SFI TRANSMISSION

COMPLEXITY SCIENCE FOR COVID-19

STRATEGIC INSIGHT: **The archaeological record can teach us much about cultural resilience and how to adapt to exogenous threats.**

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One thing humans are particularly good at is perceiving environmental cues, adapting our cultural practices around those cues, and encoding lessons for future generations on how to prevail. For example, the practice of quarantine comes from the 14th-century convention of keeping ships at anchor outside Venetian harbors to protect citizens from unknown pathogens; the etymology of the word comes from *quaranta giorni*, the 40-day period sailors had to wait before disembarking. Even Charles Darwin had to quarantine before exploring foreign shores as a naturalist. This behavior remains encoded in our own 21st-century cultural practice. Take comfort in knowing the boredom we face in our homes as we socially isolate was also felt by the sailors stuck at anchor outside the shining city of Venice in the 1300s.

Lessons can come from many societies worldwide, such as these premodern examples in the U.S. Southwest. Among the Ancestral Pueblo people who lived in what is now Mesa Verde National Park and surrounding regions, challenges such as droughts and unrest led to innovations that helped the society thrive there for 700 years, though that society went through periods of prosperity and upheaval. Perhaps the most emblematic is the rise of Chaco Canyon, a large, highly centralized polity in northern New Mexico — and its rapid decline. As political hierarchies at Chaco grew, so too did increasingly large community structures built on the ability to control farming production. When productivity failed, the Chacoan hierarchical society fractured, violence increased, and society reorganized into regional communities that eschewed hierarchy. The archaeological record, bolstered by computer simulation (fig. 1), shows us how they reacted to societal upheaval; as maize farming became less predictable and violence escalated, hierarchy disintegrated. When finally the communities left Mesa Verde, walking hundreds to thousands of miles to new regions, they brought with them the accumulated knowledge of successful society,

