,⁷ it appeared that most Latter-day Saints along the Wasatch front initially favored the MX project. The Great Basin deserts of Utah and Nevada, where the MX was to be implemented (fig. 3), consist of what John McPhee would subsequently refer to as "basin and range" topography: uplifted mountains on the east of each valley with alluvial fans.⁸ The DOD intended to use the flat playas in a number of valleys to construct a vast network of silos for the newly proposed MX missile system. In 1978, DOD anticipated total construction costs, excluding the costs of the two hundred MX missiles and their two thousand W-87 warheads, to be \$40 billion—about \$179 billion in 2022 dollars. This would have made the MX missile system the largest single construction project in modern history, an endeavor on scale with the ancient pyramids of Egypt.

Real estate speculators throughout Utah and Nevada were thrilled. The Milford, Utah, barbershop regularly received calls from New York offering to buy any nearby land at any price. The prospect of new jobs and the injection of massive amounts of money into desert areas limping by on meager ranching and mining operations was irresistible, as I had previously discovered during my efforts to stop the construction of a 600-megawatt coal-burning power plant on the Kaiparowits Plateau in southern Utah.

As a devout Latter-day Saint, I felt somewhat distanced from my fellow members who equated unwavering support for DOD initiatives with patriotic support for the United States of America. Although a committed conservationist, I tend to be quiet about my environmental views in church settings because I go there to worship and not to share my political views with others. Still, it is difficult to overstate the popular support within Utah and Nevada for the MX project in 1979–81. In Utah, where Latter-day Saints constituted a majority of the populace, public ire was directed at the hippies, peaceniks, fellow travelers, and a few ranching families that

6. Spencer W. Kimball, "The False Gods We Worship," *Ensign* 6, no. 6 (June 1976): 6.

7. Matthew Glass, *Citizens against the MX: Public Languages in the Nuclear Age* (Urbana: University of Illinois Press, 1993), 130.

8. John McPhee, *Basin and Range* (New York: Farrar, Straus and Giroux, 1982).



FIGURE 3. Map of proposed MX missile basing in Utah and Nevada. Courtesy Library of Congress.

dared to publicly voice opposition against the MX system. After all, the MX project enjoyed strong bipartisan support. The MX initiative was proposed in 1979 by the Democratic Jimmy Carter administration and then championed by Republican officials who would rise to power in the newly elected Reagan administration. The MX missile would be good for the United States, would be good for the Utah and Nevada economies, and would protect our nation from Soviet attack. What was there to oppose?

Philip Morrison and the Boston Study Group

I had just finished writing my PhD dissertation in biology and so had time to attend seminars of the Boston Study Group organized by Philip Morrison, a renowned professor of physics at MIT. As one of the original

Manhattan Project scientists during World War II, Morrison had carried in the backseat of a Dodge from Los Alamos to the Trinity test site the plutonium core for a prototype plutonium implosion weapon. That device, the first atomic bomb, was successfully tested on July 16, 1945. On Tinian Island in the Pacific, he was in charge of the pit crew tasked with loading the atomic bombs into specially modified B-29 aircraft, which had honed their bombing strategies for Japan out of a base in Wendover, Utah. Morrison was one of the first American scientists to subsequently visit the devastated remains of Hiroshima. He knew the horrors of nuclear war firsthand.

At one evening seminar at MIT, during a question-and-answer period, I asked the visiting U.S. undersecretary of defense, "What is to stop the Soviet Union from simply fielding more missiles or equipping them with more MIRVs to overwhelm the fake MX silos?"

He replied with a shrug that Utah and Nevada were basically waste-land areas and so it would be easy to simply construct more silos in response to more Soviet missiles. I responded, "Sir, what you call waste-land, I call home."

With my PhD dissertation filed, I wrote Utah Governor Scott M. Matheson to offer my assistance in assessing the environmental impact of the MX missile. Within a week, Kenneth Olson, appointed by Matheson to direct the response to the project, hired me as staff ecologist for the Utah MX Coordination Office. In our offices in Salt Lake City, I worked with MX technical specialists John Roach, Ann Keegan, and Bob McMains to make a complete analysis of the environmental and economic impacts of the proposed MX missile program on the states of Utah and Nevada.

