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AHA Presidential Address

Inequality: Historical and Disciplinary Approaches

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IN THE UNITED STATES TODAY—but not only in the United States—the contrasts among the wealthy, the poor, and those in between are growing and gaining increasing attention. Not since the days of the Robber Barons of American industry at the opening of the twentieth century have small numbers of wealthy people gained such economic power and social prominence. The growth of the economy’s financial sector means that its profit rates and personal incomes greatly exceed those elsewhere in the economy. While petroleum companies earned nearly half of total U.S. corporate profits in the 1970s, banks and other financial firms had displaced them by the time the twenty-first century opened.

The economic crisis of 2008–2009—provoked by instability in financial markets, and bringing deep losses in corporate earnings and high levels of unemployment—reinforced the popular impression that a crisis in inequality was developing, since the big firms, and especially the financial firms, were bailed out by government allocation of tax money gathered from the general public. French economist Thomas Piketty had already been working on the issue of inequality for over a decade, along with American economist Emmanuel Saez. Their 2001 analysis of the top 10 percent of Americans’ individual earnings as a portion of total U.S. earnings led to wide circulation of graphs such as Figure 1, showing a peak in concentration among the wealthy in 1928, low levels of inequality from the 1940s to 1980, and a rapid rise in inequality thereafter.¹

To what degree is rising inequality a global phenomenon, rather than one focused on the United States? Piketty’s 2014 interpretation, entitled *Capital in the Twenty-First Century*, extended the argument to the Atlantic world’s big economies.² He ar-

I express appreciation to Daniel J. Bain, Matt Drwenski, Pat Hudson, Leo Lucassen, Ruth Mostern, David Ruvolo, and Vladimir Zadorozhny for their contributions to the preparation of this essay, and to *AHR* Editor Rob Schneider for his valuable questions and suggestions. I drew inspiration for the world-historical approach I employ here from Barbara Weinstein’s exploration of Brazilian material inequality in a global context in her AHA Presidential Address, “Developing Inequality,” *American Historical Review* 113, no. 1 (February 2008): 1–18.

¹ Levels of inequality in the U.S. continued to rise. For the top 1 percent and the top 0.1 percent, measured inequality reached unprecedented levels by 2013. Emmanuel Saez, “Striking It Richer: The Evolution of Top Incomes in the United States (Updated with 2013 Preliminary Estimates),” <http://eml.berkeley.edu/~saez/saez-UStopincomes-2013.pdf>.

² Thomas Piketty, *Capital in the Twenty-First Century*, trans. Arthur Goldhammer (Cambridge, Mass., 2014). The most thorough review of Piketty’s analysis, Pat Hudson and Keith Tribe, eds., *The Con-*

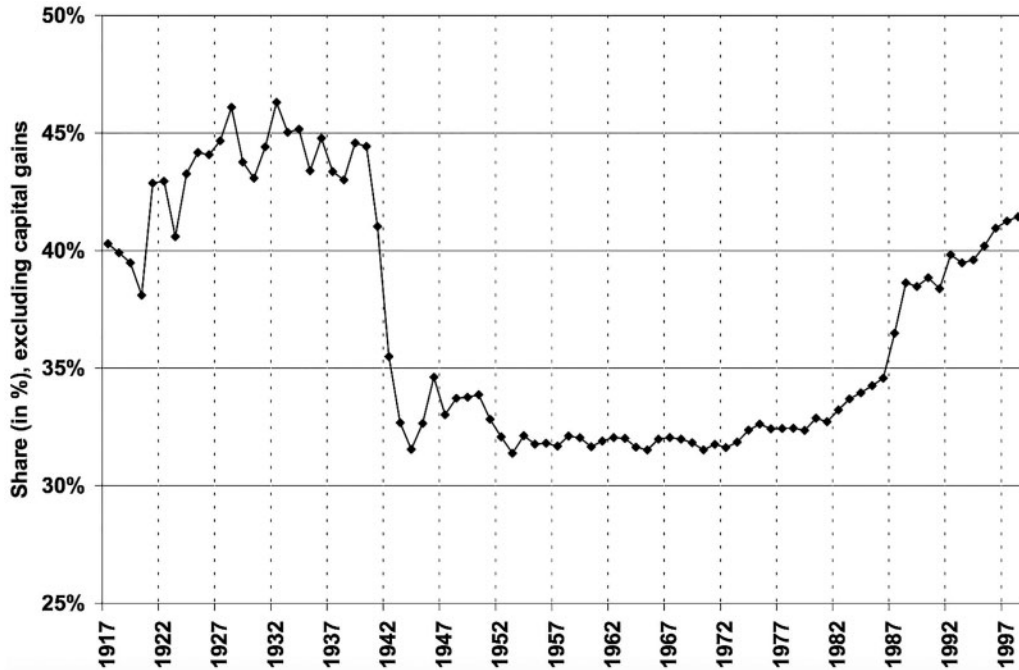


FIGURE 1: U.S. Top 10% Income as Percent of Total, 1917–1998. From Thomas Piketty and Emmanuel Saez, “Income Inequality in the United States, 1913–1998,” National Bureau of Economic Research Working Paper No. 8467 (September 2001), <http://www.nber.org/papers/w8467>.

gued that the increase in inequality is an automatic result of economic forces, independent of human will. The Great Depression and World War II reversed the previous accumulation of wealth by destroying capital, but the growth of capital and inequality resumed its steady advance from 1980. Still, most of the world’s population, living in less affluent countries, remained outside of this analysis.

The study of inequality in today’s economics literature centers primarily on economic inequality in contemporary times, and mostly in relatively wealthy countries.³ Within these limits, many excellent books and articles of economic analysis have recently appeared.⁴ Nobel laureate Joseph Stiglitz has emphasized that the top incomes consist mostly of “economic rents”—earnings above those necessary to sustain the

traditions of Capital in the Twenty-First Century: The Piketty Opportunity (Newcastle-upon-Tyne, 2016), includes fifteen chapters scrutinizing its theory, its analysis of major Western economies, and its application to Latin America, Africa, Japan, and India.

³ The contemporary analysis of Piketty and other economists has displaced the previous economic understanding of inequality, first articulated by the Harvard economist and Nobel laureate Simon Kuznets in 1954. Kuznets proposed three stages in the development of industrial economies: an early stage with low but growing inequality, a stage of rapid growth at high levels of inequality, and a stage of maturity at which levels of inequality declined. He assumed that the United States and other leading economies had reached the stage of maturity, and that other economies would follow, with declining levels of inequality and expanding democracy. Kuznets wrote in the postwar era of the welfare state, a time of relatively large public investment in roads, schools, and health services. Welfare economics, the study of the distribution of resources rather than maximization of profit, was then in its heyday, led by the British economist A. C. Pigou. Simon Kuznets, “Economic Growth and Income Inequality,” *American Economic Review* 45, no. 1 (1955): 1–28; Pigou, *The Economics of Welfare*, 4th ed. (Basingstoke, 2013).

⁴ James K. Galbraith’s *Inequality: What Everyone Needs to Know* (Oxford, 2016) is a concise primer on inequality, neatly defining many of the main issues.

level of production—rather than remuneration for productive contributions.⁵ His proposed response was regulation of the top economic level and more social investment. Piketty's well-known work argued that capital, and therefore top incomes, necessarily grows faster than wages.⁶ The most thorough work in documenting inequality worldwide has been that of Branko Milanovic. His latest volume, published in 2016, seeks to trace the dynamics of inequality in time and proposes a “new approach” to inequality.⁷ British economist Anthony Atkinson, a long-time analyst of inequality, treats the growing disparities as a serious economic danger and argues that “[a] reduction in market income inequality is possible.”⁸

Economists generally appear to believe that significant inequality is inevitable in society, though most acknowledge that it can reach levels that are excessive. Three palliatives for excessive inequality have varying degrees of support among economists: taxation, regulation, and economic growth. Piketty, Stiglitz, and other economists with social democratic outlooks support taxation and regulation as means to limit excessive holdings in financial portfolios. Opposition to taxation and regulation comes especially from wealthy individuals and big institutions, but also from important segments of general populations.⁹ More widely supported is a focus on economic growth—an argument that growth can reduce economic inequality by bringing a higher level of income for all, enabling those with lower incomes to catch up to others without reducing the incomes of the wealthy.¹⁰ At least since the mid-twentieth century, economic growth had become a principal policy objective for most national governments, for international organizations, and for business firms. Similarly, growth is high on the agenda of general populations concerned about their own well-being. Now the rising concern about economic inequality has added fuel to the fire of demand for more economic growth.

