

Maps of Time: An Introduction to Big History

By David Christian

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Reviewed by [S. Paul Wright](#), May 2004

What is Big History?

Simply put, Big History is the history of “everything” on the largest possible scale: from the beginning of the universe until its end. Big History, then, covers not only recorded human history, but also human prehistory and the prehuman history of living things and non-living things. In the case of *Maps of Time*, not-yet-recorded history is also covered: though the book jacket (and various other descriptions of the book) state the time scale as “from the Big Bang to the present day,” in fact, the final chapter covers the near future (100 years), the intermediate future (a few millennia), and the remote future (billions of years) until the universe “runs down.”

The author is an academic historian, so *Maps of Time* should properly be considered a history book. It differs from most conventional history books in being unbounded in space and time. Most historians (like other academicians) tend to be specialists, and most history books and history classes are limited to a certain geographic area and a limited period of historical time. Of course, there are introductory World History classes with their corresponding textbooks, but the writing of such textbooks is generally not considered to be “scholarly” work for an academic historian. Even then, history is generally taken to mean *recorded* human history. Human prehistory is for anthropologists; natural history is for biologists, paleontologists, geologists, cosmologists, and the like. Indeed, David Christian has his own specialty in which he has published extensively (Russian history). So how did he come to be a proponent of Big History? In the Forward William McNeill writes that “In the course of a discussion about what sort of introduction to history the department at Macquarie ought to provide for its students, David Christian blurted out something like ‘Why not start at the beginning?’ and promptly found himself invited to show his colleagues what that might mean” (p. xviii). Since 1989 he has been teaching Big History at Macquarie University in Sydney, Australia, and then (since 2000) at San Diego State University. Mostly it has involved team teaching, with lectures by geologists, biologists, and anthropologists as well as other historians. As a result of this teaching assignment, Christian has become a champion of Big History as a valid academic “specialty.”

The Intended Audience

Maps of Time is an outgrowth of the Big History courses taught by the author. As such it is primarily aimed at a general reader who is curious about history — someone like myself ([see below](#)). It is written in a very readable style; and though there is considerable scientific material in the book, it is covered at a fairly elementary level. Even the two appendices, which cover more technical material (radiometric and molecular dating techniques and the second law of thermodynamics, respectively), are fairly elementary. One minor exception is that, near the end of the Introduction, there is a section, “For and Against Big History,” in which he presents his rebuttals to arguments that Big History is “a diversion from the real tasks of historical

scholarship” (p. 8). This is clearly aimed at professional historians, but it may also interest many general readers.

A Modern Creation Myth

In writing *Maps of Time* the author has in mind something more ambitious than simply writing history on a larger scale than usual. The book’s Introduction begins by noting that “We need to know where we are going, where we have come from, and in whose company we are traveling. . . . ‘Who am I? Where do I belong? What is the totality of which I am a part?’ In some form, all human communities have asked these questions. . . . Often, the answers have been embedded in cycles of creation myths. By offering memorable and authoritative accounts of how everything began . . . creation myths provide universal coordinates within which people can imagine their own existence and find a role in the larger scheme of things” (p. 1). Ironically, the author finds that “It is one of the many odd features of modern society that despite having access to more hard information than any earlier society, those in modern educational systems do not ordinarily teach such a story. . . . We seem incapable of offering a unified account of how things came to be the way they are” (p. 2). Thus, “*Maps of Time* attempts to assemble a coherent and accessible account of origins, a modern creation myth” (p. 2). Specifically, “The story recounted in this book is the creation myth of modern human beings, educated in the scientific traditions of the modern world” (p. 6). The author insists that abdicating the responsibility for telling this story “is harmful because it contributes to the subtle but pervasive quality of disorientation in modern life . . . referred to as ‘anomie’: the sense of not fitting in, which is an inescapable condition of those who have no conception of what it is they are supposed to fit into” (p. 2). More to the point, “Like it or not, people will look for, and find, large stories, because they provide a sense of meaning” (p. 9). It is better if the story is told by those with the most accurate information. As for the role of storytelling in this endeavor, Christian quotes environmental historian William Cronon: “When we describe human activities . . . , we seem always to tell *stories* about them. . . . We do so because narrative is the chief literary form that tries to find meaning in an overwhelmingly crowded and disordered chronological reality” (p. 9).