The Prophets Speak in an Unexpected Way

Before I could leave Cambridge for Salt Lake City, the First Presidency of the Church made a surprise announcement on May 5, 1981, concerning the MX missile:

We repeat our warnings against the terrifying arms race in which the nations of the earth are presently engaged. We deplore in particular the building of vast arsenals of nuclear weaponry. We are advised that there is already enough such weaponry to destroy in large measure our civilization, with consequent suffering and misery of incalculable extent. . . . With reference to the presently proposed MX basing in Utah and Nevada, we are told that if this goes forward as planned, it will involve the construction of thousands of miles of heavy-duty roads,

with the building of some 4600 shelters in which will be hidden some 200 missiles, each armed with ten warheads. Each one of these ten nuclear warheads will have far greater destructive potential than did the bombs dropped on Hiroshima and Nagasaki. . . . History indicates that men have seldom created armaments that eventually were not put to use. . . . Our fathers came to this western area to establish a base from which to carry the gospel of peace to the peoples of the earth. It is ironic, and a denial of the very essence of that gospel, that in this same general area there should be constructed a mammoth weapons system potentially capable of destroying much of civilization.⁹

I was stunned by this statement, which had apparently been developed by Church leaders over several months.¹⁰ Such strong opposition from the First Presidency slowly began to turn the tide of public opinion—at least among my fellow members of the Church—from strongly in favor of the MX missile project to a more equivocal position. However, the MX economic and political juggernaut had a momentum of its own, with immense support from the national defense industry, so I felt I still needed to do my part to stop the project.

A Fourteen-Volume Environmental Impact Statement

I arrived at the Utah MX Coordination Office in Salt Lake City to face a fourteen-volume draft environmental impact statement (EIS), which had been completed by DOD contractors at a cost of \$45 million. For several days, I read through the EIS volumes, which were filled with reams of data, studies, and graphs. As a young twenty-eight-year-old scientist, I really didn't know how to respond to such a mass of data. Out of desperation, I took maps of the missile silos, my compass (this was before GPS systems were available), a quadrat, and a four-wheel-drive Suburban and went into the west desert of Utah to resample the data.

Alone, driving through the west desert—although my dad once or twice volunteered to sleep under the stars with me on my research trips—I felt overwhelmed. Privately, Governor Matheson had made it quite clear that he opposed the MX project, as did Nevada Governor Robert List, but I feared that the EIS, assembled by hundreds of highly paid experts, would prove to be unassailable. Perhaps I might stumble on a few technical

9. "First Presidency Statement on Basing of MX Missile," *Ensign* 11, no. 6 (June 1981): 76.

10. Jacob W. Olmstead, "The Mormon Hierarchy and the MX," *Journal of Mormon History* 33, no. 3 (Fall 2007): 1–30.

issues that could require resampling of the data, but I feared that, with strong local political support for the MX in rural Utah and Nevada, anything I came up with could at best only delay, but not stop, the MX project. My goal was simple. I would shoot compass bearings to locate every missile site proposed by the DOD and then use my quadrat to sample the plant communities present at the proposed missile sites. Perhaps I might discover some small difference in the data that would require the DOD to resample.

A Desert Orchid Saves the Day

The first inkling I had that something might be seriously flawed with the MX draft EIS came on July 9, 1981, during my field trip to Tule Valley between the House mountain range on the east and the Confusion range on the west. There I sighted in the compass bearings for an MX missile silo about a kilometer west of Notch Peak, a prominent granite outcrop in the west desert of Utah. As I walked the proposed missile site, I was stunned to see terrestrial orchids that I recognized as *Epipactis gigantea* growing along a small stream coming from a granite canyon. The stream appeared from a spring and then soon disappeared back into the desert sand. The beautiful orange and yellow orchids (fig. 4) were produced from spikes that were one to two feet tall, arising from the large parallel veined green leaves. The draft EIS said nothing about the stream or any orchids, although some enterprising rancher had piped part of the stream to fill a cattle guzzler further down in the valley. I rechecked the compass bearings and found that the orchids were positioned exactly above the missile site. How could a large team of scientists miss such a prominent and extraordinary biological feature? Even a nonbotanist would realize that there was something unusual in this stand of beautiful orchids surrounded by miles of arid desert. I wrote in my trip report to Ken Olson, "On July 9, I visited Painter Spring in eastern Tule Valley, and found, what I believe will prove to be threatened or endangered species of terrestrial orchids, Indian Paintbrush, and Columbines as well as evidence of cougar visitation."