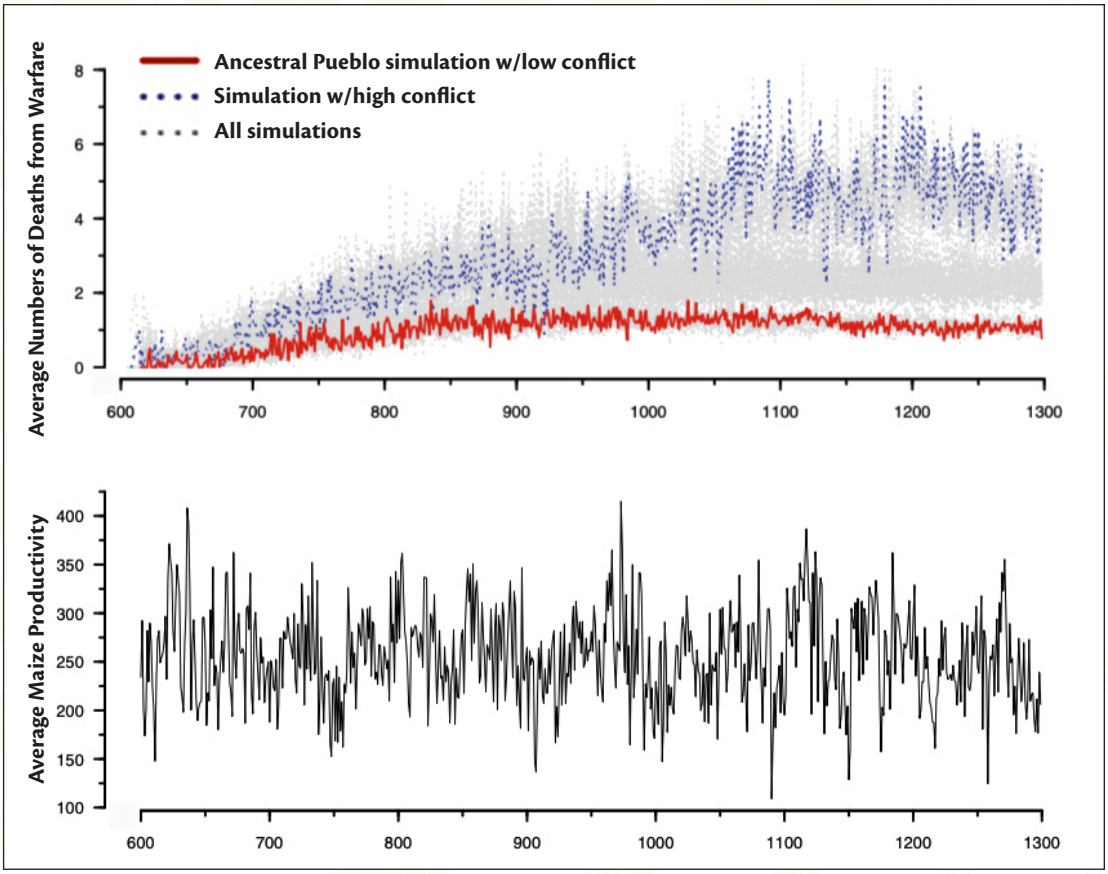

Figure 1. *Top: Simulations of Ancestral Pueblo society show that, as hierarchies grow and people fight over arable land to grow maize, warfare (and death from warfare) increases. This is juxtaposed against real average maize production by year for the whole region of Mesa Verde (bottom). The decline of the Chacoan hierarchy in the late 1100s corresponds to increases in violence and decreases in predictable food. Yet the Ancestral Pueblo society continued, reorganizing their society after the sharp exogenous shocks, and rebuilding away from Mesa Verde after 1300.*

demonstrating the resilience of culture in the face of exogenous stress. The descendent communities today demonstrate much about cultural resilience and how to adapt to exogenous threats.

This shared history and solidarity with the past suggests that we can learn from these difficult situations. The Plague of Athens (430–427 B.C.), which is estimated to have killed one-third of the city-state's population, would have been a traumatic experience to live through. Many have speculated that it caused the demise of Athenian democracy, but the writings of Thucydides offer lessons to help us understand how diseases can exploit weaknesses in society — and how we might overcome them. Public health issues like poor sanitation and overcrowding, he notes, led to increases in casualties from the

disease. These could have been avoided had officials heeded concerns about crowding. Doctors and caregivers succumbed to the disease and died; little seemed to help those who contracted it to survive. A lack of understanding of the disease sparked fear that spread through the citizens as quickly as the Plague itself. Thankfully, these writings can help us identify commonalities between how citizens reacted in 430 B.C. and how they may react today. Bolstering citizen confidence via clarity of communication from officials (such as daily briefings from state governors like Washington's Jay Inslee), increasing our collective knowledge of the disease by applying open-science principles and sharing our models (as most scientists are doing), and thoughtful prosocial behavior by citizens (such as donating masks to healthcare workers) may help avoid the types of consequences Athenians experienced after the Plague ended.

Societies that prevail encode these lessons through oral tradition, writing, songs, and artworks. We learn to adapt and innovate — a hallmark of our species. From the first Oldowan stone tools to the development of complex communication platforms, we find ways to succeed, we persevere, we *make do*, as my great-great-great grandmother who lived through the Great Depression would say. Making do required focusing on what she had, not what she didn't have, and ensuring the health and survival of her family. Countless ancestors have had to make do through challenges in the past; it is, I think, one of the comforts of being an archaeologist: knowing that I am not alone in what I face. And just like our forebears, so, too, will our society survive through this challenge. We will innovate. Our descendants will learn from the lessons we are encoding now in our cultural memory. 700 years ago Venetian sailors were stuck at harbor; 500 years later Charles Darwin also had to undergo quarantine before embarking on distant shores. In 700 years, our descendants will benefit from the innovations and lessons we are encoding today.

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