The Book’s Contents

The main focus of the book is what I like to call “The Story” — the Modern Creation Myth, the narrative history of the universe, life, and humanity. However, that is not all that the book contains. (1) Because The Story is that told by science, the author also provides much useful information about the scientific evidence that supports The Story. (2) In addition (because the author is a historian?), there is a certain amount of “the history behind the history.” For example, there is some history of theories of the universe, mentioning the work of Ptolemy, Copernicus, Galileo, Newton, Kepler, and others. There is some history of the theory of evolution and of Darwin and his critics. Particularly amusing to me as almost-a-geologist ([see below](#)) is the fact that the part of The Story that covers the geological history of the earth fills less than a page and a half, while the history of the science of geology fills nearly five pages! (3) Finally, as mentioned above, part of the Introduction is devoted to explaining why the book was written and promoting Big History as an appropriate endeavor for an academic historian. For me, at least, these digressions did not detract from The Story but provided an informative and sometimes entertaining complement.

The Story

The Story itself is actually told (at least) four times in the book. Tucked away in Appendix 1: Dating Techniques, Chronologies, and Timelines are two (arguably three) tellings of The Story. The section entitled “The Core Story” contains, in narrative form in the space of two-and-a-quarter pages, “one possible attempt to summarize the story told in the rest of this book” (p. 497). This is followed by “A Chronology for the Whole of Time” in the form of a detailed outline with approximate dates and short descriptions for “some of the fundamental changes and transitions dealt with in the text” (p. 499). This fills about two-and-a-half pages. Then, as an aid to human comprehension, this chronology is repeated briefly (about one page), collapsing 13 billion years of history into thirteen years. In this rescaled chronology, the solar system forms about 4.5 years ago, dinosaurs go extinct about three weeks ago, humans appear less than an hour ago, the first urban civilizations appear about 3 minutes ago, and the Industrial Revolution occurs about 6 second ago.

A somewhat longer telling of The Story can be obtained by reading the “Summary” found at the end of each of the 15 chapters. Each summary occupies a page or less. In addition, many chapters have a “Timeline” — a useful accompaniment to the chapter summaries. The time covered by each timeline decreases during the course of the book: the first Timeline (Chapter 1) covers 13 billion years; the final Timeline (Chapter 11) covers 1,000 years. There are also illustrations, maps, and tables throughout the book (a list of these follows the Table of Contents). Many of the tables contain chronological summaries and, like the Timelines, they provide an additional mechanism for comprehending the “big picture.”

I would go so far as to suggest that the best way to read the book is *not* to start at the beginning and read straight through. Instead (perhaps after reading the Forward, which has its own brief account of The Story), start by reading Appendix 1 (skipping over the section on “Constructing a Modern Timeline”). Then read through the chapter summaries while referring to the timelines and tables. Finally, start on the main text itself.

Of course, the main telling of The Story takes place in the text itself. One can get a good sense of what is covered from a listing of the chapter titles since these tend to be fairly descriptive. I list them here along with approximate page counts (excluding summaries) in order to give a sense of the relative emphasis given to different topics.

Introduction: A Modern Creation Myth? (11 pages)

Part I	The Inanimate Universe
Chapter 1	The First 300,000 Years: Origins of the Universe, Time, and Space (19 pages)
Chapter 2	Origins of the Galaxies and Stars: The Beginnings of Complexity (17 pages)
Chapter 3	Origins and History of the Earth (17 pages)
Part II	Life on Earth
Chapter 4	The Origins of Life and the Theory of Evolution (25 pages)
Chapter 5	The Evolution of Life and the Biosphere (28 pages)
Part III	Early Human History: Many Worlds

