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THE DYING ECHOES OF CIVILIZATION: A POST-HUMAN HISTORICAL ANALYSIS OF RUINS AND ABANDONED LANDSCAPES

Dr. Diksha Tripathi[1]*

[1]Asst. Prof. (English)- J C Bose University, YMCA, Faridabad. Founder and educator at CMP (Cultural and Mainstream Posthumanist Forum)

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Corresponding Author: Dr. Diksha Tripathi (Deeksha2318tripathi@gmail.com)

ABSTRACT

The purpose of the research paper is to analyze ruins and abandoned landscapes as active participants in history, focusing on the role of non-human forces in processes of preservation, destruction, and cultural memory. Rather than being understood only as inert residues of past civilizations, ruins are conceptualized here as dynamic agents whose material and ecological properties shape both historical trajectories and the ways in which societies remember and reinterpret their past. The novelty of the paper lies in the application of post-humanist theory to a comparative analysis of four distinct cases-Pompeii, Angkor, Chernobyl/Pripyat, and Detroit-spanning contexts from Roman antiquity to late-industrial America. This approach integrates archaeology, heritage studies, and historical anthropology in order to demonstrate how non-human agencies can be systematically incorporated into historical interpretation. Each case illustrates the workings of a particular type of agency: volcanic ash preserved entire moments of Roman daily life at Pompeii; vegetation and hydrological shifts contributed to the transformation of Angkor's urban landscape; radiation following the 1986 Chernobyl accident reorganized ecologies, governance, and citizenship; and infrastructural decay in Detroit materialized the social and racial consequences of deindustrialization. The research is based on a critical analysis of secondary sources, including archaeological reports, historical syntheses, and theoretical interventions. Data are organized into a structured analytical matrix that compares causes of abandonment, non-human agencies, material processes, and regimes of memory. This comparative design allows for the development of a typology of ruin agency that is transferable across different periods and regions. The study demonstrates that volcanic ash, vegetation, radiation, and infrastructural entropy operate as historical agents, each producing distinct tempos of collapse and modes of remembrance. Recognizing these agencies allows historical science to move beyond symbolic or anthropocentric readings of ruins. At the same time, the analysis underscores challenges for heritage governance, where conventional standards of stability and integrity remain inadequate in the face of landscapes that are inherently unstable, dynamic, and transformative. By formulating a typology of ruin agency-catastrophic, ecological, technological, and infrastructural-the article contributes both a theoretical and methodological framework that strengthens dialogue between archaeology, heritage studies, and historical anthropology. The findings suggest that heritage governance frameworks should adopt more flexible, process-oriented criteria capable of accommodating instability, ecological transformation, and ongoing material change.

KEYWORDS: ruins, non-human agency, post-humanism, historical science, heritage, Pompeii, Angkor, Chernobyl, Detroit

1 INTRODUCTION

Ruins and abandoned landscapes are more than the remains of past civilizations. They constitute sites where human history, cultural memory, and non-human processes intersect. From Pompeii to Detroit, such places reveal both the fragility of societies and the endurance of ecological and material forces. For historical science, their relevance lies not only in providing evidence of collapse and continuity but also in reshaping how the past is imagined in the present.

In contemporary scholarship, ruins have become central to debates across heritage studies, collapse studies, and the environmental humanities. Archaeologists increasingly treat them as material archives of social change, while historians interpret them as markers of political and cultural transformation, and anthropologists approach them as symbols of identity and collective memory. Public engagement reinforces their significance: abandoned sites attract tourism, artistic documentation, and political controversy. In this respect, ruins emerge not simply as material residues but as theoretical challenges for historical science.

The historiography of collapse has traditionally emphasized human decisions. Tainter's The Collapse of Complex Societies (1988) explains disintegration through systemic complexity and diminishing returns, while Diamond and Smil's Collapse: How Societies Choose to Fail or Succeed (2005) foreground environmental constraints and strategies of adaptation. Foundational as these works remain, they conceptualize ruins as passive results of human or ecological mismanagement, without attributing historical agency to non-human forces themselves (Diamond and Smil, 2005).

Later scholarship in archaeology has questioned these assumptions. Holtorf and Schadla-Hall (1999) demonstrated that authenticity is not intrinsic to ruins but socially constructed. Harrison and Schofield (2010) extended archaeological inquiry to the "contemporary past," focusing on abandoned factories and military sites. DeSilvey and Edensor (2013) emphasized ruination as an ongoing process rather than a completed event, while Dawdy (2016) highlighted the concept of "patina," whereby decay itself generates historical significance. These contributions challenged the Romantic image of ruins as static monuments but nonetheless remained largely human-centered in their interpretation.

The gap emerges here despite the recognition of temporality and transformation, ruins are still generally framed as heritage for human communities, with material and ecological dynamics relegated to the background rather than integrated into historical causality. What is lacking is a systematic framework that extends agency beyond the human and positions ruins as active participants in history.