Those who desire to resolve inequality through economic growth, however, tend to assume that growth itself is unproblematic. Further, and perhaps more significantly, the focus on growth as a solution to inequality ignores the current crisis of en-

⁵ Joseph E. Stiglitz, *The Price of Inequality: How Today's Divided Society Endangers Our Future* (New York, 2012). See also François Bourguignon, *The Globalization of Inequality*, trans. Thomas Scott-Railton (Princeton, N.J., 2015); and Alan S. Blinder, Andrew W. Lo, and Robert M. Solow, eds., *Rethinking the Financial Crisis* (New York, 2012).

⁶ Piketty, *Capital in the Twenty-First Century*. See also Thomas Piketty, *The Economics of Inequality*, trans. Arthur Goldhammer (Cambridge, Mass., 2015), which provides Piketty's definitions and measurement of inequality.

⁷ Branko Milanovic, *Global Inequality: A New Approach for the Age of Globalization* (Cambridge, Mass., 2016). See also Peter H. Lindert and Jeffrey G. Williamson, *Unequal Gains: American Growth and Inequality since 1700* (Princeton, N.J., 2016).

⁸ Anthony B. Atkinson, *Inequality: What Can Be Done?* (Cambridge, Mass., 2015). Angus Deaton has chosen to make the case for an essential link between wealth and health in the rise of inequality. Deaton, *The Great Escape: Health, Wealth, and the Origins of Inequality* (Princeton, N.J., 2013). Further, the field of economic history, thriving yet somewhat marginalized within the larger field of economics, is adding new data and interpretations to longer-term study of inequality: the World Economic History Congress of 2015, held in Kyoto, included some fifty papers on aspects of economic inequality.

⁹ Thus, the “Tobin tax” was proposed by Nobel laureate James Tobin in 1972 as a modest tax on conversions from one currency to another to limit speculation. This and other such limitations on financialization were met with sharp criticism and have been implemented only to a slight degree.

¹⁰ Stiglitz argues that growth is greater in times of relative equality; *The Price of Inequality* 5–7. Milanovic argues that economic growth among poor people will contribute little to environmental degradation; *Global Inequality*, 232–234. Deaton argues that growth in China and India has reduced average inequality; *The Great Escape*, 41–45. But Piketty argues that long-term growth does not exceed 1.5 percent per year; *Capital in the Twenty-First Century*, 83–85, 93–94.

vironmental degradation. Despite the energy and sophistication that have gone into the research, economic studies of inequality suffer from a fundamental narrowness: they neglect the inequality in other areas of life—social, political, and cultural discrimination—and assume that these other areas are separate from or subordinate to economic inequality.

In contrast to this economics-only approach, I emphasize a world-historical approach to inequality, relying not only on economics but on data and analysis from history, the social sciences, the humanities, and the natural sciences. To explicate this world-historical approach, I will introduce here the objectives, methods, and arguments of this ambitious but, I think, timely plan for historical research. Inequality, from this point of view, is a question not only of income and wealth but also of cultural hierarchies, social discrimination, political disenfranchisement, discrepancies in power, and the disparities resulting from varying conditions of health and climatic experience. A historical analysis of inequality, therefore, must address the transformations of multiple aspects of inequality, including inequality in health and the impact of climate, as well as the interactions of growth and inequality in human society with environmental changes. The proposal for a world-historical research campaign on inequality may seem to be of an enormous and perhaps impossible scale, but I believe that it is both feasible and necessary.

The parallel issue of climate change is of interest not only because it may have an impact on human inequality, but also because discoveries about the climatic system bring lessons of great relevance for the study of human inequality. Global climate studies began with relatively small-scale research, but the implications of that initial research subsequently led to larger-scale studies and to major advances in theory and in the collection of data, both contemporary and historical. For climate, the key initial example came from the study of atmospheric levels of carbon dioxide, as measured at Mauna Loa Observatory, on Hawaii's second-highest peak, beginning in 1958. The results of the analysis, as shown in Figure 2, revealed a rapid and ongoing rise in levels of atmospheric CO₂, which raised concerns about the possible impact of increased CO₂ on global temperature.

As these estimates were verified over the years, they encouraged broader studies of global warming, including the development of general models of climate and systematic collection of data on temperature and humidity around the world and for times reaching far into the past. The Intergovernmental Panel on Climate Change (IPCC), created in 1988 by two United Nations organizations, issued its first assessment report in 1990 and has reported regularly since, largely confirming the initial findings.¹¹ The results, some of which are shown in Figure 3, indicate that subsequent research, using various techniques, traced atmospheric levels of CO₂ over two centuries earlier, and confirmed the accelerating growth of greenhouse gases in the atmosphere.

Other studies have now traced the fluctuations in carbon dioxide levels back for millions of years.¹² These climatological results came to be linked to studies of plant

¹¹ The IPCC reports were published in 1990, 1992, 1996, 2001, 2007, and 2014, with growing participation and increasing unanimity on the threats of environmental change. For the Fifth Assessment Report Synthesis (2014), see <https://www.ipcc.ch/report/ar5/syr/>.

¹² On carbon dioxide levels over millions of years, see Aradhna K. Tripathi, Christopher D. Roberts, and Robert A. Eagle, "Coupling of CO₂ and Ice Sheet Stability over Major Climate Transitions of the Last 20 Million Years," *Science* 326, no. 5958 (2009): 1394–1397, doi: 10.1126/science.1178296.

Carbon dioxide concentration (in parts per million, ppm)
of the air at the summit of Mauna Loa, Hawaii, from 1958
to 2000.

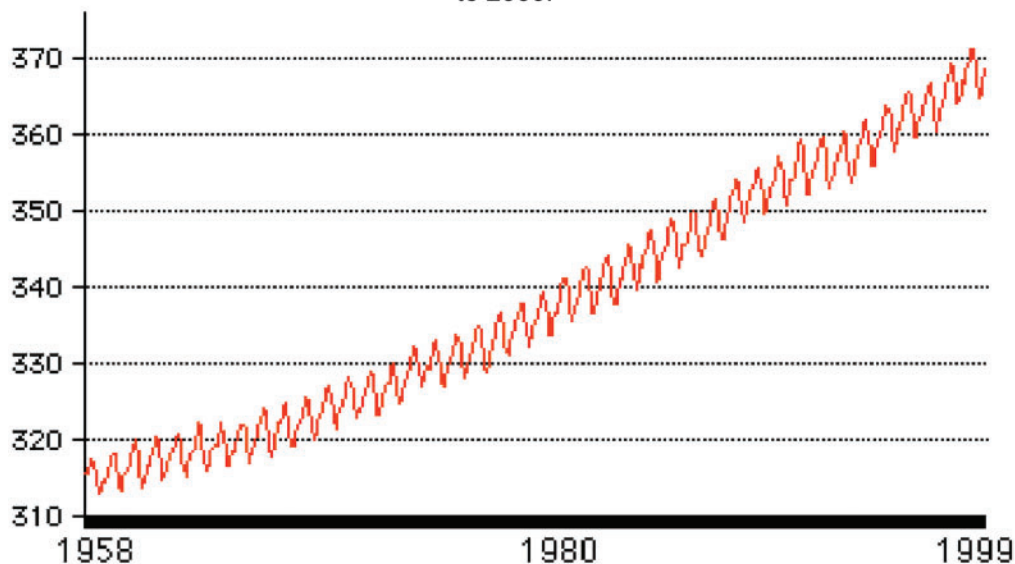


FIGURE 2: Atmospheric carbon dioxide at Mauna Loa, Hawaii, 1958–2000. Charles D. Keeling led in collecting data at Mauna Loa; this graph came to be known as the “Keeling curve.” C. D. Keeling and T. P. Whorf, “Atmospheric CO₂ from Continuous Air Samples at Mauna Loa Observatory, Hawaii, U.S.A.,” Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, October 2004, http://cdiac.ornl.gov/trends/co2/sio-keel-flask/sio-keel-flaskmlo_c.html.

and animal ecology on land and sea, all of which reflected the growing influence of human society on every aspect of planetary existence. Further, the expanding knowledge of changing climate has also been connected to new results in studies of the extinction of species, changes in the oceans, and changes in the earth beneath us.

