Translating Space, Rendering Violence: Iannis Xenakis’s Polytope de Mycènes (Mycenae—Alpha)

In the early nineties, French composer and theorist Michel Chion used the term rendering to describe a haptic cinematic process where real and imaginary temporaliities are joined through digital sync-sound technology. The result of this novel process is a visceral doubling of images, sounds, and bodies on screen, one that Chion found exemplified in an iconic scene in Philip Kaufman’s 1978 remake of the classic horror film *Invasion of the Body Snatchers*, which shows the “birth” of the alien dopplegänger of Donald Sutherland’s character. Chion wrote of his experience of the film as something “so concrete, so present, so sharp in the high registers, so haptic, i.e., touchable, altering the perception of the world of the film, making it more immediate, even precluding the distance.” In staging a collision between noise and image with such subtlety, an imperfectly faithful copy or approximation of “real-time” was achieved. Digital sound both amplified and doubled the experience of the reality of what was unfolding on screen and in the viewing space, resulting in what Chion termed a “quiet revolution,” or as he wrote: “Revolution first of all, are in the rendering of the real.” While Chion’s notion of rendering is a response to specific developments in cinematic audiovisual technologies in the eighties, it parallels how Greek architect and composer Iannis Xenakis interfaced digital sound technology with existing architecture to remediate space-time. His work *Polytope de Mycènes* (1978) was a process of translation—from singular to double, from image to sound, and from virtual to physical—that rendered concrete space into a violent technological imaginary.

With *Polytope de Mycènes*, Xenakis recast architecture as a series of repetitive and highly abstract technical processes. Accompanied by a complex electronic interlude—*Mycènes—Alpha*, a score composed entirely via an elaborate system of digital notation—the polytope was the result of his desire to absorb scattered sonic frameworks into a broader infrastructure of geographic and cultural specificity. One of the final versions of what was a series of site-specific multimedia installations, *Polytope de Mycènes* combined lighting and sound projections with ritualistic performances embodying the literature and culture of Greece. At its core, the installation was a profound attempt to reconcile discrete categories of ephemera—binary code, digital sound, mathematics, memory—with the concrete reality of the body and its lived history. It was not only an elaborate attempt to reenact ancient Greek mythology—it was also, I argue, an attempt to overcome material conditions of political violence and exile that Xenakis had experienced during World War II, by reproducing both the sensations and infrastructural conditions of warfare.

In footage of the polytope captured by Greek director Fotis Psichramis in his film *Polytope (Mycènes Alpha)—Hybrid Cinema* (1978), the disorienting elements of the performance are apparent. Twelve aircoast searchlights intermittently cast the ruins of the Mycene Acropolis into moments of dark mystery and illuminate it in violent clarity, as winding processions of animals and humans transverse the ravines surrounding the acropolis’s citadel. Torch-bearing children and bell-laden goats are intermittently lit by grotesque projections of Achaean funeral masks and the glow of fires burning across hilltops, invoking the mobile displacement of war, while the score of *Mycènes—Alpha* and accompanying orchestral percussion blast them with the sonic sensations of warfare. The modulation of perception, from discreet to monumental, becomes a form of sensual violence, making present aspects of reality that were previously imperceptible—a form of apprehension that media theorist and historian Douglas Kahn terms “transperception” or the “consciousness or intrinsic awareness of an energy that includes what has been transversed.”

With *Polytope de Mycènes*, Xenakis’s desire to create a networked transmission of vision and sound was less about rendering time and space and more about rendering the body as a receiver for the transmission of violent sensation. By reproducing the overwhelming sensations of techno-warfare as a networked media spectacle, Xenakis created an architectural system that supported his earlier ideas of uncinema and an intertwining of pointillist intermediary to translate space into sound. Such an initial probing can be found in a footnote to his 1976 thesis defense, where Xenakis elaborated on his proposal for the polytope, in which he envisioned using air-raid alarm speakers to disperse sound: “A network of laser beams to be reflected by artificial satellites, joining the continents at precise points situated near significant agglomerations between polytope centers, open to the general public, could react between one another (intercontinentally), following pre-established game rules.”