Post-humanist and new materialist theories provide tools to address this lacuna. Morton (2013) has described "hyperobjects"-phenomena such as radiation or climate-that operate across temporal and spatial scales beyond human control. Latour's actor-network theory and Bennett's notion of "vibrant matter" similarly emphasize distributed agency, in which humans and non-humans jointly shape outcomes. Applied to ruins, these perspectives reveal volcanic ash, encroaching vegetation, radioactive contamination, or decaying infrastructure as historical agents in their own right. They actively condition preservation, destruction, and cultural memory. Yet despite their potential, post-humanist frameworks remain only rarely operationalized in historical studies of ruins.

The present article responds to this gap by advancing the thesis that ruins and abandoned landscapes act as agents within history. They are not inert symbols of decline but dynamic participants whose non-human processes reshape both memory and historiography. To substantiate this claim, four case studies are examined: Pompeii, Angkor Wat, Chernobyl/Pripyat, and Detroit. Each represents a distinct mode of abandonment-catastrophic disaster, ecological transformation, technological accident, and socio-economic collapse. The inclusion of Chernobyl is particularly significant for Ukrainian and Eastern European scholarship, where abandoned sites stand at the intersection of debates on heritage, environment, and identity (Yablokov et al. 2010).

The design of the study is comparative and theory-driven, drawing exclusively on secondary sources that include archaeological reports, historical syntheses, and theoretical analyses. The cases were selected to represent a spectrum of triggers-catastrophic and gradual, natural and technological, ancient and modern. Data are organized into an analytical matrix that compares causes of abandonment, forms of non-human agency, material processes, and associated memory regimes. While limited by the absence of fieldwork, the strength of this approach lies in providing a replicable framework for applying post-humanist perspectives to historical science. The guiding questions are how a post-human lens alters historical interpretations of ruins and abandoned landscapes, and what common patterns of non-human agency can be identified

across diverse contexts of collapse. The objectives are threefold: to systematize the historiography of ruins in archaeology, heritage studies, and cultural theory; to compare four diverse cases through a structured analytical framework; and to demonstrate how post-humanist perspectives can expand historical methodology by incorporating non-human agency as a central factor.

2 LITERATURE REVIEW

Romantic thinkers framed ruins as moral lessons and aesthetic symbols. Ruskin, in The Seven Lamps of Architecture (1849), treated decay as truth, linking destruction to spiritual endurance. Writers of the eighteenth and nineteenth centuries frequently cast ruins as warnings of decline, embedding cultural memory in broken stones. In a modern context, Wright (2009) extended this reading to late-twentieth-century London, where derelict landscapes reflected social and political failure. Such interpretations emphasized symbolism, nostalgia, and allegory. They revealed fragility but ignored material and ecological processes. These traditions set the stage for ruin studies but remained descriptive, treating ruins as mirrors of human decline rather than dynamic participants in history.

Archaeological approaches reframed ruins as processes rather than images. Schiffer (1987), working in the U.S. processual archaeology tradition, introduced the concept of "formation processes," explaining how material culture enters the archaeological record and shifting the debate from symbols to mechanisms of preservation and decay. Knapp and Ashmore (1999) emphasized landscapes as both constructed and conceptual, while Bailey (2007) described ruins as "palimpsests," layered records of multiple temporalities. Harrison and Schofield (2010) expanded the scope to the "archaeology of the contemporary past," treating twentieth-century sites such as factories, bunkers, and urban voids as legitimate data. This tradition stressed time, materiality, and context, yet ruins were still largely framed as outcomes of human activity. Non-human forces were noted but not fully recognized as independent historical agents.

Heritage and memory studies further elaborated the cultural significance of ruins. Edensor (2005), writing on industrial Britain, described ruined factories as spaces where decay shaped cultural imagination. Logan and Reeves (2011) highlighted "places of pain and shame," ruins tied to trauma and contested heritage. Macdonald (2013) demonstrated how European ruins anchor national and regional identity, linking abandoned landscapes to politics of memory. These works revealed ruins as political and mnemonic, raising questions about which sites deserve preservation and which should be allowed to fade. Yet the focus remained human-centered: ruins mattered primarily because communities remembered them, while material processes were treated as secondary, significant only insofar as they shaped memory.

Theoretical interventions in the twenty-first century advanced a post-humanist reorientation. Latour (2005) proposed Actor-Network Theory, in which humans and non-humans share agency. Ingold (2007) emphasized flows and relations over static materiality, while Morton (2013) introduced the concept of "hyperobjects" such as radiation or climate, forces that exceed human temporal and perceptual control. Bennett (2010) developed the notion of "vibrant matter," granting materials political and historical roles. These perspectives suggest that ruins are not merely evidence of human decline but actors in historical processes. Vegetation at Angkor simultaneously destroyed and preserved architecture; ash at Pompeii preserved entire moments of life; and radiation at Chernobyl continues to reshape ecologies and memory regimes. This framework moves beyond heritage and symbolism by treating non-human forces as historical agents. Nevertheless, systematic application of these theories in historical science remains limited.