I returned to my Salt Lake City office and pored through the vegetation reports in the draft EIS. I did not find any mention of orchids, but I found a very interesting survey of annual plants. The draft EIS included data on cover—basically the area of the shadow cast on the ground—by a variety of annual plants. Such cover data, recorded along a transect with a quadrat, are important to ranchers and land managers determining grazing potential and to plant ecologists surveying ecosystem composition. What caught my attention was the date of the EIS survey: mid-February 1979.



FIGURE 4. The orchid *Epipactis gigantea*. “Epipactis gigantea stream orchid close” by Dcrjsr, https://commons.wikimedia.org/wiki/File:Epipactis_gigantea_stream_orchid_close.jpg, licensed under Creative Commons Attribution 3.0 Unported license.

I called up the Utah state meteorologists and asked what the weather was at a proposed missile site on the sample date. An hour later, I got a call back. The state meteorologists were not sure what the weather was at that exact spot, but a weather station in Milford, Utah, about sixty miles away, recorded a meter of snow on the ground on that date. As I hung up the phone, I realized that the situation with the MX EIS was far more serious than I had ever assumed. The MX vegetation data had been faked.

A Defense Contractor Seeks Redemption

I went through the list of scientists who had authored the draft EIS, looking for any familiar names. I found a scientist I knew who had graduated from an Ivy League institution and rang him up at the defense contractors' office in California. After chatting for a few minutes, I mentioned that I had found cover data of annual plant species—species that flower in the spring and then die away in the fall—in the EIS recorded from midwinter. Would he like to explain to me how those data were obtained? There was a long silence on the phone. I told him how sorry I was that his career was probably now over and that his PhD from a prestigious eastern university would now be of little use. “As you know, fabricating data is an unforgivable sin for a scientist,” I told him. I let those words sink in.

But I then held out a lifeline. "I know that you are a good person, and I am sorry that you have had to accept a job under such a terrible employer. But perhaps there is a way that you can redeem yourself."

The Department of Defense Goes on the Defensive

Soon, the pace of work really picked up at the MX office. I continued to find more problems with the missile silo sightings. "The town of Garrison, Utah, is probably the major community in the area," I wrote to Ken Olson on August 10, 1981, about my field trip to Snake Valley during the week of August 4, 1981.

It has a highly developed agricultural base consisting of irrigated farming; the major crops appear to be corn and alfalfa. This high agricultural development is possible due to the presence of Pruess Lake, a reservoir formed by a dam across Lake Creek. Plastic PVC pipes carry water from Pruess Lake three miles to Garrison. . . . As proposed, the DTN [missile access road] would go right through the residence of the Wheeler family and through the center of several agricultural fields. . . . I was mystified by the proposed siting of the southern half of [missile] cluster #9 [which] appear[s] to straddle a high-voltage power line that traverses the valley in an east-west direction. The location of this power line is not even shown on the Air Force maps. . . . [Missile] cluster #11 also severely impacts water developments and agricultural areas for the Robinson Ranch. Fate must be against these people as the intersection of the DTN coming north from Milford and the DTN coming west from Tule is proposed by the Air Force to be built exactly on top of their house.

Several silos would have required complete realignment of the electrical power corridor from the Intermountain Power Plant in Delta, Utah, clear into Nevada. When I informed the Intermountain Power Agency that they would have to reroute hundreds of miles of powerlines, they were not pleased. The DOD immediately dispatched a team from Norton Air Base to Salt Lake City to try to calm them down. I discovered similar conflicts with access to Getty mining roads in the Great Basin, and again a team from Norton Air Base was sent to Salt Lake City to deal with the controversy. I spent a lot of time with ranchers staring at missile silo maps spread out on the hood of my four-wheel drive. They pointed out to me how the proposed missile silos would require them to stop ranching. Things reached a crescendo when Governor Matheson sent the DOD a memo I had prepared for him about the West Desert High School in Trout Creek, Utah.