The scientific advance of studies on climate, which have created extraordinary new knowledge over the course of thirty years, raises the hope that an equivalent advance is possible for social-scientific knowledge on inequality. By analogy, one can argue that such insightful studies in economic inequality as the initial work of Piketty and Saez may have launched the expansion of knowledge on the dynamics of human society. The success of research on climate change—paralleled by success in genomic research—suggests that it may be possible to invest equal amounts of energy into social research.¹³ We can hope to learn more about the processes of change, both positive and negative, within human society as a whole.

CONTEMPORARY HUMAN SOCIETY FACES two great crises. The crisis of inequality, a matter of human society, is best addressed through the social sciences. The environmen-

¹³ For the contemporaneous genomic study that confirmed the African origins of humanity, see Rebecca L. Cann, Mark Stoneking, and Allan C. Wilson, “Mitochondrial DNA and Human Evolution,” *Nature* 325, no. 6099 (1987): 31–36, doi: 10.1038/325031a0. For a comparison of the research campaigns in climatology, genomics, and inequality, see Patrick Manning, *Big Data in History* (Basingstoke, 2013), 90–97.

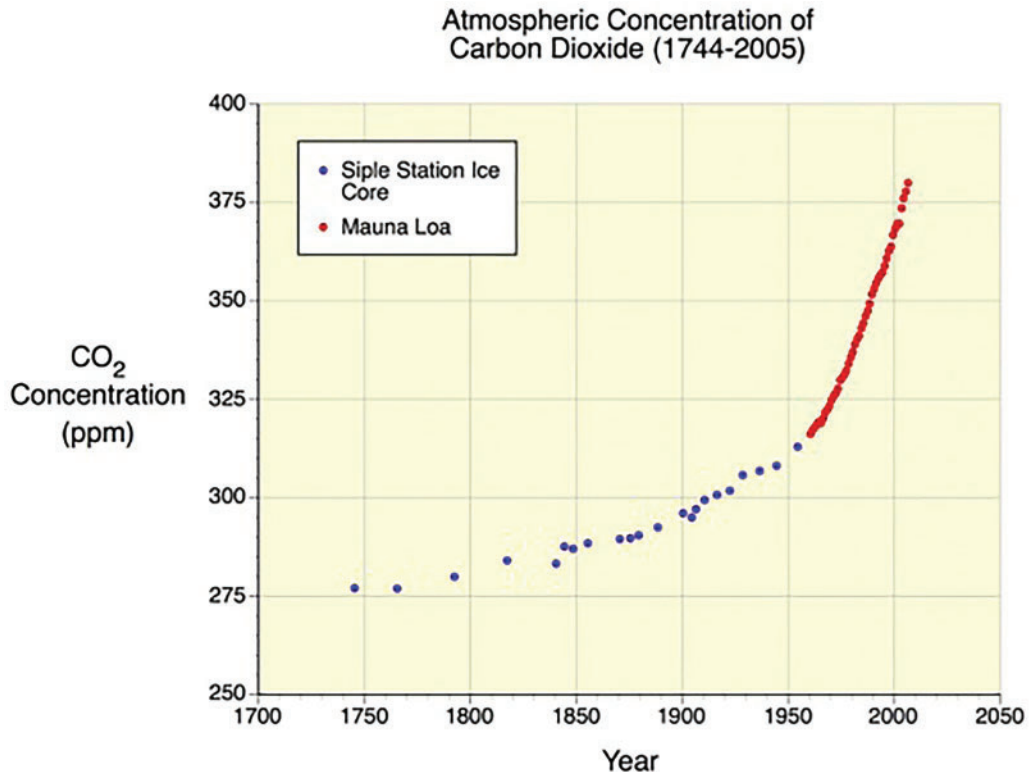


FIGURE 3: Atmospheric carbon dioxide levels as shown in Keeling and Whorf, “Atmospheric CO₂ from Continuous Air Samples at Mauna Loa Observatory,” and from an Antarctic ice core as reported in A. Neftel, H. Friedli, E. Moor, H. Lötscher, H. Oeschger, U. Siegenthaler, and B. Stauffer, “Historical Carbon Dioxide Record from the Siple Station Ice Core” (Physics Institute, University of Bern), <http://cdiac.ornl.gov/trends/co2/siple.html>. The level of atmospheric CO₂ exceeded 400 parts per million in September 2016.

tal crisis, a matter of the earth as a whole, is best addressed through the natural sciences. In addition, the shifts in the natural world, under pressure from the expansion of human society, reveal the disequilibrium of our planetary equation. Balancing the equation—or understanding the collision of humanity and nature—will require the cooperation of all fields of knowledge.

My purpose here is to spur intellectual action addressing the most neglected element of the equation: our understanding of inequality in human society. A project is already underway to build a world-historical data resource and focus it on the question of the source and transformation of inequality in society worldwide during the past five centuries. The Collaborative for Historical Information and Analysis (CHIA) has pursued the design and implementation of world-historical research since 2011. CHIA is a multi-institutional, multidisciplinary organization. Headquartered at the World History Center at the University of Pittsburgh, it includes affiliates at several other universities.¹⁴ Its rationale is that the policies now being imple-

¹⁴ CHIA links research groups at the University of Pittsburgh, Harvard University, Michigan State University, the University of California, Merced, Boston University, and the International Institute of Social History. I serve as its director. The Collaborative has received awards from the National Science Foundation, the National Endowment for the Humanities, and the University of Pittsburgh. For further

mented by governments and international organizations need to be based on knowledge: knowledge of global and historical social structures and dynamics. In seeking to assemble that knowledge, CHIA focuses on social-science analysis and on close collaboration with information scientists and natural scientists. It is one of a number of groups that have been exploring large-scale analysis of human society, struggling for funding but persistently setting their sights higher. Indeed, CHIA has now helped to form a more inclusive group, known as Big Data in Human History, that is addressing similar issues through a still broader collaboration.¹⁵

The CHIA project has articulated an encompassing perspective on how to learn about the crises facing humanity, through collaboration among disciplines. The natural sciences have developed theory and data for modeling the material world at scales from the subatomic to the universal. They have significantly advanced study of the environmental crisis, in what I call Project 1. The social sciences work on issues in human society, especially at the community level, with discrete data and discrete analysis. They should expand the scale of their work and take leadership in analyzing social inequality, in what I call Project 2. The humanities explore perceptions and representation across numerous media, from the individual to the global level, and are achieving dramatic advances in digital representation. The information sciences draw on continuing technological advances to provide steadily improving techniques for analyzing and representing information in many fields. In fact, all of these academic domains overlap significantly. Thus the humanities and the social sciences overlap intimately in the field of history—to select a specific example, the history of civil rights in the United States can best be understood by combining the humanistic study of debates on race and culture with the social-scientific study of economic inequality and political mobilization.

Similarly, environmental degradation must be of concern to social scientists, even though it includes issues beyond the usual frontiers of social science.¹⁶ From the standpoint of human society, growth has been the main pattern during recent generations, and social groups find it logical to press for its continuation. For two centuries, humanity has achieved unprecedented growth in population, industrial output, food supplies, literacy, health conditions, scientific knowledge, communication, and more. But from the standpoint of the earth as a whole, one sees that the human system has

discussion of CHIA and its projects, see Manning, *Big Data in History*; Vladimir Zadorozhny, Patrick Manning, Daniel J. Bain, and Ruth Mostern, "Collaborative for Historical Information and Analysis: Vision and Work Plan," *Journal of World-Historical Information* 1, no. 1 (2013): 1–14, doi: 10.5195/jwhi.2013.2; and Patrick Manning, "Notes toward a World-Historical Data Resource," *Journal of World-Historical Information* 2–3, no. 2 (2014–2015): iv–xi, doi: 10.5195/jwhi.2015.32.