While these original plans were renounced, the resulting polytopes were intended as a demonstration of what Xenakis referred to in his thesis as the “pressure-time space of sound” or a “primordial” rendering of abstract thoughts and procedures through a compressed temporal loop of audiovisual effects. Xenakis’s earliest versions of the polytope foregrounded how new technology was being explored as a sensorial tool to enhance architecture; this approach can first be noted in the design of the Philips Pavilion at Expo 58 in Brussels. Xenakis collaborated on the pavilion with the Swiss-French architect Le Corbusier. While controversy marred the final accreditation of the pavilion’s design, Xenakis was primarily responsible for its iconic structural form. Le Corbusier did design the original floor plan (with a circulation pattern modeled on the human digestive system) and programming, but Xenakis devised an innovative structure comprised of hyperbolic paraboloid shells. The Philips Pavilion staged an audiovisual assault on viewers; it contained an eight-minute score titled *Poème électronique* that was composed by French musician Edgard Varèse, a series of visual projections by French graphic designer Jean Petit and French filmmaker Philippe Agostini, and a two-minute sonic interlude composed by Xenakis. The bombard of the pavilion’s soundscape was enhanced by Xenakis’s decision to remove the concrete casings from over three hundred loudspeakers used to broadcast Varèse’s score. Alongside Xenakis’s structure of curved paraboloid shapes and swooping peaks, the precise time schedule devised by Le Corbusier for the four sequential film projections—which depicted “the course of civilization and the threat to its prolongation” in tandem with a lighting program designed to “manipulate atmosphere and mood”—was intended to trigger
In the early nineties, French composer and theorist Michel Chion used the term *rendering* to describe a haptic cinematic process where real and imaginary temporalities are joined through digital sync-sound technology.1 The result of this novel process is a visceral doubling of images, sounds, and bodies on screen, one that Chion found exemplified in an iconic scene in Philip Kaufman’s 1978 remake of the classic horror film *Invasion of the Body Snatchers*, which shows the “birth” of the alien doppelgänger of Donald Sutherland’s character. Chion wrote of his experience of the film as something “so concrete, so present, so sharp in the high registers, so haptic, i.e., touchable, altering the perception of the world of the film, making it more immediate, even precluding the distance.”2 In staging a collision between noise and image with such subtlety, an imperfectly faithful copy or approximation of “real-time” was achieved. Digital sound both amplified and doubled the experience of the reality of what was unfolding on screen and in the viewing space, resulting in what Chion termed a “quiet revolution,” or as he wrote: “Revolutions first of all, are in the rendering of the real.”3 While Chion’s notion of rendering is a response to specific developments in cinematic audiovisual technologies in the eighties, it parallels how Greek architect and composer Iannis Xenakis interfaced digital sound technology with existing architecture to remediate space-time. His work *Polytope de Mycènes* (1978) was a process of translation—from singular to double, from image to sound, and from virtual to physical—that rendered concrete space into a violent technological imaginary.

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Le Corbusier’s 1958 plan for combining a spectacular lighting show with a highly regimented program of images and sounds hinted at the potential autonomy of technology from human control. It also served as a warning about the horrors of modern warfare and nuclear annihilation. By modulating the spatial and sonic conditions of the viewer’s experience, the architecture of the Philips Pavilion functioned as a medium within itself. For his monumental Polytope de Montréal in 1967, Xenakis extended Le Corbusier’s multimedia vocabulary for constructing and understanding architectural structures as experiential. Made for France’s pavilion at Expo 67, Polytope de Montréal was Xenakis’s first iteration in the series. It involved over one thousand strobe lights mounted on a series of curved paraboloid shapes. Accompanied by Xenakis’s score—also called Polytope de Montréal—the light show was structured around six-minute pulsations and the amplified playback of the composition through an audiotaped loop. According to sound theorist Brandon LaBelle, in Polytope de Montréal, Xenakis’s long-standing study of mathematics, architecture, and music was realized “in the form of a spatial experience,” one where visitors could move through the installation while being “enveloped in sound and light as a sonic and optical phenomenon.” Much like the Philips Pavilion, viewers were subjected to a fluid rendering of space and time with no fixed perspective.

Following Expo 67, Xenakis installed Polytope de Cluny in 1972 at the Musée de Cluny in Paris. Employing a more complex installation system than in his previous endeavors, one predicated on scaffolding, mirrors, and laser lights, Xenakis used an IBM mainframe computer to control the interactions between the installation’s disparate elements. The audience was invited to lie down on the site’s floor. Such an informal arrangement invited the participants to marvel at the sensations wrought by the installation’s display of technology and engage with the particularly novel experience of the lasers—technology that musicologist Maria Anna Harley has referred to as being “associated with revolutionary tools and dangerous weapons rather than ubiquitous household items.”