Chapter 6	The Evolution of Humans (29 pages)
Chapter 7	The Beginnings of Human History (29 pages)
Part IV	The Holocene: Few Worlds
Chapter 8	Intensification and the Origins of Agriculture (33 pages)
Chapter 9	From Power over Nature to Power over People: Cities, States, and “Civilizations” (34 pages)
Chapter 10	Long Trends in the Era of Agricultural “Civilizations” (47 pages)
Part V	The Modern Era: One World
Chapter 11	Approaching Modernity (26 pages)
Chapter 12	Globalization, Commercialization, and Innovation (39 pages)
Chapter 13	Birth of the Modern World (28 pages)
Chapter 14	The Great Acceleration of the Twentieth Century (20 pages)
Part VI	Perspectives on the Future
Chapter 15	Futures (23 pages)
Appendix 1	Dating Techniques, Chronologies, and Timelines (11 pages)
Appendix 2	Chaos and Order (6 pages)

Some Important Components of The Story

One of the criticisms of Big History is that it must inevitably lack detail. The author responds, “But there are compensations” (p. 8). In Big History it is possible to discern patterns that may be missed when history is looked at too closely. Thus, in *Maps of Time* there are certain large-scale themes that permeate The Story. I will mention three of these; the first two are notable but not dominant themes while the third theme occupies a central role in The Story: (1) the “myth” of progress, (2) environmental impacts, and (3) the interplay of order and chaos, of complexity and entropy.

(1) The Myth of Progress

In contrast with most traditional creation stories, this Modern Creation Myth does not see more complex entities (like humans) as “better” (or “worse”) than less complex entities. The Story simply relates the increase in the level of complexity of entities over the course of time, explaining this as much as possible as the consequence of natural processes with no purpose in mind. The author comments that Herbert Spencer, who did much to popularize Darwin’s theory of evolution, “saw biological change as a movement from ‘lower’ to ‘higher’ life-forms, as a form of progress. This is unfortunate, because such an approach introduces arbitrary and subjective value judgments into our understanding of the history of living organisms” (p. 82). In reference to the evolution of modern humans, he stresses, “It is important to note straightaway that there was nothing inevitable about this process. . . . The elements that eventually combined into our species came together erratically and haphazardly As late as 100,000 years ago, well after our species had appeared, human populations may have fallen to as few as 10,000 adults, which means that our species was as close to extinction as mountain gorillas are today. This statistic is a powerful reminder not only of the haphazardness of evolutionary processes but also

of the fragility of complex entities” (p. 148). Later he writes, “*Civilization* is often taken as a synonym for progress, but that is not the sense in which the word is used here. . . . I make no judgments about the intrinsic worth of any particular type of society” (p. 248). Indeed, he cites anthropologist Marshall Sahlins to the effect that “primitive,” Stone Age foragers lived relatively comfortable lives, probably with more leisure time than modern humans. Thus, “Humans collectively have got better and better at extracting resources from the environment, but we cannot automatically equate this change with ‘betterment’ or ‘progress’ ” (p. 187). And in the very last paragraph of *The Story*, in contrasting the current level of complexity with the ultimate heat death of the universe, he concludes, “It is tempting to think that this flash of creativity was laid on for humans — the ultimate justification, perhaps, for the universe’s creation from nothing. Modern science offers no good reason for believing in such anthropocentrism” (p. 489).

(2) Environmental Impacts

A second common theme is how the formation of complex entities alters the environment, with unforeseen consequences for those and other entities. This is particularly, but not exclusively, applied to modern human history. Chapter 14 (“The Great Acceleration of the Twentieth Century”) and Chapter 15 (“Futures”), not surprisingly, devote considerable attention to this topic; but nearly every chapter on human history makes some reference to the problem. The author clearly sees the human impact on the environment as a major problem: “The statistics collected in this chapter [Chapter 14] give some impression of the scale and speed of change. What they cannot do is give us any clear indications of its long-term implications, . . . And that, perhaps, is the most worrying aspect of this brief survey of twentieth-century history — the fear that it is like a traffic accident in slow motion” (p. 463). Chapter 15, supposedly about the future, devotes two-and-a-half pages to the history of the Easter Islanders, whose society was completely devastated by overpopulation, deforestation, and soil erosion. Will this be our fate? The author comments, “After all, the creation of degraded environments after periods of rapid change, whether caused by megafaunal extinctions in the Stone Age or overirrigation in Mesopotamia in the third millennium BCE or in the Mayan lands just over a thousand years ago, has been a recurring theme in human history” (p. 474). But in Chapter 15, two scenarios for the near future are given. First, “If populations keep growing at rates typical of the late twentieth century, there is no hope” (p. 476). Without minimizing the technological, political, economic and social hurdles we face, he then cites hopeful signs that the human capacity for innovation and adaptation may suffice to meet these challenges. For example, population growth rates in many parts of the world are coming down, and international efforts have begun to address environmental problems with some success (e.g., CFCs and ozone-layer depletion).