¹⁵ Big Data in Human History (BDHH), founded at a July 2016 meeting in Pittsburgh, includes the institutions participating in CHIA as well as the Institute for Research on World-Systems, Seshat: Global History Databank, and the International Institute of Social History. Also participating in its discussions are the Minnesota Population Center and the Pacific World History Institute. For a survey of BDHH's collaborative work in large-scale social science, see Patrick Manning, Pieter François, Daniel Hoyer, and Vladimir Zadorozhny, "Collaborative Historical Information Analysis," in Bo Huang, ed., *Comprehensive Geographic Information Systems*, 3 vols. (Elsevier, forthcoming 2017); early access to the chapter will be available through the Reference Module in Earth Systems and Environmental Sciences at <http://www.sciencedirect.com/science/referenceworks/9780124095489>.

¹⁶ On the unwillingness of governmental and corporate interests to participate in policy to limit environmental destruction, see James Hansen, *Storms of My Grandchildren: The Truth about the Coming Climate Catastrophe and Our Last Chance to Save Humanity* (New York, 2009).

become so large and influential that its relentless growth is disturbing structures and relationships throughout the planet's ecology. Humanity has already captured much of the biosphere (especially the mammals, birds, fish, and cereals that we use for food). We are heating up the atmosphere with greenhouse gases; we have polluted and warmed the hydrosphere, threatening the maritime species that form the basis of the food chain; and the geosphere now rumbles in response to our new technique of fracking for natural gas.

The human system has colonized so much of the earth that great changes in the terrestrial balance loom ever larger. We face the danger of a dramatic restructuring of the earth's ecosystem, with no certainty about which disastrous changes will be immediate and which may be delayed. Extinction of species at all levels could interfere with food supplies up and down the food chain. Climate patterns are already becoming erratic, threatening to return to the great fluctuations that had prevailed for millions of years, up until the remarkably stable and beneficial Holocene climate of the past seven thousand years. The changes we have seen so far in rising sea levels and melting ice caps are small indeed in comparison with the fluctuations in climate before the Holocene.¹⁷ Ecologists have been developing the notion of the Anthropocene, a new geologic era that may recently have opened, in which humanity governs change throughout the terrestrial system.¹⁸ While there is not yet a scientific consensus on such a paradigm shift, this debate shows that natural scientists are now seriously studying how humans and nature interact.

The ultimate objective is what I call Project 3—analysis drawing on all fields of knowledge to explain the interaction between human inequality and environmental degradation. Only through cross-disciplinary collaboration can we learn the sources and dynamics of these crises. Only then will we have the knowledge to propose the steps to mitigate their effects, somehow gathering support across social lines for what will surely be difficult decisions. Work has already begun on Project 3 as well, especially in the natural sciences, but real success in understanding these human-natural interactions will come only when we have substantial results from both Project 1 on the environment and Project 2 on inequality.

Meanwhile, I believe that the crisis within humanity—the crisis of inequality—must be the immediate concern of social scientists and humanities scholars. It should be treated as a crisis, first, because of recurring social outcries echoing around the globe at all social levels. Those uprisings include successive waves of decolonization; periodic clashes over gender relations; struggles over racial, ethnic, and confessional divisions; and populist anger across economic, national, and religious lines—each pitting the haves and the have-nots against each other. Widespread individual oppression and deprivation contrast sharply with extreme levels of privilege. Contemporary globalization appears to combine local patterns of inequality into ever more extreme degrees of global inequality. If indeed global inequality is expanding, it brings an increase in aggregate opportunity cost—that is, the potential innovations and produc-

¹⁷ Sea level has risen by 15 centimeters since 1920. This rise, already alarming, is much smaller than the decline by some 40 centimeters from 1200 to 1700. Earlier sharp changes in sea level included a rise of more than 1 meter 2,000 years ago, and a rise of 140 meters from 20,000 to 7,000 years ago. Earlier fluctuations in sea level ranged up to 150 meters.

¹⁸ On the Anthropocene, see Working Group on the “Anthropocene,” convenor Dr. Jan Zalasiewicz, <http://quaternary.stratigraphy.org/workinggroups/anthropocene>.

tivity that are foregone because so many individuals are prevented from developing their gifts. Discrepancies in power mean that small but influential groups make self-serving decisions without considering the external effects, making decisions for their own benefit that neglect the interests of society generally. Demonstrable examples of the neglect of external effects include persistent inefficiency in food-distribution systems and the reluctance of governments and large corporations to undertake action that would limit greenhouse-gas emissions to halt the rise in atmospheric temperatures.¹⁹ All of these points, however, will remain arguments rather than confirmed observations on inequality until large-scale research is conducted to confirm or refute them.

The study of human inequality—Project 2—is the most immediate need in social research, and the one in which historians will be most fully involved. Such a project requires historical data, techniques of documentation, theories linking many types of social experience, and methods for aggregating community data at levels up to the global. The problem is that the social sciences are the scholarly domain most in need of new methods. Perhaps because of the difficulty of breaking through the obstacles, these disciplines continue to rely on inherited techniques, using tabular data held in discrete and isolated files; they work with theories that remain in the silos of economics, sociology, politics, and anthropology. We need research on difference that ranges across scales from the familial to the global, across characteristics from the physical to the cultural, distinguishing causation by human agency or by natural factors, and tracing the effects of inequality on human society and the earthly environment. So far, studies of these issues remain few in number.

The social sciences have benefited from some important results of natural-science research on questions of social inequality, notably the refutation of the earlier postulates of “eugenics.” In the mid-nineteenth century, an eclectic group of scholars led by the British social scientist Francis Galton posited the ability to identify and to breed strains of humans who would have superior intelligence or other specific characteristics. Some biologists showed interest in eugenics; others opposed its racialistic tinges on moral grounds but also argued that such distinctions did not dependably exist in humans. Eugenics had nearly disappeared as an organized field by the 1970s.²⁰ More definitively, as the human genome was decoded, the results reconfirmed the rejection of eugenics. That is, if all persons within families or nationalities were very much alike and significantly different from others, it would make sense to interpret history and society in terms of bloodlines or races rather than in terms of individual and contingent relationships. But genetic analysis has shown consistently greater genetic variation *within* populations than *among* populations, so that the notion of distinctive racial or class groups has been rejected decisively.²¹ With regard to

¹⁹ On food distribution, see Howard D. Leathers and Phillips Foster, *The World Food Problem: Toward Ending Undernutrition in the Third World*, 4th ed. (Boulder, Colo., 2009). On the current Paris Agreement, see United Nations Framework Convention on Climate Change, http://unfccc.int/paris_agreement/items/9485.php.

²⁰ Richard Lynn, *Eugenics: A Reassessment* (Westport, Conn., 2001), 35–43; Aaron Gillette, *Eugenics and the Nature-Nurture Debate in the Twentieth Century* (New York, 2007).

²¹ Frequent human migration across social boundaries keeps the genetic difference among human groups at a minimum. At the same time, research has shown that it is possible to identify shared genetic characteristics within social groups, even though the accompanying differences between groups remain relatively small. On migration, see Patrick Manning, “Cross-Community Migration: A Distinctive Human Pattern,” *Social Evolution and History* 5, no. 2 (2006): 24–54. On genetic similarities, see D. J. Wither-

intelligence, the differences between geneticists and psychologists show that the debates continue. Geneticists see intelligence as arising from a wide variety of locations on the genome, so that it is too complex and variegated to be inherited along simple family lines. Psychologists are divided: some see intelligence as relatively unitary and heritable, while others support the thesis of Howard Gardner that there exist multiple types of intelligence (from musical-rhythmic to naturalistic). According to the latter view, no single measure of excellence is sufficient to identify superior skill; thus there is no simple inheritance of intelligence.²²

TO ANALYZE INEQUALITY IN ALL of human society for the past five hundred years—Project 2—is a truly immense task. Yet it is a task worth taking on because of the benefits it may bring in understanding inequality, and because the successful advance of this research should lay the groundwork for further analysis of global-scale human dynamics. The design of the research for a historical analysis of global inequality must be comprehensive: the framework owes a great deal to the logic of world-historical research. It must be general in its attack on multiple issues, wide-ranging in its concern for global interactions, and energetic in collecting enough data for empirical analysis.²³

The spatial framework for this study of inequality encompasses the whole of the earth and the whole global population for the period since 1500. Its fully global spatial scope is a matter of principle, as we assume that all segments of human society interact.²⁴ In contrast, the temporal scope, the last half-millennium, is a practical choice based on the availability of data: the era of global navigation and overseas colonization, beginning in roughly 1500, brought a great expansion in information available on societies worldwide. This leaves us with the problem, to which I shall return, of how to understand the period before 1500, since it is plausible that earlier developments were central to forming configurations of human inequality.²⁵ The topical framework of this study extends to multiple dimensions of inequality—especially economic, political, social, and natural (notably in health and climate). The study is intended to account for issues of inequality at several levels of social aggregation, addressing gender, family, community, political regimes, geographic regions, and the global level.