Harley crucially notes how the installation of Polytope de Cluny, conceived of by one of the most radical composers of that era, came on the heels of France’s 1968 student protests. In some ways, the confrontational nature of Xenakis’s work spoke directly to the events of May 1968. His transformation of one of Paris’s oldest sites into a volatile techno-imaginary reflected the contemporary political turbulence of massive protests and general strikes. As architectural historian Sven Sterken has also argued, Polytope de Cluny conflated the repetitious circuit of digital sound technology with the sensorial chaos of violence and conflict—creating an overwhelming “modulation” of space where “the audience is now in the spectacle, witness of the temporary transformation of the historical site into a violent cataclysm.”

While Xenakis staged another polytope in Persepolis, Iran (1971) and revised another version at the Musée de Cluny (1972–73), the most interactive version of the series was installed in the ruins of the Mycenae Acropolis in September 1978. Combining a series of laser projections and ritualistic performances involving processions of children, adults, and animals, Polytope de Mycènes animated the space of the acropolis with a cacophony of light and sound over the course of four nights (fig. 1). Located near the village of Mykines, the ruins of Mycenae—a former

13. Treib, Space Calculated in Seconds, 94.
17. Ibid.

fig. 1  Iannis Xenakis, Polytope de Mycènes, Mycenae, Greece, 1978. © Collection Famille Xenakis DR.
emotional and physiological responses in the viewer. Threatened by the overwhelming scale of the acoustics and the images of atomic warfare referenced in the visual slides, visitors alternately described the pavilion as “an intense physical experience,” a “storm of light, images, color and sound,” and “a terrifying natural disaster.”

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citadel surrounded by Mounts Zara and Agios Ilias—are flanked by plains and ravines. Once a stronghold of the ancient Mycenaean civilization, the ruins had, by the seventies, been transformed into a tourist attraction. As performance studies theorist Marina Kotzamani notes, the citadel, uninhabited since the Mycenaean civilization collapsed in 1000 BCE, had become an alienated landmark for the Argolis region’s contemporary residents.19 Her vivid description of the Mycenae polytope’s performance outlines the environmental scale of Xenakis’s light and sound shows, which together formed “the coordinates of a virtual, abstract sculpture,” where the citadel, burial grounds, and ravines were transformed into a liminal historical space.20 Kotzamani reads Xenakis’s reinvention of the site’s historical specificity as a popular reinterpretation of ancient Greek culture: a hybrid nationalist reenactment that triangulates memory, place, and the lived experience of the area’s past and present inhabitants.21 Others also see nationalism woven into the specificity of the performance's geographical location. Architectural historian Olga Touloumi argues that Xenakis “saw in Mycenae a past that could potentially become a future, not only for Mycenaen per se, but also for Greece.”22 The uncomfortable dichotomies between Greece’s recent transition from military junta to democratic republic and Xenakis’s reinvention of Mycenae as the Bronze Age site of the “origins of democracy” were incongruities that Xenakis was both aware of and willing to exploit.23

The site’s geography held significance for Xenakis, who returned to Greece in 1975 after fleeing in 1947 to avoid prosecution for his role in the Greek resistance movement. After the government sentenced him to death in absentia, Xenakis spent decades without setting foot on Greek soil.24 Harley describes how Xenakis’s journey to Mycenae after his long absence was a profoundly spiritual attempt to reconnect with his heritage by visiting the “ruins of what has been called the cradle of Western civilization.”25 It was also an oblique circumnavigation of history. Xenakis’s choice to stage such a highly technical composition in dialogue with Greece’s ancient cultural milieu was a deliberate “leap back in time” toward violent paganism—a move that excluded thousands of years of Christianity.26 Oscillating between the archaic and the contemporary, Xenakis created an alternate historical framework through repetition. Kotzamani reads Polytope de Mycenes as a performative reworking of space and history in aid of nationalism,27 which dovetails with Touloumi’s interpretation of Xenakis’s piece as a cybernetic system,28 one that accelerated the chaos of Greek history through a closed temporal loop, underscoring Xenakis’s desire to overcome specific material and historical contingencies through compression.29 My analysis takes up this idea of transcendence to argue that Polytope de Mycènes was both directly informed by Xenakis’s wartime experiences and an attempt to obliquely recreate them using novel digital technologies. Xenakis had long desired to create a globalized network of vision and sound, where discrete sites would communicate with each other via satellite broadcast.30 The harsh electronic complexity of Mycenae—Alpha, the first score composed using Xenakis’s innovative UPIC tool, provides a visual rendering of scattered sonic environments being absorbed into a cohesive

20. Ibid., 166.
21. Ibid.
23. Ibid., 103–11.
24. Xenakis joined the left-wing National Liberation Front/Greek People’s Army (EAM-ELAS) around 1941. At the end of the war, many former EAM-ELAS fighters were conscripted into the Greek army by the new right-wing government under threat of imprisonment or internment in detention camps. For further context, see Nouritza Matousiou, Xenaki (London: Kahn & Averill, 1985), 19–33.
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geography (fig. 2). In filtering the material world through a highly technological system of digital and analog actors (such as the UPIC tool and the bodies of the musicians), Xenakis rendered the site’s architecture as a form of sonic infrastructure tied to the temporal specificity of technology, rather than geography. It was a version of reality rooted in the “unreal” contingencies of sensation and logistics.

