

BOOKS & ARTS

Two views of collapse

We need realism, not positivity, to learn lessons from past societal demises, urges **Jared Diamond**.

Why have some societies thrived for millennia, whereas others have collapsed? That question is the subject of these two contrasting books. One details the rise and fall of Bronze Age civilization in Greece and Crete; the other argues that societies seldom collapse.

The region around the Aegean Sea spawned Europe's first complex societies, with the first writing, state governments, kings and palaces. Later, the region endured the biggest collapse of the past 10,000 years of European and Mediterranean history. In *The Cambridge Companion to the Aegean Bronze Age*, archaeologist Cynthia Shelmerdine and her co-authors synthesize a huge specialized literature on the lands and islands of the Aegean between 3000 BC and 1070 BC. The book offers one of the best regional accounts of the origins of complex societies worldwide.

Within the Aegean, those hallmarks of civilization arose first on Crete because of its numerous geographic advantages. Its excellent harbours and position at the mouth of the Aegean Sea enabled islanders to trade widely with the nearby Greek and Anatolian mainlands and smaller Aegean islands, and with distant Cyprus, Egypt, the Black Sea, the Levant and Italy. Similar to Britain and Japan, Crete was close enough to mainlands to profit from them, but far enough away to be safe from invasion for many centuries.

Crete's soils, good for agriculture but poor in metals, nourished a large population that was motivated to trade. The mountainous landscape was dissected enough to spur state formation through competing polities, but not so dissected as to prevent unification. Crete was big enough to dominate the Aegean for a long time, but too small to avoid eventually being conquered by Greek mainlanders, the Mycenaeans, around 1450 BC.

Late Bronze Age civilization collapsed spectacularly throughout the eastern Mediterranean in the early twelfth century BC, for reasons that are still debated. All Mycenaean palaces were burned, depopulation eliminated 90% of sites, Greece became illiterate for 400 years, state governments reverted to



D. H. COLLIER/GETTY

Chaco Canyon's huge buildings hint at the sophisticated society that existed there in the first century.

villages and great art forms vanished. One theory of the cause posits a domino-like collapse of the Mediterranean's interconnected states. If so, the manner of the Bronze Age's end could shed light on risks to today's world, such as the milder, domino-like collapse of the globally interconnected financial systems in 2008–09.

Some researchers query the interpretation of past societal demises, preferring a positive message about human nature. *Questioning Collapse*, a volume of essays edited by anthropologists Patricia McAnany and Norman Yoffee, focuses on three questions: "Why do we portray ancient societies — especially those with indigenous descendants — as successes and failures? How do we characterize people who live today in the aftermath of empires?

How are urgent climatic and environmental issues today similar to those faced by our ancestors?"

The book's thesis is that "human resilience is the rule rather than the exception" and that "collapse" — in the sense of the end of a social order and its people — is a rare occurrence. Past societies did the "best they could" to respond to crises that hit them, and were not

driven to failure by man-made problems such as overpopulation or environmentally destructive behaviour, as is often argued by other authors, including myself. On the book's other theme of empire expansion, the authors seem uncomfortable with the glaring fact that it is Europeans, not Native Australians or Americans or Africans, who have expanded over the globe in the past 500 years. They dismiss as an "accident of geography" those explanations of this outcome that rest on environmental factors — such as continental differences in biogeographic endowments, shapes and locations — but they do not offer a substitute thesis. The essays often depict non-Western societies as virtuous and Western societies as evil-doers.

The editors state that each contributing author is "deeply concerned about the inaccuracies of popular portrayals [of history] and feels that students and laypersons alike deserve to read a better story". This goal is laudable. However, in forcing all of history into their framework, they resort to errors and implausible extremes. For instance, one chapter claims that the Greenland Norse people emigrated rather than dying out, despite no evidence for that claim and despite graphic archaeological evidence of starvation — bones and debris in the topmost archaeological layer from the final winter of the Greenland Western Settlement's existence. Another chapter contends that the ancient people of the American southwest, the Anasazi, did not deforest Chaco Canyon

The Cambridge Companion to the Aegean Bronze Age

Edited by Cynthia W. Shelmerdine
Cambridge University Press:
2008. 524 pp. \$29.99, £18.99

Questioning Collapse: Human Resilience, Ecological Vulnerability, and the Aftermath of Empire

Edited by Patricia A. McAnany and Norman Yoffee
Cambridge University Press: 2009.
392 pp. \$29.99, £17.99

in New Mexico, that “there was never a forest in the canyon” and that analysis of plant remains in ancient pack-rat middens there “reveal a climate and ecology almost exactly like that which exists today”. Yet the opposite is true: radiocarbon dating of middens revealed a former pinyon-juniper woodland that is now absent from the canyon.