To guide the research within its framework, the project is focused on a set of hypotheses reflecting the initial questions and assumptions. In sequence, the hypothe-

spoon, S. Wooding, A. R. Rogers, E. E. Marchani, W. S. Watkins, M. A. Batzer, and L. B. Jorde, "Genetic Similarities Within and Between Human Populations," *Genetics* 176, no. 1 (2007): 351–359, doi: 10.1534/genetics.106.067355.

²² Howard Gardner, *Frames of Mind: The Theory of Multiple Intelligences*, 3rd ed. (New York, 2011).

²³ For a recent review of world-historical methods, see Patrick Manning, "Locating Africans on the World Stage: A Problem in World History," *Journal of World History* 26, no. 3 (2015): 605–637, doi: 10.1353/jwh.2015.0018.

²⁴ World historians have been skeptical of assumptions that human communities have been isolated; they have been relatively successful in locating connections among communities.

²⁵ Data are scarce worldwide for the sixteenth as compared with the nineteenth century. Still, we believe that the availability of data drops off more sharply for the fifteenth century and earlier; this is an argument for the logic of a post-1500 world-historical data resource.

ses address the sources of inequality, both human and natural; the dynamics of inequality emerging from various types of social change (I identify three main types); and the relationship of inequality to social welfare.

What is the source of inequality? Does it come from “human nature”? Our group hypothesizes that human inequality is principally socially constructed. At an intuitive level, one need only compare the elaborate complexity of human inequality with the simpler forms of inequality in other species to conclude that humanity’s social behavior is the source of most of its inequality. Such socially constructed inequality is passed from one generation to the next through conscious acts of teaching, learning, and remembering, but also through the influences of social institutions in governance, production, and war. On the other hand, other aspects of inequality may come from the natural influence of biological inheritance, in which the genome passes on certain patterns of aggression and familial behavior. Thus we can postulate two sorts of human nature: “socially constructed human nature,” resulting from conscious decisions that become widely approved and can contribute to complexity in society, and “biologically inherited human nature,” resulting from the slow process of evolution that governs humans’ most basic behavior.²⁶

Socially constructed inequality originates primarily in human decisions to categorize. Language itself, being socially constructed and continually updated, has helped to create inequality: through it were articulated decisions to define family and gender groups and larger social groups, rank them, and identify them as within or beyond social boundaries. This conscious construction of social groups through categorization has generated inequalities from early times to the present.²⁷ The resulting institutions and ideologies—such as discrimination on the basis of race, gender, religion, and ethnicity—have initiated much or most of the economic inequality that exists today, within and between national units. As a symbol for the social construction of inequality, we have found it useful to consider the construction of walls, including the Great Wall of China, walls along borders today, and borders on smaller scales—because such walls simultaneously draw upon and create designations of social inequality. A well-known U.S. example of creating inequality is the practice of “redlining,” which allowed realtors and lenders to consider the “residential security” of a particular neighborhood before determining someone’s eligibility for a housing loan or insurance on property there. As a result of its use by financial institutions to exclude certain populations from being approved for loans for home purchases, social decisions supported by the federal government and local interests led to discrimination against African American prospective homebuyers, especially from the 1930s to the 1970s.²⁸ The long-term consequence was that African American families were denied

²⁶ While I hold to this distinction, I emphasize that the literature on human social and cultural evolution, contrasting and overlapping with biological evolution, is immense and multidisciplinary. For an important contribution to this literature, see Peter J. Richerson and Robert Boyd, *Not by Genes Alone: How Culture Transformed Human Evolution* (Chicago, 2005).

²⁷ Categorization can include spurious categorization, in which categories of no real substance come to be accepted socially. Ashley Montagu, *Man’s Most Dangerous Myth: The Fallacy of Race*, 3rd ed. (New York, 1952); Joseph L. Graves Jr., “What We Know and What We Don’t Know: Human Genetic Variation and the Social Construction of Race” (June 7, 2006), <http://raceandgenomics.ssrc.org/Graves/>.

²⁸ Urban-Suburban Investment Study Group, Center for Urban Studies of the University of Illinois, *Redlining and Disinvestment as a Discriminatory Practice in Residential Mortgage Loans* (Washington,

the increase in wealth that came to the other families who owned homes during a long era of appreciation in properties. This was an economic result of social choices.

The natural sources of inequality fall into two main categories: *endogenous* (arising within humanity) and *exogenous* (arising in the environment surrounding humans). By endogenous natural inequality, I mean the “biologically inherited human nature” proposed in some theories to explain gender inequality, family hierarchy, and social violence. It is parallel to varying types of inequality in other mammalian species. By exogenous natural inequality, I mean the results of climatic shifts such as El Niño oscillations (leading to drought, flood, or famine) or variations in rainfall, nutrition, epidemics, and long-term exposure to one climate or another.²⁹ I also include such health factors as epidemic disease, though mortality in epidemics also depends on the preexisting health of the victims.³⁰ Measures of human height, which commonly appear in military records along with prison and other data, reflect nutrient intake during childhood, though it is understood that nutrition depends on both the physical and social availability of foods.³¹ These natural sources of inequality interact with and balance, in part, the inequality brought about by human choice.

The dynamics of socially constructed inequality work on at least three levels: the conscious construction of inequality by individuals and groups, patterns of generational rise and fall, and emergent processes and their social dynamics. All three levels are essential, but the dynamics of emergent processes are most important to our historical analysis. The first of the three, the conscious construction of inequality, got a solid start as fully articulated speech took form some 80,000 years ago, enabling early speakers to add social categories such as division of labor and identification of priests to the biological categories of the natural world. To transmit these early ideas and labels to later generations required some social consensus and institutionalization. This pattern of contributions by individuals to the construction of social structures and representation of the world continues to this day as a mechanism of individual innovation.

Beyond the level of individual contributions, inequality fluctuates with generational dynamics, where generations average just under thirty years in length. Generational rise and fall takes place at the levels of family, community, dynasty, and state. If the hopes of the founders of families and communities are for sustainability and growth, the actual experience is one of periodic misfortune, so that there are alternations of prosperous and unfortunate generations, as well as times of equality and inequality in the distribution of resources. Similarly, at the levels of monarchies or larger-scale civilizations, periods of advance and decline or relative equality and in-

D.C., 1977); William Samuel James Smith, “Redlining: A Neighborhood Analysis of Mortgage Lending in Pittsburgh, Pennsylvania” (M.A. thesis, University of Pittsburgh, 1982).

²⁹ Mike Davis, *Late Victorian Holocausts: El Niño Famines and the Making of the Third World* (London, 2001).

³⁰ The dynamics of disease are undergoing historical study in the case of the 1918 influenza pandemic, where the combination of population censuses and statistics on deaths has made it possible to trace the path and intensity of the pandemic across India, Ceylon, Indonesia, and Japan. See, for instance, Siddharth Chandra and Yan-liang Yu, “Fertility Decline and the 1918 Influenza Pandemic in Taiwan,” *Biodemography and Social Biology* 61, no. 3 (2015): 266–272, doi: 10.1080/19485565.2015.1062718.

³¹ Roderick Floud, Robert W. Fogel, Bernard Harris, and Sok Chul Hong, *The Changing Body: Health, Nutrition, and Human Development in the Western World since 1700* (Cambridge, 2011).

equality may be observed over time.³² A related question, which will be susceptible to exploration only when we develop adequate global data, is whether the cycles in equality and inequality also exist at the global level, as inequality is communicated with both positive and negative reinforcement among the regions of the world.