The Eastern European context illustrates the importance of this shift. The 1986 Chernobyl disaster created a 30-kilometer exclusion zone and displaced more than 100,000 people. Yablokov et al. (2010) documented radiation's long-term consequences for health and environment, while Mycio (2005) described the zone as an emergent ecological space where abandoned villages coexist with new wildlife populations. Brown (2019) demonstrated how radiation shaped both politics and memory, while Kalinina (2014) linked ruins to post-Soviet nostalgia in which empty spaces symbolized identity and loss. Ukrainian scholarship has further framed Chernobyl as contested heritage, where ecological forces and political narratives converge. Unlike Romantic ruins, these are not symbolic alone: radiation functions as an active historical force, preserving, destroying, and reshaping both human and non-human futures. For the purposes of historical science, Chernobyl exemplifies the need to integrate ecological and material agency into analysis.

Taken together, historiography traces a clear trajectory. Romantic writers viewed ruins as symbols; archaeologists analyzed processes and

contexts; heritage scholars emphasized trauma, politics, and identity; and theoretical interventions expanded agency to non-human forces. Eastern European cases have shown the stakes of ecological ruins in the modern world. Yet a gap persists. Much of the scholarship remains anthropocentric, and post-humanist theory has rarely been applied in a systematic, comparative way. Even in Ukraine, where Chernobyl offers a paradigmatic case, studies tend to emphasize memory more than material agency. The present article responds to this gap by applying post-humanist theory across four diverse cases-Pompeii, Angkor, Chernobyl, and Detroit. Each represents a different type of abandonment: catastrophic, ecological, technological, and socio-economic. By comparing them, the study develops a framework that treats ruins as active agents in history. This novelty is both theoretical and methodological, offering historical science new tools to integrate non-human forces into its narratives.

3 RUINS AND ABANDONED LANDSCAPES AS HISTORICAL AGENTS

Ruins and abandoned landscapes have long been interpreted as the residual traces of civilizational decline, signifying the end of cultural vitality and the fading echoes of once-thriving societies. Classical aesthetics, from Simmel's reflections on the romantic appeal of ruins to Trigg's analysis of nostalgia and decay, framed them primarily as symbolic reminders of transience and mortality (Simmel, 1965; Trigg, 2006). More recent scholarship, however, emphasizes that ruins are not inert markers of the past but dynamic entities shaped by ongoing processes of material transformation, temporal layering, and ecological entanglement (Stoler, 2013; McAnany and Yoffee, 2009). In this sense, ruination is not a final state but a continuous condition that extends historical agency beyond human actors alone.

Methodologically, comparative and case-study approaches have become central to clarifying these processes without reducing them to linear narratives of rise and fall. As Flyvbjerg (2006) has noted, well-chosen cases allow researchers to grasp complex interactions in situ, while Ragin (2014) demonstrates how comparative strategies reveal patterned similarities and divergences across contexts. Such approaches prevent the oversimplification of ruins into static symbols and instead highlight their heterogeneity as historical phenomena.

The integration of post-humanist and relational theories has further advanced this shift. Latour's actor-network theory (2005) and Hodder's archaeology of entanglement (2012) argue that non-human materials, infrastructures, and biological agents participate actively in the making of history. Within this framework, "agency" can be understood as the capacity of both human and non-human actors to produce effects, while "assemblage" describes the entangled networks through which such actors interact and co-constitute outcomes. In concrete terms, volcanic ash at Pompeii, encroaching vegetation at Angkor, radioactive isotopes in Chernobyl, or corroding steel in Detroit are not passive residues but active forces that shape preservation, destruction, and cultural memory (Dawdy, 2020; Edensor, 2007). This perspective situates ruins as co-authors of history rather than as silent witnesses, placing material agency at the center of historical explanation.

At the same time, the move toward material agency is not without limitations. Earlier historiography's emphasis on symbolism often produced descriptive accounts infused with nostalgia, foregrounding human meaning at the expense of material process (Wright, 2009). Conversely, certain strands of theory-heavy post-humanism risk abstraction if not sufficiently grounded in empirical analysis, generating accounts where ruins are over-conceptualized and detached from the concrete conditions of their formation (Trigg, 2006). The challenge for historical science, therefore, lies in striking a balance: situating ruins within broader theoretical debates while anchoring interpretation in tangible evidence and comparative case studies. Recognizing this interplay enables a more comprehensive understanding of ruins, not merely as vestiges of decline, but as dynamic assemblages that actively mediate the relationship between past and present.

4 HUMAN-CENTERED INTERPRETATIONS OF RUINS

Romantic and twentieth-century traditions have long framed ruins as moral allegories and aesthetic objects, casting them as symbols of human ambition, decadence, and eventual decline. Thinkers such as Simmel (1965) emphasized the melancholic beauty of ruins as reminders of mortality and cultural transience, while Trigg (2006) situated ruination within a broader discourse of nostalgia and absence. In this perspective, ruins were understood less as active sites of transformation and more as mirrors of human meaning, shaped by cultural imagination and historical narrative-a framing later challenged by material and ecological approaches.