(3) Complexity versus Entropy

In the Introduction the author writes, “At every level, we will be interested in ordered entities, from molecules to microbes to human societies to large chains of galaxies. Explaining how such things can exist, how they are born, how they evolve, how, eventually, they perish is the stuff of history at all scales” (p. 7). Appendix 2 contains an extended discussion of scientific and philosophical issues related to the formation of complex entities. Christian writes, “Of all the patterns that occur at many different scales, the most fundamental is the existence of pattern itself” (p. 505). Modern science makes clear that, while the total amount of energy in the universe (including matter) remains constant (according to the law of conservation of energy or the first law of thermodynamics), the amount of *free* energy, i.e., “useful” energy available to do

work such as creating patterns and complex entities, decreases with time (the second law of thermodynamics). The “unusable” energy, which is always increasing in the universe as a whole, is usually quantified as *entropy*. But when complex, ordered entities form, entropy must *decrease*, at least locally. How is this possible? It is possible because energy and matter are not evenly distributed. Energy differentials and the resulting flows of energy permit complex entities to form. In particular, it is the temperature difference between the sun and the earth, and the flow of energy from sun to earth, that maintains life on earth. However, “The ultimate source of free energy (and therefore of order) remains one of the great puzzles of modern cosmology, because, as far as we can tell, the early universe was remarkably homogeneous” (p. 507). But there was enough inhomogeneity for gravity to operate on matter, forming concentrations that became dust clouds, then stars, then solar systems, and the rest, as they say, is history. Nevertheless, in the inconceivably distant future, all free energy will be used up and the universe will undergo “heat death.” Ironically, the formation of complex entities may actually speed up this process: “What complex structures do is to handle huge flows of energy and, in the process, dissipate large amounts of free energy, . . . Though they appear to reduce entropy momentarily and locally, they in fact generate entropy more effectively than simple structures” (p. 509). One way to quantify complexity is by the density of such energy flows. Table 4.1 on page 81 (from Eric Chaisson, 1991, *Cosmic Evolution: The Rise of Complexity in Nature*) gives the “Free Energy Rate Density” for various structures from galaxies (with a value of 1) and stars (a value of 2) to plants (earth’s biosphere, a value of 900) to the human brain (150,000) to modern human society (500,000). (The unit of measurement is ergs per second per gram, but it’s the relative magnitudes that are important.)

The Story is, in many respects, the record of a series of “transitions” during each of which a new level of complexity comes into being. These transitions have certain features in common: “transitions to greater complexity come about through the creation of new forms of interdependence, as entities that once existed more or less independently are incorporated within new and larger structures. . . . as new levels of complexity have appeared, they seem to operate according to new rules (‘emergent properties,’ in the jargon of complexity theory)” (p. 139-40). Here I can do no more than comment on a few of the more important transitions while noting the author’s recurring refrain about rising levels of complexity. To start with: “The lighting up of the first stars was a momentous turning point in the history of the universe, for it marked the appearance of a new level of complexity, of new entities operating according to new rules” (p. 44). The chemical elements that are essential to life (carbon, oxygen, etc.) resulted from the formation and explosion of stars. Summarizing the transitions up to the appearance of humanity, he writes: “Human history marks the sudden and unexpected emergence of a new level of complexity, as did the first appearance of stars, of life on earth, or of multicelled organisms” (p. 139). Furthermore, “As with earlier transitions, human history links once-independent entities into larger patterns of interdependence . . . Humans, acting together, have learned how to manage increasingly large energy flows. . . . humans have learned to extract from their environment more than just the energy needed to survive and reproduce” (p. 140). The use of fire, the invention of agriculture, the domestication of large mammals, and the more recent use of fossil fuels are some examples how humans have increased the amount of energy available per capita. The particular importance of humanity in The Story is emphasized and justified: “Clearly, a fundamental threshold of some kind was crossed with the appearance of our species. Human history marks the appearance of new rules of historical change. So, to focus on human history is not just a matter