The book promotes an absurd rewriting of the Spanish conquest of the Inca Empire: “Spain was a mess, whereas Inca Peru was a model of good government ... in effect, the conquistadors were adopted by their native Andean allies.” It argues that overpopulation did not contribute to the 1994 genocide in Rwanda, relating it instead to local views of sacred kings. But a surviving Rwandan schoolteacher whose wife and four children were killed in the genocide gave a blunter explanation when he was interviewed: “The people whose children had to walk barefoot to school killed the people who could buy shoes for theirs.” Another essay describes a New Guinean man named Yali, giving a lengthy reinterpretation of his views about the European colonization of New Guinea in the light of the experiences of another man with the same name — not realizing that the two Yalis were different people, 40 years apart in age and with dissimilar life stories and opinions.

Although the authors of *Questioning Collapse* may wish it were otherwise, students and laypersons alike know that Europeans did conquer the world. They will not be satisfied by being told that Andean peoples merely adopted Spanish conquistadors. The depopulations of the southern Maya lowlands and Chaco Canyon also cry out for explanation, even if one relabels them as something other than a collapse. Most readers of Shelmerdine’s book will conclude that the end of the Aegean Bronze Age rates as a collapse.

It makes no sense to me to redefine as heart-warmingly resilient a society in which everyone ends up dead, or in which most of the population vanishes, or that loses writing, state government and great art for centuries. As *Questioning Collapse* shows, that naively optimistic redefinition inevitably forces one to distort history and to avoid trying to explain what really happened. Even when many people do survive and eventually reestablish a populous complex society, the initial decline is sufficiently important to warrant being honestly called a collapse and studied further. We today, who face similar problems and could face similar fates, will not be consoled by the thought that our grandchildren might exhibit resilience.

Modern peoples often fail spectacularly to respond to circumstances as well as they could, and the past offers abundant examples.

Although *Questioning Collapse* aims “to shed light on the way forward”, readers seeking illumination should instead turn to Shelmerdine’s volume and the many other books that are available on the fates of past societies. ■

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The unfolding of time

From Eternity to Here: The Quest for the Ultimate Theory of Time

by Sean Carroll

Dutton: 2010. 448 pp. \$26.95

Why does time run forwards, not backwards? In his much-anticipated book, theoretical physicist Sean Carroll offers an explanation that unifies thermodynamics and cosmology.

Carroll is a good citizen of the scientific blogosphere. A regular Internet pundit — writing first on his own blog, The Preposterous Universe, but more recently on Cosmic Variance, a collective blog hosted by Discover magazine — he opines on topics from physics and philosophy to religion, poker, baseball and coffee. Carroll’s easy and engaging style has attracted a mass of followers, and opened up a lively forum for debate about science.

Carroll’s research focuses on the arrow of time. The Austrian physicist Ludwig Boltzmann supplied the standard explanation that time’s advance is due to the second law of thermodynamics and the growth of disorder, or entropy. As Carroll points out, this merely shifts the problem. The question becomes: why did the entropy of the Universe begin so low? The answer to that involves gravity, space-time and multiverses, and Carroll brings these jigsaw pieces together to explain it.

The narrative is colloquial and jolly, but *From Eternity to Here* reads more like an extended essay than a popular physics book. It is largely devoid of anecdotes and potted biographies of famous scientists, and the pages convey the high density of material that you would find in a *Scientific American* article. Carroll has a point to make, and must cover a lot of concepts to make it. The book is a modern incarnation of the sort of works that twentieth-century physicists such as Arthur Eddington, Erwin Schrödinger and Werner Heisenberg wrote late in their lives — venerable, erudite accounts with a new, possibly esoteric idea to put across.

Time is a clever unifying theme. Using its role in relativity, quantum mechanics, philosophy

and thermodynamics to pull together many developments of modern physics, Carroll brings the reader back to focus on his big question. This trick gives the book a sense of purpose and prevents the prose from becoming too glutinous. Carroll’s excellent description of Boltzmann’s towering achievements and the limitations of his proof is sharp. The explanation of attempts to study time travel in general relativity is on a par with Kip Thorne’s masterful *Black Holes and Time Warps* (W. W. Norton, 1994).

Carroll’s solution for the arrow of time invokes the multiverse, a controversial concept that is a current battleground in theoretical physics. Arguably a prediction from cosmology and string theory, and to some extent quantum mechanics, the multiverse idea supposes that the Universe that we perceive is but one of a countless collection, each of which can be in a different physical state. A case can be made that our Universe looks the way it does because it is the only one of the many possible universes that can harbour us. For example, in another universe in which the constants of physics were slightly different from those in ours, life would not be possible.

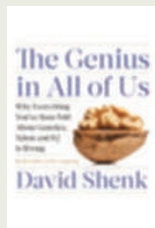
Going further, Carroll adapts the multiverse idea to explain the directionality of time. Universes such as ours, he suggests, continually pop into existence within the multiverse, which is itself in thermal stasis, with no sense of time. We just happen to live in one of these baby universes, which started off in a low-entropy state and has an entropic arrow of time.