Within these human-centered readings, non-human processes of decay-erosion, vegetation, weathering-were often relegated to the background, serving primarily as settings against which human politics, empire, and memory were staged (Wright,

2009; Stoler, 2013). Even when material change was acknowledged, it tended to be interpreted symbolically, as an allegory for the fragility of human achievement rather than as an autonomous historical process. As Hamilakis (2007) has shown in the context of Greek antiquities, ruins often became instruments in the construction of nationalist narratives, where their physical form was subsumed into the service of cultural identity and state ideology.

The achievements of this tradition are nonetheless significant. By consolidating ruins as subjects of heritage and memory, these approaches illuminated the role of antiquities and abandoned landscapes in shaping collective identity, imperial imagination, and political discourse (Stoler, 2013; Hamilakis, 2007). They demonstrated that ruins are not only archaeological remnants but also central to modern memory regimes, tourism economies, and cultural reproduction. This legacy continues to inform heritage management and public history.

Yet the limitations of such approaches are equally clear. The emphasis on symbolism often marginalized the material dynamics of decay and preservation, reducing ruination to a metaphor rather than a process. Narratives of "collapse" were typically presented as terminal endpoints of civilizations rather than as moments of transformation and adaptation that implicate non-human agencies (McAnany and Yoffee, 2009; Middleton, 2020). Taken together, these traditions highlight both the interpretive richness and the analytical constraints of focusing primarily on human meaning. While invaluable in demonstrating how ruins inform nationalism and cultural identity, they require supplementation by approaches that recognize the material and ecological processes through which ruins persist, transform, and continue to generate history.

5 POMPEII AND THE CATASTROPHIC AGENCY OF VOLCANIC ASH

The eruption of Mount Vesuvius in 79 CE simultaneously annihilated and preserved Pompeii, creating one of the most extensively documented archaeological archives of antiquity. Within a matter of hours, pyroclastic flows and thick deposits of volcanic ash obliterated urban life, yet the very forces of destruction sealed buildings, domestic interiors, wall paintings, and organic materials in an unprecedented state of suspension (Beard, 2010; Cooley and Cooley, 2013). What perished as a functioning city was reborn as an archaeological archive, not through human intention but through the material agency of volcanic catastrophe. The deposits did not merely record events passively; they actively determined the conditions of survival, shaping what could endure and what would vanish irretrievably from the historical record.

The detail preserved at Pompeii has few parallels in the archaeological record. Entire households have been reconstructed from the arrangement of furnishings, storage containers, and even carbonized foodstuffs, offering granular evidence of everyday rhythms and social differentiation (Beard, 2010; Cooley and Cooley, 2013). Graffiti and electoral inscriptions provide testimony of political culture, while skeletal remains and plaster casts created from body voids capture the human experience of catastrophe in haunting immediacy. Urban analyses of Pompeii have revealed intricate systems of water management, street design, and neighborhood hierarchies, situating the city not only as a provincial Roman settlement but as a microcosm of Mediterranean urbanism (Laurence, 2007). In this sense, natural disaster paradoxically generated knowledge that could never have been accessed through ordinary historical transmission.

The historiography of Pompeii illustrates how interpretations of ruins are shaped as much by contemporary imagination as by material evidence. Since its rediscovery in 1748, Pompeii has been a laboratory of shifting scholarly and public fascination. Enlightenment-era antiquarians viewed the city as a window onto classical art and luxury, while nineteenth-century excavations under Giuseppe Fiorelli introduced systematic methods, including plaster casts of voids left by decomposed bodies, which forever altered the visual culture of archaeology. Romantic and moralizing narratives emphasized decadence and spectacle, casting Pompeii as an allegory for civilizational hubris and divine punishment (Beard, 2010). Modern archaeology, by contrast, has moved toward contextual and processual understandings of the site, highlighting stratigraphy, depositional dynamics, and the biases inherent in catastrophic preservation. This transition underscores the tension between symbolic and materialist approaches in ruin studies.

The agency of volcanic ash is central to this transformation. Preservation was highly selective: frescoes and masonry survived relatively intact, while papyrus scrolls, textiles, and certain metals deteriorated or were altered beyond recognition. Organic remains such as loaves of bread, olives, and wooden furniture were carbonized, simultaneously annihilated and preserved in new material states (Cooley and Cooley, 2013). Such selective survival complicates reconstructions of Roman society, reminding historians that the archaeological record is

never a neutral mirror of the past but an active product of destructive and preservative forces. Volcanic catastrophe thus functions not only as an object of study but as a methodological challenge, forcing scholars to reckon with absence as much as presence in the archive.