Emergent social processes create additional dynamics of inequality.³³ Over time, the consequences of conscious human agency have led to the unconscious emergence of larger-scale processes. Language itself is one example; agriculture and urbanism are two more. Industrialization and nationhood are recent instances. Further, as each new process emerges, it reveals the previously nonexistent dynamics by which it is to operate. For language, the new dynamics included grammars and the process of linguistic change over generations.³⁴ For agriculture, the dynamics included agricultural calendars and the sexual division of labor. Other dynamics accompanied the rise of states, writing, and commerce. Each of these dynamics generated new sorts of inequality, and that inequality was reproduced by the very function of the emergent dynamic. For the period after 1500, we can argue that new categorizations by race and religion, compounded by law and practice distinguishing slave from free, generated dynamics yielding greater levels of inequality. Similarly, the rise of factory production created dynamics that differentiated wage workers from managers and employers, as the assembly line propagated discipline and solidarity among workers, male or female, yet kept workers' income and status below those of employers. The worldwide expansion of public schools, while it progressed at an uneven pace, brought results that both increased and decreased social inequality. The creation of large pension funds in the postwar world contributed to financialization beginning in 1980, which transferred profits increasingly from productive sectors to the financial sector.³⁵ In sum, these multiple instances indicate how historical analysis, in tracing a succession of historically emergent processes, can locate the construction of new dynamics of social inequality.

A further nexus of contending hypotheses addresses inequality and social welfare. One may ask, most broadly, what is the social function of inequality? Inequality is commonly seen as a resultant of social processes, but it is also posed as a causal factor, leading to either social advance or decline. On one side, contributors to the economics literature have typically shown little interest in the question of whether in-

³² On economic cycles, see Barry K. Gills and Andre Gunder Frank, "The Modern World System under Asian Hegemony: The Silver Standard World Economy, 1450–1750," in Patrick Manning and Barry K. Gills, eds., *Andre Gunder Frank and Global Development: Visions, Remembrances, and Explorations* (New York, 2011), 50–80, here 59–63; on demographic cycles, see Peter Turchin and Sergey A. Nefedov, *Secular Cycles* (Princeton, N.J., 2009).

³³ The British philosopher G. H. Lewes introduced this notion of emergence in the 1870s. It has since been widely adopted in the natural and social sciences, for instance in David Christian, *Maps of Time: An Introduction to Big History* (Berkeley, Calif., 2003), 82, 140, 511.

³⁴ This argument that language had inherent dynamics upon its creation is parallel to Noam Chomsky's much-debated notion of "universal grammar." Chomsky, *Aspects of the Theory of Syntax* (Cambridge, Mass., 1965).

³⁵ Gerald Epstein defines financialization as "the increasing role of financial motives, financial markets, financial actors and financial institutions in the operation of the domestic and international economies." He also cites approvingly a definition by Greta Krippner: "a pattern of accumulation in which profit making occurs increasingly through financial channels rather than through trade and commodity production." Epstein, "Introduction," in Epstein, ed., *Financialization and the World Economy* (Northampton, Mass., 2005), 3–16, here 3. As will be argued below, such emergent dynamics can be labeled as human social evolution during recent times.

equality is harmful for society. They have also argued, at least until very recently, that society becomes less inequitable as it becomes more advanced in economic complexity.³⁶ From this standpoint, one may claim that the creation of large-scale institutions such as national governments and advances in knowledge through universities require a concentration of resources in these areas of high priority. Yet this hypothesis also encounters debate, in that while warfare often involves a heavy concentration of resources, it typically results more in destruction of resources than in productivity. From a longer-term standpoint, contributors to the anthropological literature tend to argue that society becomes more unequal as it becomes more complex.³⁷

Still more hypotheses await exploration. In general, if one were to analyze social groups on the assumption that some have achieved superior adaptation, one could argue that redistributing wealth and power to such groups will lead to greater long-term social advancement for humanity, at the cost of some short-term deprivation for other humans. If one were to analyze individuals, assuming them to be roughly equal in their endowments of skill and energy, one might argue that the concentration of wealth and power is wasteful in that it leads both to short-term deprivation and to long-term decline, because of the opportunity cost of the productivity and innovation foregone among those who are deprived. As newly emerging social dynamics generate inequality, one must ask: Was inequality necessary for the *construction* of the emerging dynamic and the social institutions that result? Was the resulting inequality necessary for *sustaining* the new dynamic?³⁸ Thus one might imagine that inequality, though it accompanied the rise of industrialization, was not actually necessary to the emergence of industrial life; or that if inequality were necessary to the rise of industrialization, it might not be necessary to sustaining industrial life. Further, one can imagine that if inequality were necessary for industrialization, that same inequality might be deleterious to human life in general, so that it would need to be offset in some way to achieve adequate overall social welfare. Hopefully these possibilities will be sorted out through historical research.

THE NEXT STEPS IN RESEARCH DESIGN, beyond the framework and hypotheses just surveyed, proceed with the collection and processing of data and bring to light the major challenges entailed in the management of data to carry out the intended global analysis. The pervasiveness of these technical and organizational difficulties helps to explain why social scientists have been slow to take on analysis at the global level. There are seven major challenges that must be met in order to permit effective information-based analysis of human society:

Collecting data. Historical data must be collected and digitized: the original data are in analog formats (text, tables, and images), in multiple languages, scripts, and formats. The need to collect, digitize, and archive historical data is the single greatest

³⁶ Pat Hudson and Keith Tribe, "Introduction," in Hudson and Tribe, *The Contradictions of Capital in the Twenty-First Century*, 1–9, here 1–3.

³⁷ Kent Flannery and Joyce Marcus, *The Creation of Inequality: How Our Prehistoric Ancestors Set the Stage for Monarchy, Slavery, and Empire* (Cambridge, Mass., 2012).

³⁸ A deeper and more difficult question is that of the relation between inequality and violence. On that relationship, see Douglass C. North, John Joseph Wallis, and Barry R. Weingast, *Violence and Social Orders: A Conceptual Framework for Interpreting Recorded Human History* (New York, 2009).

challenge in global social-science research. Historical data for researchers are difficult to access because of restrictions by institutions, the reluctance of scholars to release data they have collected and processed, the costs and logistical difficulty of digitizing, and more. The challenge of obtaining data is thus both an organizational and a technical issue. And as data are collected, additional major challenges remain, such as the need to account for margins of error in both quantitative and qualitative data.³⁹ A useful regional focus in data collection centers on the Caribbean, where small, well-defined and well-documented island regimes benefited from widely different levels of investment and production.⁴⁰ Caribbean territories have varied greatly in the size and distribution of wealth and population at any moment and across time. Tightly connected to world population, social change, and economy, this region might serve as a metaphor for global inequality. For a topical focus, data collection on population and migration worldwide—of Europeans, Africans, Asians, Americans, and islanders—over the period from 1500 is central to the study of inequality.⁴¹ Another topical focus is the changing nature of work. Here the Global Collaboratory on the History of Labour Relations, based in Amsterdam, documents labor activities according to a comprehensive typology, facilitating comparisons among selected places at various moments.⁴² Studies of major commodities in global trade will gradually document the worldwide network of trade as it has expanded and fluctuated. Work has begun on tracing global silver production; the study of grains, other minerals, and manufactures such as textiles will continue.⁴³

Documenting data. In large-scale historical research, data do not speak for themselves—they must be documented with precision and thoroughness. Data documentation and archiving require advanced infrastructure and skilled labor. Data files must be fully documented at three levels before they can be combined and analyzed. Basic documentation of files (Level 1) yields a description of each file as a whole, giving source, provenance, basic information on time, space, and topic, and principal variables.⁴⁴ Documenting the elements of files (Level 2) yields a description of the contents of each file—including cells, data points, words, and images—through the

³⁹ On the collection of historical data, see Ruth Mostern and Marieka Arksey, “Don’t Just Build It, They Probably Won’t Come: Data Sharing and the Social Life of Data in the Historical Quantitative Social Sciences,” *International Journal of Humanities and Arts Computing* 10, no. 2 (2016): 205–224, doi: 10.3366/ijhac.2016.0170. In cases where values of data are not known with precision, it is necessary to attribute error margins and maintain them in the analysis.

⁴⁰ Matt Drwenski, “Scales of Inequality: Strategies for Researching Global Disparities from 1750 to the Present” (M.A. thesis, University of Pittsburgh, 2015).

⁴¹ On projections of population and migration, see Patrick Manning, Scott Nickleach, Bowen Yi, and Brian McGill, “Demographic Models for Projecting Population and Migration: Methods for African Historical Analysis,” *Journal of World-Historical Information* 2–3, no. 1 (2014): 24–39, doi: 10.5195/jwhi.2015.19. On estimations of “cross-cultural migration rates” as a globally comparable measure of modern migration, see Jan Lucassen and Leo Lucassen, “Measuring and Quantifying Cross-Cultural Migrations: An Introduction,” in Lucassen and Lucassen, eds., *Globalising Migration History: The Eurasian Experience (16th–21st Centuries)* (Leiden, 2014), 3–54.