of genealogical vanity” (p. 144). Various explanations have been offered for the transition to humanity, including upright posture leaving the hands free for tool-making, and larger brain size. The author favors human symbolic language as the most important factor. It is language that makes collective learning possible so that humans survive and thrive less as the result of biological adaptation than through cultural evolution: “Humans as individuals are not that much cleverer than chimps or Neanderthals; but as a species we are vastly more creative because our knowledge is shared within and between generations. All in all, collective learning is so powerful an adaptive mechanism that one might argue it plays a role in human history analogous to that of natural selection in the histories of other organisms” (p. 147).

Subsequent human history is largely about increasing levels of interdependence, from small, relatively independent groups of foragers to today’s almost completely interdependent global community. The role of agriculture is especially crucial: “A threshold is crossed, with a shift from extensive to intensive technologies” (p. 207). That is, the expansion of humanity shifted from migration into new territories to supporting larger numbers of humans in the same territory. Agriculture “stimulated population growth and encouraged humans to settle in the large, concentrated communities we call villages and towns. Denser settlement encouraged more exchange of ideas, and stimulated collective learning so that the pace of technological change accelerated. But larger and denser settlements also created novel social and organizational problems, whose solutions required both new social relationships and larger and more complex social structures” (p. 207). Food surpluses allowed villages to become cities, city-states, and eventually civilizations. This was accompanied by division of labor since not everyone was needed for food production. Rulers, merchants, craftsmen, soldiers, and government bureaucrats came into being along with innovations such as writing, mathematics, and taxation! All this was well established in ancient times, and history as traditionally taught is often about the rise and fall of various civilizations in various parts of the world. Big History is less about individual civilizations than about overall trends. These include increased urbanization as a larger and larger fraction of humanity came to live in cities, increased commercial and technological interchange between centers of civilization (and between centers of civilization and the “barbarians” who lived beyond the boundaries of the “civilized” world), and boom-and-bust Malthusian cycles of population expansion. These cycles are characterized by population growth, which eventually outruns the carrying capacity of the land, resulting in a population crash until technology catches up and population numbers move to an even higher level. The crash is often exacerbated by environmental degradation (destruction of forest, depletion of soils) and by diseases that are introduced when regions that were formerly isolated from one another come into contact for the first time. For example, during the first millennium CE, world population did not rise at all, and this has been attributed to “increasing traffic along the major exchange networks of Eurasia, such as the Silk Roads and the sea routes linking the Mediterranean and South and East Asia” (p. 315).

The final “transition” in *The Story* produced the Modern World. In the 16th century, with the bridging of the Atlantic, a truly global exchange network came into being with Europe as its chief beneficiary. Merchants became increasingly powerful: “European merchants and the rulers who backed them were rewarded spectacularly and rapidly. . . . Serious dependence on commercial revenues gave states a particular structure and distinctive policies. First, merchants often enjoyed unusually high status in such polities; in some, such as Venice or Holland, they

were the state. Second, states dependent on commercial revenues . . . protected the rights of merchants with an enthusiasm uncommon in the larger and more traditional agrarian empires” (p. 394). The stage was set for the appearance of modern capitalist states. The Industrial Revolution completed the process, transforming not only industry but also the structure of government and society, in particular “the extent to which state power reached directly into the lives of a majority of its subjects” (p. 427). In the wake of the French Revolution, governments began “to collect more information on the demographic and economic resources they controlled. . . . to take an interest in public health and to support systems of public education” (p. 427). They also became more directly involved in police matters: “The steepness of the modern gradient of wealth put far more wealth in the hands of a minority than ever before . . . States, in short, had to be powerful enough to protect the wealthy and the entrepreneurial” (p. 428).