Pompeii also exemplifies the broader politics of heritage and memory. Designated a UNESCO World Heritage Site in 1997, it has become a focal point of debates over conservation, tourism, and the commodification of ruins. Ongoing deterioration, caused by weathering, vegetation, and mass visitation, illustrates that ruination is not fixed in 79 CE but continues as a material process in the present (Khalaf, 2020). Efforts to preserve Pompeii are therefore entangled with the very forces of decay that first ensured its survival, raising questions about authenticity, continuity, and the limits of heritage management. In comparative perspective, sites such as Herculaneum and Akrotiri, also buried by volcanic eruptions, offer parallel cases but differ significantly in what was preserved, underscoring the contingent nature of catastrophic agency.

The interpretive richness of Pompeii is therefore matched by its analytical challenges. While early traditions risked reducing the city to a moral allegory of Roman decadence, more recent scholarship emphasizes process, selectivity, and the material agency of disaster. Yet even within these frameworks, preservation biases remain, and the temptation to treat Pompeii as a frozen tableau of Roman life persists. The site must instead be read as an archive actively shaped by forces of destruction and survival, one in which ash, architecture, and human remains interact to produce a complex record of urban life and death. Pompeii ultimately demonstrates that ruins are not passive witnesses of decline but dynamic assemblages, in which non-human forces such as volcanic ash play constitutive roles in shaping history.

6 POMPEII AND THE CATASTROPHIC AGENCY OF VOLCANIC ASH

The eruption of Mount Vesuvius in 79 CE simultaneously obliterated and preserved Pompeii, producing one of the most extraordinary archaeological archives of the ancient world. While urban life was annihilated in a matter of hours, the rapid deposition of volcanic ash and pyroclastic material sealed domestic interiors, wall inscriptions, and even organic remains, suspending them in a state of sudden arrest (Beard, 2010; Cooley and Cooley, 2013). Rediscovered in 1748 and excavated across more than forty hectares, the site became an unparalleled record not simply because it survived but because volcanic deposits actively co-produced the archaeological archive, shaping what could endure and what was lost to subsequent history.

This catastrophic burial yielded a uniquely detailed record of Roman society. From the arrangement of houses and the plaster casts of victims to graffiti-covered walls and the carbonized remnants of food, the preserved material provides granular evidence for spatial practices, social hierarchies, and the rhythms of daily life (Beard, 2010; Cooley and Cooley, 2013). Urban analyses have built on this archive to reconstruct patterns of civic infrastructure, commercial exchange, and neighborhood organization, offering insights into the interplay of architecture, economy, and community in Roman urbanism (Laurence, 2007). In this sense, Pompeii exemplifies how natural disaster can paradoxically act as an agent of historical preservation, enabling forms of knowledge that would otherwise be inaccessible.

At the same time, the interpretive tradition surrounding Pompeii has not been without limitations. Moralizing accounts that emphasized decadence, luxury, and spectacle often overshadowed careful analysis of how volcanic deposits themselves structured the record (Beard, 2010). Preservation was uneven: while ash sealed many organic and architectural remains, it also introduced biases by favoring certain materials and contexts over others, thereby complicating reconstructions of the ancient city (Laurence, 2007). Such selective survival highlights the need to read Pompeii not as a frozen tableau of Roman life but as an archive dynamically shaped by the material agency of volcanic catastrophe-a process comparable to other forms of ecological and technological ruination.

7 CHERNOBYL AND THE HISTORICAL FORCE OF RADIATION

The reactor explosion at Chernobyl on 26 April 1986 inaugurated a landscape defined by abandonment, long-term hazard, and the profound reorganization of human–environment relations. Within hours of the disaster, nearly 50,000 inhabitants of Pripyat were evacuated, and within days the Soviet authorities had declared a thirty-kilometer "zone of alienation" encompassing dozens of depopulated towns and villages in northern Ukraine. Entire communities were uprooted, leaving behind schools, factories, and homes that remain frozen in their final moment of use. These material traces, layered with contamination, form a ruin landscape whose temporality is unlike that of natural catastrophe. Unlike Pompeii's sudden burial,

Chernobyl initiated a process of slow violence, where the invisible hazard of ionizing radiation continues to shape life, governance, and ecology across decades and potentially centuries (Mycio, 2005; Brown, 2019).

Radiation itself functions as a historical force. Alongside the physical dereliction of Soviet infrastructure, it reorganizes ecological relations and human institutions. Petryna (2013) has shown how the concept of "biological citizenship" emerged as survivors negotiated entitlements to health care and compensation in the absence of transparent state data. Exposure was not simply a medical condition but a political identity, binding citizenship to claims of biological damage. Brown (2019) extends this perspective, tracing how radioactive contamination altered governance structures, international oversight, and cultural memory. In parallel, the exclusion zone has become a paradoxical space of ecological flourishing: wolves, lynx, bison, and wild horses now roam abandoned farmlands and settlements, producing novel ecosystems where human absence coexists with radioactive persistence (Mycio, 2005; Brown, 2019). Radiation, in this respect, is not merely destructive but also generative, creating ecological niches and new modes of life that defy human expectations.