While most readings of Polytope de Mycènes emphasize Xenakis’s ceremonial excavation of Mycenae’s mythic past as the work’s dominant ethos, it is this abstraction of architectural and historical specificity into a sonic regime of techno-sensation that is critical to its overall experience. In this sense, Xenakis’s work can be analyzed through two parallel ideas of rendering: through Chion’s definition of sonic rendering as a sound “intended to translate impressions of materiality or immateriality,” or a process that reconstitutes material reality into a sensual force; and through architectural historian Lucia Allais’s notion of architectural rendering as a material intervention that weaves between “experience as constructed, and experience as received,” where architecture performs a “virtual witnessing” to encode both real and imaginary space simultaneously. Both definitions point to Xenakis’s complex reconstruction of Mycenae as something existing outside of chronological time. By reorienting the site’s historical narrative around formal repetitions of sight and sound, Xenakis used technology to enact a kind of algorithmic transference between two parallel realities. Allais’s question of witnessing is key for understanding how Xenakis used digital technology to override existing architecture. By transforming the site’s forms into media, Xenakis compressed ancient Mycenaean history into a technological imaginary of modern warfare, reducing architecture to a set of intangible properties—a remediation of violence that required accelerated human perception. In one of the long-range images captured from the site during the polytope’s performance, the ruins—bathed in the alien glow of twelve antiaircraft searchlights stationed around the citadel and the surrounding ravines—arguably have the appearance of an anonymous war zone rather than a primal cultural celebration (fig. 3).

Logically, the monumental scale of Xenakis’s vision for Polytope de Mycènes required the mobilization of vast resources and relied heavily on the use of both military operations strategy and military technology. As Harley argues, this co-option was part of Xenakis’s overall fantasy to convert the equipment of warfare into spectacles of peace. However, Polytope de Mycènes still “depended on the resources and the centralized power of an essentially war-oriented institution.”

LaBelle also points out how the use of antiaircraft searchlights and air-raid alarm systems recast Xenakis’s final years in Greece. The artist’s wartime experiences had exposed him to “an ‘intensified soundscape’ consisting of the noises of war,” where the constant turmoil of air raids and violent political demonstrations had transformed Athens “into a reverberant terrain punctuated by previously unheard movements of sound and light, bodies and voices, technologies and machines.” The city had become more a series of violent events than a landscape. For Xenakis, the logistics of war were also deeply tied to sensation and perception. In his biography, he recalled events leading up to the injury that would alter his life: in December 1944, an explosion struck the building where Xenakis was coordinating resistance fighters. Shrapnel from the blast shattered the bones in his face and cost him an eye. Although Xenakis underwent successful reconstructive surgery, the “simple and fundamental framework of his sensory perception” had been altered, leaving him with distorted optical, spatial, and audio perception.

Chion’s argument about rendering as a subtle shift in acoustic scale that allows for a compression of time and space allows us to read Polytope de Mycènes more as a paradigm than a performance. Although Xenakis’s highly mathematical compositions came from a very different place than the science fiction narrative of Kaufman’s film, they both signal a new interfacing of digital technology with its environment. Chion’s definition of rendering as a moment of rupture where digital technology enters the realm of the analog to create a third version of reality opens up new ways of theorizing architecture as a form of media, alongside Xenakis’s translation of space into a real-time event. Xenakis’s work—in the specific context of Polytope de Mycènes—joins real and imagined temporalities by interfacing the environment with digital technology. Like Sutherland’s alien double emerging from the San Francisco night air, Xenakis’s sensorium of violence renders what Chion terms the “quiet revolution” of matter and lived perception being replicated via digital technology.