Carroll rightly relegates his speculative proposal to the final few pages. It remains to be seen

how his provocative conclusion will be received within the physics community, but multiverse explanations are fashionable so it will garner interest. As a device to end the book’s digression from relativity to the quantum, it works. *From Eternity to Here* is an engrossing, well-crafted introduction to the Universe and the foundations of modern physics. ■

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“Carroll suggests that universes such as ours continually pop into existence within the multiverse.”



Talent does not stem from our genes alone, argues science writer David Shenk in *The Genius in All of Us* (Doubleday, 2010). Favouring

nurture over nature, he examines the science of genetics, cognition and human development and concludes that top performers are moulded by hard work and circumstance, not their biological blueprint. Although the idea of preprogrammed success has been promulgated for decades, Shenk shows instead that human intelligence and talent are abundant resources that society should tap into.



Wisdom is the theme explored by Stephen Hall in his interweaving of neuroscience and philosophy. He explains in *Wisdom* (Knopf,

2010) how thinking about intellect, emotion and ethics has influenced social change over the centuries. In the past 50 years, scientific advances have given us insight into decision-making, emotion and cognition, compassion and empathy. Yet chance and stress still alter the degree to which we can apply our wisdom in the world.



Evolutionary biologist David Stern argues in his book that evolution and development are inextricably intertwined, concluding

that the evolution of genomes is foreseeable. In *Evolution, Development, & the Predictable Genome* (Roberts, 2010), he focuses on the individual steps of evolutionary change, examining how certain genetic and developmental traits are favoured within populations. He explains how new data are emerging that will allow us to test patterns of biological diversity.

Smithsonian on human origins

A permanent exhibition exploring what it means to be human opened last month at the Smithsonian National Museum of Natural History in Washington DC. The US\$20.7-million David H. Koch Hall of Human Origins depicts how human traits evolved out of our ancestors' struggle to survive changes in climate over the past 6 million years.

The exhibit focuses on six evolutionary milestones of early humans: walking upright, experimenting with new tools and foods, changing body sizes and shapes, developing bigger brains, increasing social networks and communicating using symbols.

Visitors can compare their stride to the 3.6-million-year-old footsteps of *Australopithecus afarensis*. This species of hominin, which includes the fossilized partial skeleton named Lucy, walked upright and climbed trees, adapting as climate fluctuated between wet and dry, cool and warm. Walking on two legs helped *A. afarensis* to pick fruit and left their hands free to carry babies. In a striking comparison of body size, a child skeleton of *Homo erectus* named Turkana Boy stands next to the adult composite skeleton of *Homo neanderthalensis*, which is only marginally taller.

Whereas *H. erectus* was adapted to hot climates, having a long, narrow body for dissipating heat, *H. neanderthalensis* had a shorter, wider body to conserve heat in colder European climes.

On show are tools from as early as 2.6 million years ago that allowed the killing of large animals for food. The use of hand axes in the Palaeolithic for chopping, cutting and scraping began about 1.7 million years ago. A million years later, early humans began gathering at the hearth to share food, find safety from predators and build social networks. As they encountered new environments and faced new challenges, their brains got bigger, according to a display that correlates climate fluctuations with expanding brain size.

Another display encourages visitors to feel the sloping face of a 2.5-million-year-old *Australopithecus africanus* skull, balance a pencil on the prominent brow ridges of a 350,000-year-old *Homo heidelbergensis* skull and compare both with the face of a modern human. People can practise forensic anthropology with the most precious fossil in the collection: 130 bones of the only Neanderthal skeleton housed in the United States. He was a 40-something male, found in Iraq, who had arthritis and probably died from a stab wound to the chest. The most crowded part of the exhibit is the least scientific: a photo booth



The permanent exhibit casts climate change as the driver of human evolution.

that transforms your picture into a portrait of your prehistoric ancestor.

Seven reconstructed busts — including that of a 1-metre-tall female 'hobbit', *Homo floresiensis*, from Indonesia and a male *H. neanderthalensis* — allow a more personal connection than the blank gazes offered by their skulls, 76 of which are bolted to a huge wall display, representing

15 species. To determine whether they could turn up the corners of the mouth like modern humans, "we looked at where smile

muscles attach", says Rick Potts, director of the Smithsonian's Human Origins Program. "Their smiles look different from ours and are more like the grimace of a chimpanzee."

Above the skulls, a label reads: "Fossils of more than 6,000 individuals discovered so far. More than a dozen species identified. Only our species, *Homo sapiens*, remains." The exhibition gives constant reminders that life is precarious — whether through suspenseful music, in a short video playing the chimp-like squeals of an early human attacked by a leopard or in displays of hominin bones etched by crocodile teeth or eagle talons. Although we have survived, "our species has also been fragile", says Potts. *H. sapiens* almost became extinct 70,000 years ago when vast swings in climate reduced the population to a few thousand breeding adults. Potts adds: "Our intentions, the decisions we make, make a difference."

Janet Fang is a news intern at Nature.

Correction

In the picture caption of the Book Review 'Two views of collapse' (*Nature* 463, 880–881; 2010), we wrongly stated that Chaco Canyon's society existed in the first century. It should have read 'eleventh century'.