One aspect of the transitions in complexity throughout history, which receives only occasional mention in *Maps of Time*, is their irrevocability. Each transition produces “new forms of interdependence” (p. 139) which cannot be undone without destroying that which has been created. For example, in describing the transition to agriculture, the author writes: “As populations of sedentary communities increased, and as they became more dependent on a narrowing range of favored species and more skilled at raising the productivity of the species, both the possibility and the desirability of returning to nomadic lifeways diminished. This is a pattern we can describe as the trap of sedentism. . . . they had become committed to a sedentary lifeway as they lost ancient skills” (p. 235). The same could be said about urbanization, about division of labor, about industrialization. With each upward step in complexity and interdependence, humans made choices, consciously or unconsciously, which irrevocably changed human history and even human nature as certain skills were developed (science-math-technology) while others were allowed to atrophy (“wisdom”?).

Personal Reflections

In many ways *Maps of Time* is quite successful; in other ways many readers may find it disappointing. For me personally, the book provided very much what I was looking for: a sense of the “big picture” of history, an outline and a context which will help me, when I read other historical materials, to put things in a larger perspective. As Big History, *Maps of Time* is, I think, a great success. But, as mentioned earlier, it also aspires to be a Modern Creation Myth, “the creation myth of modern human beings, educated in the scientific traditions of the modern world” (p. 6). This also is a success in the sense that The Story accurately reflects the views of modern science, and this is informative and helpful in understanding the modern world. Its success as a Creation Myth is more debatable. Here is an expanded version of a quote given earlier: “Creation myths provide universal coordinates within which people can imagine their own existence and find a role in the larger scheme of things. Creation myths are powerful because they speak to our deep spiritual, psychic, and social need for a sense of place and a sense of belonging. Because they provide so fundamental a sense of orientation, they are often integrated into religious thinking at the deepest levels, . . . ” (p. 2). As a lover of science myself, I understand the sense of awe and wonder that science can provide, but I have doubts about science’s ability to satisfy “our deep spiritual, psychic, and social need.” At the very end of The

Story, in the Summary for the final chapter, Christian writes: “From the standpoint of an inconceivably distant future, when the universe contains no more than a depressingly thin sprinkling of photons and subatomic particles, the 13 billion years covered in this book will seem like a brief, exuberant springtime” (p. 491). He elaborates on this in the final paragraph of that chapter, part of which was quoted earlier: “It is tempting to think that this flash of creativity was laid on for humans — the ultimate justification, perhaps, for the universe’s creation from nothing. Modern science offers no good reason for believing in such anthropocentrism. Instead, it seems, we are one of the more exotic creations of a universe in the most youthful, exuberant, and productive phase of a very long life. Though we no longer see ourselves as the center of the universe or the ultimate reason for its existence, this may be grandeur enough for many of us” (p. 489). For some this may perhaps suffice; for most, I think not.

About the Reviewer

It seems only fair to say something about who I am and what qualifications I may have (or lack) for reviewing this book. My lifelong interest in science led me to study science in college, ending up (after a couple of changes of major) with a major in geology and a minor in chemistry. After a brief interruption (resulting in another change in major), I obtained Master’s degrees in experimental psychology and statistics. During all this time I took only the minimum required non-science courses; this included one year of American History. Since graduating, I have worked as a statistician at a university and, more recently, in a private company. My leisure-time reading remains predominantly nonfiction, mostly science and math along with some psychology/philosophy/religion, but very little that could be called history. Reading *Maps of Time* was an attempt to redress the balance. With its comprehensive spatial and temporal coverage and its considerable attention to scientific evidence, it proved to be an excellent way for someone of my background and interests to begin to grasp the Big Picture. I highly recommend it.

References & Links

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World History for Us All website: <http://worldhistoryforusall.sdsu.edu>.

This site is under development, but has enough content to be worth visiting. David Christian is the associate director of the project, and the organization of teaching units is very reminiscent of *Maps of Time*.

History 112, An Introduction to World History. This is the Study Guide for the 1999 version of David Christian's Big History class at Macquarie University. Among other things, it includes a list of lecture topics and guest lecturers, a chronology similar to the one in Appendix 1 of *Maps of Time*, and an extensive bibliography (which also appears in *Maps of Time*).

<http://cas.memphis.edu/~jmblythe/GlobalS04Web/David%20Christian%20course.html>