I wrote to Ken Olson:

Perhaps one of the most odious siting proposals, is that of [missile] cluster #16 which is sited upon the West Desert School, the major educational facility in the area. Cluster site 16-5 appears to be placed directly on top of the school building. The school children would be within a one-mile radius of [missile] shelters 16-4, 16-35, 16-6, 16-31, and 16-5. This will, no doubt, add to their appreciation for the nation's commitment to defense. However, for purposes of safety of the school children and with respect to the tremendous distance which children are bused to this school, I suggest that all of cluster #11 south of the CMF be completely eliminated.

The governor had that year been the invited speaker for the graduating class of four students. My memo to the DOD stated, "Although we appreciate the efforts of the Department of Defense to inculcate patriotism among our Utah students, could the MX silo be moved sufficiently away from the school so they could at least play half-court basketball?"

That memo generated a direct call to me from General Lamb at Norton Air Force Base. "Dr. Cox, you won't take this to the press, will you?" I told him that he need not worry, that I would of course not go to the press because I was merely a scientist working on technical topics. If anybody took it to the press, it would be Governor Matheson. I mentioned that perhaps a nice fade-in of the governor's graduation speech at the school to stock footage from an H-bomb test in Bikini Atoll would make for an interesting segment on the evening news.

Many of the proposed missile sites violated technical design features for the MX missile as determined by the Air Force. "The Douglas ranch would be severely impacted by shelters 16-22 and 16-23. Trout Creek would be severely impacted by 16-29, which, for some mysterious reason is sited in the middle of the creek," I wrote to my superiors.

DOD: Defending My Fourth Amendment Rights?

Governor Matheson, through Ken Olsen, warned me that my office phone and home phone were being tapped. I should henceforth make important calls from public telephones. I dismissed his warnings. The Air Force invited me to spend a weekend at the underground Strategic Air Command headquarters in Omaha, but my mother told me not to go. "Paul, they are going to do something to you down there, and you won't come back the same boy." I thought that this was all overreaction, but then one morning I came into my office and noticed that a few security measures I had instituted, such as my pencil pointing at a certain word in an open

book on my desk or a hair placed strategically on a file cabinet drawer, had been disturbed. Clearly my office had been thoroughly and professionally searched.

I invited my United States Air Force liaison officer into my office. “Major, I just wanted to let you know even though we are on different sides of the MX issue, how grateful I am that you are willing to risk your life to protect my constitutional rights.” I paused and stared at him.

“Who told you? How did you know? This happened on orders from the Pentagon.”

“We don’t have any secrets here. If you need to see something in my desk or file cabinet, just ask me and I’ll give it to you.”

“They just can’t figure out how every time we announce a new environmental study, Governor Matheson responds in a few hours with a detailed critique including thirty to forty footnotes.”

“Governor Matheson is a brilliant and capable individual who is totally conversant with the applicable technical issues and environmental laws. The Department of Defense should never underestimate his intellectual abilities.”

After this, Air Force officials dropped a few comments about my former personal life and activities in Cambridge, Massachusetts, and my upcoming appointment at the University of California, Berkeley. I found the Air Force comments more amusing than creepy and shrugged them off.

On August 19, 1981, I was flying in the State plane over the MX area and asked the pilot to stop at the small airstrip in Delta, Utah, where I knew there was a public phone booth. Once on the ground, I called my wife, Barbara, who was staying with my mom and dad—then superintendent of Deer Creek State Park—at their ranger home. Barbara told me that she had felt some contractions. I raced back to the plane and asked the pilot to fly me straight to Midway, Utah. Early the next morning, Barbara gave birth to our third child, Mary.

A Party at Norton Air Force Base

The entire summer was filled with nearly weekly flights dispatched from Norton Air Force Base to Salt Lake City to deal with Governor Matheson’s continuing barrage of erudite and technically accurate critiques of DOD environmental reports. I succeeded in having the Utah Attorney General declare excavating a missile silo as being a mining activity and therefore subject to the 1977 U.S. Surface Mining Control and Reclamation Act. The DOD would therefore be required to submit a reclamation plan for each of the silos. I found evidence that a golden eagle nest had been disturbed during environmental surveys, which was a clear violation of the

1973 Endangered Species Act. Working with the Utah State Geological Survey, I found that DOD contractors had gone onto Utah State land sections in the Great Basin without prior permission and reminded the DOD that the citizens and State of Utah took trespass laws very seriously. I asked the DOD where they were going to get the water to irrigate the aspen trees surrounded by graceful deer that they had portrayed in the conceptual drawings of the MX silos. The DOD contractor's consultant, who appeared to be a graduate student, said he planned to pump water from the Colorado River (three hundred miles distant) to the MX project. I met with him and Air Force representatives in Carson City, Nevada, with all of the desert experts I could load onto the State plane, including reclamation pioneers Professor Neil West, Professor Bertrand Harrison, Dr. Neil Frischknecht, Ralph Holmgren, and Perry Plummer. These experts told the DOD and their consultant that the proposed reclamation plan was fanciful at best.