⁴² Global Collaboratory on the History of Labour Relations, <https://collab.iisg.nl/web/labourrelations>.

⁴³ Patrick Manning, Dennis O. Flynn, and Qiyao Wang, “Silver Circulation Worldwide: Initial Steps in Comprehensive Research,” forthcoming in *Journal of World-Historical Information* 5, no. 1 (2017).

⁴⁴ Level 1 documentation is provided for all CHIA files that have been archived on the Harvard World-Historical Dataverse, <https://dataverse.harvard.edu/dataverse/worldhistorical>. The Level 1 documentation is the first sheet of information in the Excel file containing each set of data.

application of ontologies documenting space, time, and topic in detail.⁴⁵ When data files are combined to give large-scale information, they must be transformed to become consistent with each other. Level 3 documentation keeps track of the steps as files are combined and aggregated.⁴⁶ Preservation of data requires a large-scale archive, most likely based in a supercomputing center. In addition, the archive will inevitably be distributed among multiple servers because of issues of ownership, unique software, or performance of specialized data updates. The various servers must be connected dependably.

Linking discrete datasets. The most technically difficult of the challenges in global social-science research is linking and aggregating tabular datasets. Up until now, quantitative datasets have been discrete, each with its own categorization of data.⁴⁷ In some cases, as with censuses, prior imposition of a firm typology makes it so that data can be collected within consistent categories, and so that local files can be aggregated into regional and national files.⁴⁸ Most such aggregation is not currently possible: despite the many parallels of datasets, each has its own unique definition of variables. This task requires development of algorithms that make it possible to link and aggregate datasets. The process of linking data begins with locating common variables in multiple datasets, and building aggregation from that level. The Col*Fusion infrastructure developed by the CHIA project has taken the initial step of locating similar variables among datasets, linking the datasets, and then building other links.⁴⁹

Estimating missing data. This task becomes steadily more important as one moves to earlier times and to regions where written documents are less common. Nevertheless, a properly global analysis of inequality must include all the people of the world and estimate the patterns of inequality in which they lived. Our work adopts various approaches to simulation of the missing data to enable a more comprehensive analysis. In cases of relatively small-scale datasets, we rely on interpolation, extrapolation, and modeling based on existing data to fill in missing values. For instance, missing data in trade statistics can commonly be filled in by interpolation and extrapolation. In a large-scale case of modeling, the populations and migrations of Africa, as seen in multiple regions and in the period from 1650 to 1950, are being estimated through a demographic simulation that accounts for rates of birth, death, and enslavement.⁵⁰

Collaboration among researchers. A collaborative infrastructure enables re-

⁴⁵ A world-historical gazetteer, in collaborative development based at the University of Pittsburgh and modeled on the example of Pelagios for the pre-1500 world, is to provide a coherent list of world-historical places for the period after 1500. With it, a temporal ontology is in development, to provide categorization of the various uses of time. For a topical ontology, the Library of Congress classification system, along with others, can be revised and upgraded.

⁴⁶ Metadata (information describing the data) must remain tied to data, to enable transformations on the fly. Metadata grows as transformations grow, so that the volume of metadata may ultimately exceed the volume of data.

⁴⁷ Leading social-science archives, composed of discrete datasets, include the Interuniversity Consortium for Political and Social Research (ICPSR), <https://www.icpsr.umich.edu/>; the Harvard Dataverse, <https://dataverse.harvard.edu/>; and Human Relations Area Files (HRAF), hraf.yale.edu/.

⁴⁸ Integrated Public Use Microdata Series (IPUMS), <https://usa.ipums.org/>.

⁴⁹ Zadorozhny, Manning, Bain, and Mostern, "Collaborative for Historical Information and Analysis."

⁵⁰ Manning, Nickleach, Yi, and McGill, "Demographic Models for Projecting Population and Migration."

searchers in multiple scholarly domains to exchange information efficiently and develop shared insights. But the program of meetings, reports, and detailed updating, plus regular consultation of project-management software across disciplinary lines, must be sustained without fail, or deadlines come to be missed and mutual misunderstandings grow. Maintaining a culture of data-sharing among project participants is a basic but essential element of this collaborative infrastructure.⁵¹

Different orders of data. Yet another challenge is that high-speed computation is necessary to analyze multiple orders of data, using the latest available algorithms. These orders include tabular data in interval, ordinal, nominal terms, and texts and images of various sorts—plus the estimation of missing data.⁵² The need is to combine data so that an overall assessment of inequality can be made. Individual humans assess overall inequality at an intuitive level, somehow weighing and processing all the varying types of information. This project requires techniques for the equivalent task of formally linking data of different orders. One such technique emphasizes filling large gaps in data for numerous variables—an aggregate approach that relies on high-speed computing, working initially with simple algorithms to propose initial sets of missing values.⁵³ The process then “sparsifies” the estimates (deleting a majority of simulated data), seeks to reconstitute them according to the selected algorithms, and compares the reconstituted result to the relatively small sample of historical data. This process is repeated until the estimated data become consistent with the historical data. As this process is repeated, steadily more sophisticated algorithms can be incorporated.

Analysis. An analysis is undertaken to consider interaction among groups of variables—variables that have been individually described as summarized above. Each social-science theory proposes relationships among certain of the variables, which can be tested across time, space, and levels of aggregation. Further, analysis should seek ways to compare and combine the various theories, linking them to natural-science theories.⁵⁴ The methods of information science and statistics provide additional algorithms for identifying relations among variables. Throughout, the analysis will seek to identify the sources, scale, and effects of inequality, with an effort to disaggregate its various economic, social, and natural dimensions. It is important to emphasize that all data and all calculations in this research will be open to public access. While specialists will wish to consult the details of complex analyses, project websites will emphasize making results available to all users, including students and the general public.

TWO GREAT CRISES IN KNOWLEDGE and policy confront us. Environmental degradation, advancing incrementally and threateningly, is a crisis because it reveals unmistakable

⁵¹ Universities are increasingly encouraging faculty members to contribute data to campus repositories; submission to CHIA or other archives would be an extension of this process.

⁵² Nominal data on gender and interval data on income are analyzed with different statistical tests; combining these with each other and with other forms of data will require innovative methods.

⁵³ “Collaborative Research: Toward a Social Weather Service: Linking Social Sciences and Information Sciences in Large-Scale Inequality Analysis,” proposal submitted to NSF in February 2016 (co-PIs: Patrick Manning and Vladimir Zadorozhny). The proposal was not funded, but work along this line continues.

⁵⁴ Patrick Manning and Sanjana Ravi, “Cross-Disciplinary Theory in Construction of a World-Historical Archive,” *Journal of World-Historical Information* 1, no. 1 (2013): 15–39, doi: 10.5195/jwhi.2013.3.

evidence that we are moving toward catastrophic change that could come in our own lifetimes. Inequality is a crisis because it is a question of how humans treat one another: few have any idea of what to do about it. Will our differences undermine global society and the earthly environment—or will we be able to draw on the full reservoir of human intelligence and make common decisions for our mutual interest? I have identified three overlapping stages of research on these crises. In Project 1 on environmental degradation, work has already advanced substantially under the leadership of the natural sciences, but must continue; in Project 2 on human inequality, the social sciences should take leadership in the challenging research to be conducted at unprecedented scales; and in Project 3 on human-natural interactions, a full range of disciplines should analyze the processes through which the two crises are linked. (Our political and social systems have responsibility for implementing policy based on the resulting knowledge—and that is quite a different issue.)