The ruins of Pripyat embody this entanglement of industrial failure and ecological reconfiguration. Iconic images-the deserted amusement park, the rusting ferris wheel, classrooms overtaken by vegetation-circulate globally as emblems of modern catastrophe. As Brown (2019) notes, the Chernobyl zone has been reframed in recent years as a space of dark tourism, attracting thousands of visitors who seek to witness the material remains of the Soviet past and confront the spectral presence of radiation. The site thus functions simultaneously as an archaeological archive of late socialism, a memorial landscape of displacement, and a laboratory for imagining ecological futures under conditions of contamination. Yet the visibility of ruins contrasts sharply with the invisibility of radiation itself, which resists sensory apprehension and requires technical mediation to be understood. This duality complicates both memory and heritage practices.

Interpretation and governance remain deeply contested. Soviet secrecy during the initial aftermath produced long-lasting gaps in data, risk communication, and public trust (Petryna, 2013). Competing narratives-heroic sacrifice, technological hubris, ecological rebirth-circulate in political discourse and popular culture, fragmenting collective memory. International agencies such as the IAEA and UNESCO have attempted to integrate the disaster into global heritage and safety regimes, yet heritage standards premised on stability and integrity struggle to accommodate a ruin landscape that is inherently unstable and hazardous (Khalaf, 2020). Chernobyl challenges the very categories of heritage conservation: how can continuity be maintained in a site where contamination guarantees ongoing transformation, and where preservation entails containment rather than restoration?

The case of Chernobyl highlights the analytical potential of treating radiation as a historical agent. It demonstrates how ecological forces and technological infrastructures intersect to produce new forms of citizenship, governance, and memory. At the same time, it underscores the limitations of anthropocentric models of ruin, which cannot adequately account for hazards that operate beyond human temporal and sensory scales. Chernobyl thus bridges the study of ruins with broader debates in post-humanist theory, illustrating how non-human forces condition historical outcomes. This perspective is crucial when approaching other modern landscapes of abandonment, such as post-industrial Detroit.

8 DETROIT AND THE ENTROPY OF INDUSTRIAL INFRASTRUCTURE

Detroit's late-twentieth-century crisis emerged at the intersection of post-industrial restructuring, racial inequality, and suburbanization. Once celebrated as the global capital of automobile production, the city became emblematic of deindustrialization as factories closed, jobs relocated, and investment drained away from urban neighborhoods. Between 1950 and 2010 Detroit's population fell from 1.8 million to fewer than 700,000, a demographic collapse that reflected both economic transformation and entrenched segregation (Sugrue, 2014; Boyle, 2001). Discriminatory housing policies and suburban flight deepened spatial divisions, situating Detroit as both a monument to industrial modernity and a symbol of its decline.

The built environment itself became an active participant in this trajectory. Iconic structures such as the Packard Automotive Plant, shuttered in 1958, and Michigan Central Station, closed in 1988, shifted from landmarks of progress to monuments of entropy. Corroding steel beams, collapsing roofs, and invasive vegetation transformed these infrastructures into ruins whose material instability reshaped their physical form and cultural meaning (Boyle, 2001; Edensor, 2005; Edensor, 2007). Environmental forces, freeze–thaw cycles, rain, unchecked plant growth - accelerated decay, producing sensory landscapes of silence, fragmentation, and overgrowth. In this way,

the infrastructures that once sustained mass production came to embody disorder, reinforcing Detroit's redefinition as an abandoned landscape.

At the same time, the ruins of Detroit became globally legible as archives of deindustrialization. Documentary photography, cultural reportage, and academic reflection positioned the city as an archetype of industrial decline (Binelli, 2013). These representations also generated debates about resilience and adaptive reuse, where ruins were alternately framed as evidence of failure and as resources for post-industrial futures (Edensor, 2007). Yet, as Binelli (2013) emphasizes, the city's global visibility was marked by a paradox: the spectacle of collapse was consumed worldwide while the material consequences remained concentrated among Detroit's residents.

This aestheticization of decay popularly termed "ruin porn" often reduced Detroit's crisis to visual spectacle, foregrounding images of collapsed factories and deserted neighborhoods while obscuring the lived realities of residents who continued to inhabit the city. Infrastructural decline imposed uneven burdens across racialized geographies, compounding the inequalities produced by decades of disinvestment and discriminatory policy (Sugrue, 2014; Boyle, 2001). Thus, the global fascination with Detroit's entropy revealed a disjuncture: outsiders consumed images of collapse, while communities bore its ongoing costs.

In this respect, Detroit illustrates how the slow violence of infrastructural decline generates both cultural capital and enduring inequality. Unlike Pompeii's sudden catastrophe or Chernobyl's invisible hazard, Detroit's ruination unfolded incrementally, driven by disinvestment, segregation, and entropy. Its landscapes of decay serve not only as reminders of the contradictions of industrial modernity but also as evidence that infrastructural processes themselves act as historical agents, shaping both memory and the material conditions of urban continuity.