As my departure for UC Berkeley approached, I issued a final report to the State of Utah in which I said, "The environmental documents produced by the Air Force and its contractors which I have read this summer, have been almost universally devoid of scientific merit."

The Utah governor indicated to the DOD that the draft EIS was so deeply flawed that it violated the 1970 National Environmental Policy Act and would have to be completely rewritten, a process that would likely take two years.

On my last day at the MX office in Salt Lake City before I left for my new job at the University of California, Berkeley, I received a phone call from General Lamb at Norton Air Force Base. "Dr. Cox, do you hear that noise in the background?"

I could hear loud laughter, the sounds of joviality. I told him that it sounded like a party. "Correct. Do you know why we are having a party?"

"No," I responded.

"Because it's your last day at the MX office! Have fun at Berkeley," he said.

However, two months later, I received a very different message from General Lamb. He wrote, "In all seriousness, I thank you for your candid comments. . . . I appreciate comments concerning the good or bad performance of our contractors, particularly from persons with credentials like yours. We, too, are concerned with the quality of our contract work efforts."¹¹ I was later told that the FBI had been asked to investigate one of the contractors for fraud.

11. Charles W. Lamb to author, October 14, 1981.

The Cold War Is Over, So Why Worry?

The environmental impacts of nuclear weapon detonation represent the most serious environmental threat known. Since the Castle Bravo test at Bikini Atoll on March 1, 1954, to the present, indigenous inhabitants of neighboring atolls have not been able to return to their home islands because of residual radiation from the distant H-bomb tests.

Detonation of even a small thirty-kiloton thermonuclear device would generate lasting environmental consequences greatly exceeding the costs of the losses from Hurricane Katrina, which reached \$125 billion. Loss of life would of course be far greater. Seventy thousand Japanese civilians instantly died in Hiroshima at 8:16 a.m. on August 6, 1945.¹² We could expect many more Americans to perish from a large Soviet hydrogen bomb with explosive force measured in the megatons. A limited nuclear exchange between the United States and Russia, even consisting of the launch of a single R-3 intercontinental ballistic missile (successor to the Soviet SS-18) with its ten independently deployable warheads, would kill millions of Americans and reduce the economy of the United States to Third World status.

Although strategic nuclear exchanges between the United States and the Soviet Union were successfully deterred during the Cold War, use of nuclear weapons has been threatened by President Vladimir Putin of Russia in the aftermath of his February 2022 invasion of Ukraine, particularly if Russia stands to lose the conflict or if Putin believes that there is an existential threat to his regime.¹³ Furthermore, China has been rapidly increasing its strategic nuclear arsenal beyond its former deterrent posture¹⁴ in response to emerging regional conflicts with the USA. Proliferation of nuclear weapons to smaller states has tremendously increased the probability of future nuclear warfare. Pakistan and India have only five minutes to respond to launch warnings; during periods of tension,

12. "Atomic Bombings of Hiroshima and Nagasaki," *Encyclopedia Britannica*, <https://www.britannica.com/event/atomic-bombings-of-Hiroshima-and-Nagasaki>.

13. Susan D'Agostino and François Diaz-Maurin, "Will Putin Go Nuclear? An Updated Timeline of Expert Comments," *Bulletin of the Atomic Scientists*, June 6, 2022, <https://thebulletin.org/2022/06/will-putin-go-nuclear-an-updated-timeline-of-expert-comments/>; Dennis Romboy, "U.S. Should Prepare for a 'Cornered, Delusional' Vladimir Putin Using Nuclear Weapons, Mitt Romney Says," *Deseret News*, May 23, 2022, <https://www.deseret.com/utah/2022/5/23/23137940/mitt-romney-us-prepare-delusional-vladimir-putin-nuclear-weapons-russia-ukraine-war-nato>.