31. The UPIC (Unité Polyagogique Informatique du CEMAMu) was a digital tablet used to translate hand-drawn compositions into digital waveforms. Designs were drawn using an electromagnetic ball-point pen, read by a computer connected to the tablet, and interpreted according to user parameters. Data were then translated into sound and recorded on a digital tape drive. For further detail, see Iannis Xenakis, “Music Composition Triks,” in Composers and the Computer, ed. Curtis Roads (Los Altos: William Kaufmann, Inc., 1983), 196–87.
34. LaBelle, Background Noise, 188.
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While most readings of *Polytope de Mycènes* emphasize Xenakis’s ceremonial excavation of Mycenae’s mythic past as the work’s dominant ethos, it is this abstraction of architectural and historical specificity into a sonic regime of techno-sensation that is critical to its overall experience. In this sense, Xenakis’s work can be analyzed through two parallel ideas of rendering: through Chion’s definition of sonic rendering as a sound “intended to translate impressions of materiality or immateriality,” or a process that reconstitutes material reality into a sensual force; and through architectural historian Lucia Allais’s notion of architectural rendering as a material intervention that weaves between “experience as constructed, and experience as received,” where architecture performs a “virtual witnessing” to encode both real and imaginary space simultaneously.

Both definitions point to Xenakis’s complex reconstruction of Mycenae as something existing outside of chronological time. By reorienting the site’s historical narrative around formal repetitions of sight and sound, Xenakis used technology to enact a kind of algorithmic transference between two parallel realities. Allais’s question of witnessing is key for understanding how Xenakis used digital technology to override existing architecture. By transforming the site’s forms into media, Xenakis compressed ancient Mycenaean history into a technological imaginary of modern warfare, reducing architecture to a set of intangible properties—a remediation of violence that required accelerated human perception. In one of the long-range images captured from the site during the polytope’s performance, the ruins—bathed in the alien glow of twelve antiaircraft searchlights stationed around the citadel and the surrounding ravines—arguably have the appearance of an anonymous war zone rather than a primal cultural celebration (fig. 3).

Logistically, the monumental scale of Xenakis’s vision for *Polytope de Mycènes* required the mobilization of vast resources and relied heavily on the use of both military operations strategy and military technology. As Harley argues, this co-option was part of Xenakis’s overall fantasy to convert the equipment of warfare into spectacles of peace. However, *Polytope de Mycènes* still “depended on the resources and the centralized power of an essentially war-oriented institution.”

LaBelle also points out how the use of antiaircraft searchlights and air-raid alarm systems recast Xenakis’s final years in Greece. The artist’s wartime experiences had exposed him to “an intensified soundscape” consisting of the noises of war, where the constant turmoil of air raids and violent political demonstrations had transformed Athens “into a reverberant terrain punctuated by previously unheard movements of sound and light, bodies and voices, technologies and machines.” The city had become more a series of violent events than a landscape.

For Xenakis, the logistics of war were also deeply tied to sensation and perception. In his biography, he recalled events leading up to the injury that would alter his life: in December 1944, an explosion struck the building where Xenakis was coordinating resistance fighters. Shrapnel from the blast shattered the bones in his face and cost him an eye. Although Xenakis underwent successful reconstructive surgery, the “simple and fundamental framework of his sensory perception” had been altered, leaving him with distorted optical, spatial, and audio perception.

Chion’s argument about rendering as a subtle shift in acoustic scale that allows for a compression of time and space allows us to read *Polytope de Mycènes* more as a paradigm than a performance. Although Xenakis’s highly mathematical compositions came from a very different place than the science fiction narrative of Kaufman’s film, they both signal a new interfacing of digital technology with its environment. Chion’s definition of rendering as a moment of rupture where digital technology enters the realm of the analog to create a third version of reality opens up new ways of theorizing architecture as a form of media, alongside Xenakis’s translation of space into a real-time event. Xenakis’s work—in the specific context of *Polytope de Mycènes*—joins real and imagined temporalities by interfacing the environment with digital technology. Like Sutherland’s alien double emerging from the San Francisco night air, Xenakis’s sensorium of violence renders what Chion terms the “quiet revolution” of matter and lived perception being replicated via digital technology.

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31. The UPIC (Unité Polyagogique Informatique du CEMAMu) was a digital tablet used to translate hand-drawn compositions into digital waveforms. Designs were drawn using an electromagnetic ball-point pen, read by a computer connected to the tablet, and interpreted according to user parameters. Data were then translated into sound and recorded on a digital tape drive. For further detail, see Janine Xenakis, “Music Composition Tricks,” in *Composer and the Computer*, ed. Curtis Roads (Los Altos: William Kaufmann, Inc., 1981), 168–87.
34. LaBelle, *Background Noise*, 198.