9 COMPARATIVE ANALYSIS OF NON-HUMAN AGENCY IN RUINS

Comparative analysis demonstrates that ruins are not static residues of civilizational decline but dynamic archives shaped by heterogeneous non-human forces. Examining Pompeii, Angkor, Chernobyl, and Detroit side by side reveals how divergent triggers-catastrophic eruption, ecological succession, technological contamination, and infrastructural entropy-produce distinct tempos of ruination and contrasting regimes of memory. Such cross-case comparison underscores the multiplicity of ruin formation while resisting the reduction of complex processes to single causal narratives (Ragin, 2014; Flyvbjerg, 2006).

The material agencies at work highlight this diversity. In Pompeii, volcanic ash and pyroclastic flows annihilated urban life in hours, yet paradoxically preserved domestic interiors and inscriptions for millennia (Beard, 2010; Cooley and Cooley, 2013). At Angkor, lidar surveys conducted in 2012–2013 revealed extensive hydraulic networks and urban infrastructures whose decline unfolded gradually through monsoon variability, vegetation encroachment, and shifting political economies (Evans et al., 2013; Higham, 2001). In Chernobyl, the 1986 disaster created a 2,600 km² exclusion zone where radiation and infrastructural dereliction produced invisible but enduring hazards that reorganized ecosystems and redefined citizenship in terms of exposure and entitlement (Petryna, 2013; Brown, 2019). In Detroit, the abandonment of the Packard Automotive Plant (1958) and Michigan Central Station (1988) exemplifies infrastructural entropy, where weathering, disinvestment, and spontaneous vegetation dismantled industrial modernity and imposed uneven burdens across racialized neighborhoods (Sugrue, 2014; Boyle, 2001). Together, these cases demonstrate how non-human forces-whether sudden or gradual, material or invisible-constitute enduring agents of historical transformation.

From these comparisons emerges a provisional typology of ruin agency. Catastrophic agencies, as in Pompeii, act with sudden violence that simultaneously destroys and preserves. Ecological agencies, visible in Angkor's vegetation and hydrological cycles, act incrementally, entwining human and non-human histories. Technological agencies, such as Chernobyl's radiation, persist through invisible contamination with temporalities extending across centuries. Infrastructural agencies, embodied by Detroit's industrial collapse, reveal how entropy and neglect reshape urban space over decades. These categories overlap-Detroit's infrastructural ruination is inseparable from socio-economic disinvestment, just as Angkor's ecological decline cannot be disentangled from political shifts. The typology thus provides analytical clarity while reminding us that ruin formation is rarely reducible to a single domain.

This comparative framework also has implications for heritage governance. Different forms of agency challenge conventional heritage categories in distinctive ways: Pompeii's catastrophic preservation risks over-curation; Angkor's ecological entanglements raise questions of authenticity; Chernobyl's radioactive contamination disrupts assumptions of continuity

and integrity; Detroit's industrial entropy blurs the boundary between living urban heritage and abandonment. Early European accounts by Portuguese and Spanish travelers, later compiled and translated by Groslier and Smithies, reinforced Angkor's image as a deserted monumental landscape, framing it within narratives of civilizational collapse (Groslier and Smithies, 2006). These cases underscore the importance of integrity-aware documentation that acknowledges ongoing material processes rather than treating ruins as static objects (Khalaf, 2020; Dawdy, 2020).

At the same time, comparative synthesis carries risks. The evidentiary bases are uneven: Pompeii offers a uniquely detailed archaeological archive, whereas Angkor's transformations are reconstructed primarily through remote sensing. Chernobyl's contamination restricts access, while Detroit's global image is shaped disproportionately by aestheticized photography, often sidelining resident perspectives. Preservation and visibility biases therefore complicate inference, while overgeneralization risks flattening the specific historical and social trajectories that produced each ruin. Paleodemographic reconstructions at Teotihuacan, for instance, reveal both the potential and the limits of extending localized datasets to broader historical claims (Storey, 1992). Scholars must remain attentive to such local contexts, in line with critiques of universalizing collapse narratives (McAnany and Yoffee, 2009; Middleton, 2020).

In conclusion, ruins and abandoned landscapes should be recognized not merely as vestiges of past societies but as co-authors of history. Comparative attention to their catastrophic, ecological, technological, and infrastructural agencies illuminates the diversity of processes that shape material remains and memory regimes. At the same time, methodological caution and respect for local specificity are essential to ensure that global typologies of ruination enrich rather than obscure the human and ecological histories they seek to explain.