14. Alastair Gale, "China Is Accelerating Its Nuclear Buildup over Rising Fears of U.S. Conflict," *Wall Street Journal*, April 9, 2022, <https://www.wsj.com/articles/china-is-accelerating-its-nuclear-buildup-over-rising-fears-of-u-s-conflict-11649509201>.

either side might find themselves in a “use it or lose it” situation. Pakistani physicist and engineer A. Q. Khan transmitted Chinese language blueprints for atom bomb design to Libya and is believed to be the source for the design of the 4,500 ultra-high-performance centrifuges that are isolating weapons-grade uranium in the Islamic Republic of Iran.¹⁵ North Korea has conducted nuclear weapons tests culminating in a successful hydrogen bomb and has launched three-stage intercontinental missiles of sufficient range to strike the United States. Only their current inability to protect missile warheads from the heat and pressure of reentry stands as a barrier to the North Korean leadership from directly threatening cities in the United States. Israel has a nuclear arsenal estimated at one hundred warheads and the ability to quickly deliver them to their adversaries.

Nonstate actors including Al-Qaeda, ISIS, and other terrorist groups have demonstrated their desire to obtain nuclear weapons. Since 1993, there have been 419 cases of smuggled nuclear materials worldwide with about 1.6 million kilograms of highly enriched uranium and 500,000 kilograms of plutonium available in nations around the world, an amount estimated sufficient to manufacture numerous nuclear bombs.¹⁶

Loss of biodiversity, climate change, and all other known environmental threats pale compared to the environmental consequences of nuclear war. I do not think that Latter-day Saints should forget the 1981 words of the First Presidency, who told us that if a nuclear attack occurred, “the result would be near annihilation of most of what we have striven to build since our pioneer forebears first came to these western valleys. Furthermore, we are told that in the event of a first-strike attack, deadly fallout would be carried by prevailing winds across much of the nation, maiming and destroying wherever its pervasive cloud touched.”¹⁷

President Gordon B. Hinckley quoted General Omar Bradley: “We have grasped the mystery of the atom and rejected the Sermon on the Mount. . . . Ours is a world of nuclear giants and ethical infants. We know more about war than we know about peace, more about killing than we know about living.”¹⁸ But we are not without hope. Here are three concrete steps the United States can take to reduce the peril of nuclear war:

15. Gordon Corera, *Shopping for Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A. Q. Khan Network* (New York: Oxford University Press, 2006).

16. Marina Koren, “Top Ten Cases of Nuclear Thefts Gone Wrong,” *Smithsonian*, February 4, 2013, <https://www.smithsonianmag.com/science-nature/top-ten-cases-of-nuclear-thefts-gone-wrong-10854803/>.

17. “First Presidency Statement on Basing of MX Missile,” *Ensign* 11, no. 6 (June 1981): 76.

18. Gordon B. Hinckley, “Reach Out in Love and Kindness,” *Ensign* 12, no. 11 (November 1982): 77.

1. Make the nuclear nonproliferation treaty (NPT) a major foreign policy priority. The NPT is one of the most well-supported international treaties, with 191 signatory nations. The United States should take the lead on implementing the disarmament portions of the treaty.
2. Decline to install smaller nuclear warheads on cruise missiles and to enter a new arms race to develop hypersonic weapons, which offer little if no advantages over ballistic missiles in delivery times of payloads.¹⁹
3. Reenter the Anti-Ballistic Missile treaty while simplifying and strengthening the triad of the U.S. nuclear deterrent (land-based missiles, airborne bombers, and submarines).

My youngest daughter, Jane, called to serve in the Japan Fukuoka Mission, sent me a picture her companion had taken of her standing in front of the Hiroshima Peace Memorial, which was ground zero for the first detonation of a nuclear weapon in warfare (fig. 5). As a Latter-day Saint, I believe that sharing the restored gospel with the world is more likely to lead to world peace than any number of nuclear missiles. As President Ezra Taft Benson said, “The spectacle of a nation praying is more awe-inspiring, more powerful, than the explosion of an atomic bomb.”²⁰



FIGURE 5. The Hiroshima Peace Memorial. My daughter Jane Cox, a missionary serving in the Hiroshima area, is pictured in front.

19. David Wright and Cameron Tracy, “The Physics and Hype of Hypersonic Weapons,” *Scientific American* 325, no. 2 (August 1, 2021): 64–71.