10 RUINS IN THE CONTEXT OF MODERN HISTORICAL SCIENCE

Within modern historical science, the study of ruins has moved beyond narratives of collapse as terminal decline toward frameworks that emphasize transformation, resilience, and long-term socio-ecological entanglements. Comparative archaeology and historical anthropology now foreground processes of adaptation and reconfiguration, situating collapse as one phase within broader trajectories of continuity and change (McAnany and Yoffee, 2009; Middleton, 2020). This reframing shifts the focus from civilizational failure to the multiplicity of pathways through which societies and their material remains persist, adapt, or transform.

Recent theoretical developments have also altered how scholars conceptualize agency within ruins. Actor-network theory and entanglement approaches highlight the inseparability of human intentions, material infrastructures, and non-human processes, offering explanations that operate across multiple scales of time and space (Latour, 2005; Hodder, 2012). Such perspectives underscore that ruins are not passive residues but dynamic assemblages in which materials, infrastructures, and ecological processes continue to act upon historical outcomes.

These shifts have produced significant achievements. By recognizing ruins as dynamic rather than static, scholarship has encouraged methodological pluralism in historical science, integrating archaeological, ecological, and sociological approaches. The entanglement of material processes with heritage regimes also strengthens the link between integrity and transformation, underscoring that conservation must account for ongoing decay and reconfiguration (Khalaf, 2020). Furthermore, framing ruins as active participants in history refines causal accounts of decline and continuity, moving beyond symbolism to incorporate the agencies of corrosion, vegetation, or contamination as historically meaningful (Dawdy, 2020; Edensor, 2007).

At the same time, challenges persist. Comparative analysis still lacks standardized protocols for measuring the influence of non-human agency across diverse contexts, which complicates cross-site synthesis. Moreover, theory-heavy models risk abstraction when they outpace empirical grounding, leading to conceptual inflation detached from material data (Flyvbjerg, 2006; Ragin, 2014). Addressing these limitations requires methodological reflexivity and the careful integration of theory with evidence. In this respect, the field benefits from comparative typologies of ruin agency, which provide both analytical clarity and empirical grounding, ensuring that non-human forces are systematically integrated into historical explanation.

11 CONCLUSION

The comparative study of Pompeii, Angkor, Chernobyl, and Detroit demonstrates that ruins are not inert residues of past civilizations but dynamic assemblages shaped by heterogeneous non-human forces. Volcanic ash at Pompeii sealed wall paintings, graffiti, and even loaves of bread, transforming

catastrophe into an archive of Roman everyday life. At Angkor, lidar has revealed buried canals and reservoirs overtaken by monsoon cycles and vegetation, illustrating how ecological processes gradually reshaped an imperial capital. In Chernobyl, the exclusion zone, with its abandoned villages and thriving populations of wolves and wild horses, testifies to the enduring and invisible force of radiation. In Detroit, the crumbling Packard Automotive Plant and the hollow shell of Michigan Central Station embody the slow violence of infrastructural neglect, racialized inequality, and disinvestment. These examples show how ruins emerge as co-authors of history, producing distinctive archives and memory regimes long after human societies have withdrawn.

From these cases arises a typology of ruin agency. Catastrophic agencies, as in Pompeii, act with sudden violence that simultaneously destroys and preserves. Ecological agencies, exemplified by Angkor, unfold incrementally through environmental entanglements. Technological agencies, as in Chernobyl, operate invisibly across extended temporal scales. Infrastructural agencies, visible in Detroit, manifest through slow corrosion and abandonment. Yet these categories overlap: Detroit's infrastructural decline is inseparable from socio-economic forces, and Angkor's ecological change cannot be disentangled from political upheaval. Recognizing such overlaps prevents typology from becoming rigid and affirms that ruin formation is a complex interplay of multiple domains.

These insights also bear directly on heritage governance. Each case challenges conventional notions of authenticity and integrity: Pompeii risks over-curation, Angkor poses dilemmas of ecological authenticity, Chernobyl strains UNESCO standards of continuity in the face of radioactive contamination, and Detroit blurs the line between living urban space and abandonment. These tensions highlight the need for heritage regimes to accommodate ongoing material processes and the agencies of decay rather than treating ruins as frozen objects of preservation (Khalaf, 2020).

At the same time, comparative synthesis faces limitations. The evidentiary base remains uneven: Pompeii offers unparalleled detail, Angkor relies on partial archaeological reconstructions, Chernobyl's contamination restricts access, and Detroit's global image is often shaped by aestheticized "ruin photography" that obscures lived inequality. Preservation and visibility biases complicate inference, while generalizations risk flattening the distinct social trajectories that produced each ruin.

Nevertheless, by foregrounding non-human agencies and integrating them into historical explanation, the study of ruins advances modern historical science. It refines methodological pluralism by linking archaeological, ecological, and sociological approaches; it expands comparative methods to include multi-scalar and interdisciplinary perspectives; and it repositions ruins as sites where material processes and human histories remain entangled. In this way, ruins cease to be monuments of loss and instead become laboratories for understanding resilience, transformation, and the ongoing interplay of human and non-human forces in shaping the historical record.

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