20. Ezra Taft Benson, “Watchman, Warn the Wicked,” *Ensign* 3, no. 7 (July 1973): 41.

Paul Alan Cox was awarded the Goldman Environmental Prize, sometimes known as the Nobel Prize of the Environment, and was named one of *TIME* magazine's eleven "Heroes of Medicine." His conservation foundation, Seacology, has set aside over 1.5 million acres of rain forest and coral reef in sixty-six countries around the world. After serving as professor and dean at Brigham Young University, he became the first King Carl XVI Gustaf Professor of Environmental Science in Sweden. Currently, he serves as director of the Brain Chemistry Labs in Jackson Hole, Wyoming. This article is based on a talk presented at BYU's David M. Kennedy Center for International Studies on January 18, 2017. He thanks the Utah State Archives for retrieving memos he had written at the Utah MX Coordination Office.

Appendix

First Presidency Statement on Basing of MX Missile

The First Presidency issued on Tuesday, May 5, 1981, the following statement²¹ on the proposal to base the MX missile in Utah and Nevada:

We have received many inquiries concerning our feelings on the proposed basing of the MX missile system in Utah and Nevada. After assessing in great detail information recently available, and after the most careful and prayerful consideration, we make the following statement, aware of the response our words are likely to evoke from both proponents and opponents of the system.

First, by way of general observation we repeat our warnings against the terrifying arms race in which the nations of the earth are presently engaged. We deplore in particular the building of vast arsenals of nuclear weaponry. We are advised that there is already enough such weaponry to destroy in large measure our civilization, with consequent suffering and misery of incalculable extent.

Secondly, with reference to the presently proposed MX basing in Utah and Nevada, we are told that if this goes forward as planned, it will involve the construction of thousands of miles of heavy-duty roads, with the building of some 4,600 shelters in which will be hidden some 200 missiles, each armed with ten warheads. Each one of these ten nuclear warheads will have far greater destructive potential than did the bombs dropped on Hiroshima and Nagasaki.

We understand that this concept is based on the provisions of a treaty which has never been ratified, and that absent such a treaty, the proposed installation could be expanded indefinitely. Its planners state that the system is strictly defensive in concept and that the chances are extremely remote that it will ever be actually employed. However,

21. "First Presidency Statement on Basing of MX Missile," *Ensign* 11, no. 6 (June 1981): 76.

history indicates that men have seldom created armaments that eventually were not put to use.

We are most gravely concerned over the proposed concentration in a relatively restricted area of the West. Our feelings would be the same about concentration in any part of the nation, just as we assume those in any other area so selected would have similar feelings. With such concentration, one segment of the population would bear a highly disproportionate share of the burden, in lives lost and property destroyed, in case of an attack, particularly if such were to be a saturation attack.

Such concentration, we are informed, may even invite attack under a first-strike strategy on the part of an aggressor. If such occurred the result would be near annihilation of most of what we have striven to build since our pioneer forebears first came to these western valleys.

Furthermore, we are told that in the event of a first-strike attack, deadly fallout would be carried by prevailing winds across much of the nation, maiming and destroying wherever its pervasive cloud touched.

Inevitably so large a construction project would have an adverse impact on water resources, as well as sociological and ecological factors in the area. Water has always been woefully short in this part of the West. We might expect that in meeting this additional demand for water there could be serious long term consequences.

We are not adverse to consistent and stable population growth, but the influx of tens of thousands of temporary workers and their families, together with those involved in support services, would create grave sociological problems, particularly when coupled with an influx incident to the anticipated emphasis on energy development.

Published studies indicate that the fragile ecology of the area would likewise be adversely affected.

We may predict that with so many billions of dollars at stake we will hear much talk designed to minimize the problems that might be expected and to maximize the economic benefits that might accrue. The reasons for such portrayals will be obvious.

Our fathers came to this western area to establish a base from which to carry the gospel of peace to the peoples of the earth. It is ironic, and a denial of the very essence of that gospel, that in this same general area there should be constructed a mammoth weapons system potentially capable of destroying much of civilization.

With the most serious concern over the pressing moral question of possible nuclear conflict, we plead with our national leaders to marshal the genius of the nation to find viable alternatives which will secure at an earlier date and with fewer hazards the protection from possible enemy aggression, which is our common concern.