While natural-science research explores knowledge for its own sake, one may also characterize science as having worked energetically for the past two centuries to manipulate nature, exploiting it for the benefit of human society. Advances in natural science have enabled humanity to expand our control of other spheres of the environment and to bring about growth in the human population, economy, and society. But—especially with the rising threat of atomic warfare—natural scientists have turned as well to considering the negative implications of advances in science and technology.⁵⁵ Natural-science disciplines are now reconsidering interactions within their fields and with human society, rethinking the overall trajectory of the planet.⁵⁶

The social sciences, in contrast, have taken a narrower approach to their subject matter. Social sciences work at levels from families and communities up to nations, including comparisons of national experiences. They do not have a strong tradition of analyzing human society as a whole, nor a deep tradition of exploring human-natural interactions. Environmental history and health history have grown in significance in recent years, but their approach has not been generally adopted.⁵⁷ Social scientists, while increasingly ready to speculate on global historical and social configurations, have devoted little energy to actually documenting humanity as a whole. Similarly, they have left to natural scientists the task of exploring the interactions between human society and the natural world. My main point, therefore, is to call for large-scale involvement of social scientists in the Project 2 research on the global crisis of human inequality.

How will historians be able to contribute to the grand effort on Project 2? Most will not be willing or able to turn on a dime and suddenly focus their energies on world-historical research. What, then, can they realistically do to advance the study of global structures? The easiest and arguably most valuable step is for historians and other social scientists to submit data files to public archives, where they can be

⁵⁵ The *Bulletin of the Atomic Scientists* was founded in 1945 by Manhattan Project scientists who wished to chronicle “the dawn of the nuclear age,” and to argue for nuclear disarmament. Since 1947, each issue has included a “Doomsday Clock,” to convey how close humanity appears to be to nuclear destruction. The *Bulletin* is online at <http://www.tandfonline.com/loi/rbul20>.

⁵⁶ Certain natural sciences have long traditions of exploring natural influence on humans, especially in medicine, biology, chemistry, and climatology.

⁵⁷ An outstanding work in this arena is J. R. McNeill, *Something New under the Sun: An Environmental History of the Twentieth-Century World* (New York, 2000).

CHIA COLLABORATIVE FOR HISTORICAL INFORMATION AND ANALYSIS

Home About World-Historical Dataverse Human System Data Resource Research Publications

CHIA

The Collaborative for Historical Information and Analysis (CHIA, formed 2011) links academic and research institutions in North America and Europe—with ties to institutions in Africa, Asia, and Latin America. CHIA's key contributions are data linkage (for data analysis in general) and a global archive (to permit historical analysis on a global scale).

Mission

The long-term purpose of CHIA is to sustain a Human System Data Resource, linking variables to analyze many areas of human experience.

CHIA has three basic structures. Global Data Submission (GDS) incorporates data, relying on **Data Hoover** to "sweep up" data but also survey data holders and evaluate incoming datasets. World-Historical Dataverse (WHD) is the public archive of CHIA, a curated set of datasets, preserved and documented on the **Harvard Dataverse** archival platform (Level 1 documentation). The Human System Data Resource (HSDR) links datasets, relying on documentation of datasets, supported by the **Col*Fusion** infrastructure. (Level 2 documentation). CHIA circulates datasets through GDS, WHD, and HSDR until they contribute to **multi-scale analyses**.

CHIA **builds and tests theory**. It creates robust ontologies to facilitate data linkage, then CHIA has chosen global inequality as a key topic for building global historical analysis.

Search
Search the World-Historical Dataverse public archive

Submit
Submit data to the World-Historical Dataverse

Data Links and Portals
Links to online historical data worldwide

Featured Activities

[Journal of World Historical Information](#)
[Data Hoover](#)
[Social Inequality](#)
[Col*Fusion](#)
[World-Historical Gazetteer](#)

News, Events, Announcements

Patrick Manning delivers 2017 AHA presidential address on "Inequality"
Call for Contributions – submit data and documents
Ruth Mostern, CHIA co-PI, accepts directorship of World History Center
Drwenski – Manning chapter on African inequality

FIGURE 4: The CHIA home page. Users should click on the "Submit" button at right to gain access to instructions for submitting data.

incorporated into studies. In particular, I urge scholars to submit historical data files to the CHIA archive, using the CHIA Data Submission link.⁵⁸ This link enables contributors to submit historical files of any sort—tabular data, text files, images, or mixes of these, large files or small—for inclusion in CHIA's open-access historical archive. In addition, other public archives will accept data files, especially tabular data.⁵⁹ One purpose is to collect data specifically on inequality. Another is to help historians develop the habit of submitting their data to an open-access archive, which can contribute to other historical advances. Only when social scientists systematically contribute digitized data to public archives will real momentum develop in support of Project 2, the study of human inequality.⁶⁰

⁵⁸ To submit data to CHIA, go to the CHIA home page as shown in Figure 4, and click on "Submit" to start the process. CHIA staff will respond to submissions and guide the documents to the appropriate CHIA archive. Project Manager David Ruvolo (dar133@pitt.edu) is available to assist those submitting datasets.

⁵⁹ <https://www.icpsr.umich.edu/>; <https://dataverse.harvard.edu/>.

⁶⁰ For an example of a large tabular data file created by a CHIA researcher, including worldwide data since 1800, see Chelsea Mafrika, "Place, Population, Precipitation, War since 1800," <https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/ZN1WLF>. For other data in CHIA's public archive, click on the "Search" link on the CHIA home page.

Next, historians can contribute to editing and linking the available data in any of numerous ways. The CHIA archive will facilitate crowdsourcing by volunteer historians, who can help edit and document submitted files from remote locations. Following a process that has worked in other fields, professional and amateur scholars, including graduate and undergraduate students, can be highly productive in documenting data by space, time, topics, and the details of their linkage, and by estimating and simulating missing data.⁶¹ Those with programming skills can join in the linkage and aggregation of discrete datasets, so that we can document the factors contributing to inequality from local levels to continental and imperial interactions. The scholars who participate in these levels of work—contributing data, editing data, and linking datasets—can constitute a community of skilled researchers, able to make the case for the feasibility and relevance of this large-scale research, and able to make the case for expanded institutional support and funding.

Once data are collected and documented, scholars can simultaneously analyze the varying levels of monetary income, categories of gender and ethnicity, and health conditions. Attention to theories and debates in the literature will help identify which data are of highest priority for collection, editing, and linking. Small-scale studies of social interactions or of human-natural interaction may give insights that can be applied more broadly.⁶² Further, historians can be alert in identifying and scrutinizing assumptions underlying social-science analysis.⁶³ Not everyone will be able to perform all of these steps, but formal recognition that this is a common project will help build the links.

Of the various social sciences, history is well placed to reach out and explore across disciplinary lines, giving leadership in this task to scholars more generally. The strength of history is the relatively cosmopolitan nature of its literature, which gathers information and offers interpretations across a wide range of places, times, and social situations.⁶⁴ On the one hand, history, poised in the overlap of the humanities and the social sciences, can balance studies of culture and social change in developing a sense of how the contemporary human system functions and how to enable it to face the crisis of inequality. On the other hand, historians, with their cross-disciplinary interests, can link the dynamics of society to the human aspects of biological and physical changes. Adding all of these factors together, one can imagine that Project 2

⁶¹ An early and effective case of crowdsourcing was the Galaxy Zoo, an interactive project that allows users to view images of galaxies and submit classifications for them. Galaxy Zoo, a project of Zoo-inverse, Citizen Science Alliance, <https://www.galaxyzoo.org>.

⁶² For instance, Keith Tribe located and described some detailed and valuable nineteenth-century studies of inequality in England. Tribe, "Inequality," in Hudson and Tribe, *Contradictions of Capital in the Twenty-First Century*, 29–51, here 32–36.

⁶³ For instance, the logic of Adam Smith is often used to argue that individual profit maximization leads naturally to maximizing output and welfare for all in the system. Vilfredo Pareto showed, long ago, the number of assumptions required for this postulate to hold, and that the notions of external costs and external benefits provide practical ways to account for discrepancies. Yet it is still the case that advocates of major projects for growth and development neglect external effects. Pareto, *Manual of Political Economy*, trans. Ann S. Schwier and Alfred N. Page (New York, 1971); Pigou, *The Economics of Welfare*; Kenneth J. Arrow and Gérard Debreu, "Existence of an Equilibrium for a Competitive Economy," *Econometrica* 22, no. 3 (1954): 265–290.

⁶⁴ In contrast, historians would benefit from closer study of the theories they encounter; they could be effective in developing larger-scale theories linking the theories of adjoining disciplines.

in the overall research will advance significantly, giving us a much-improved picture of inequality and its dynamics in human society.

As Project 2 research advances, the temporal dimension of human inequality will eventually require extended attention. The world-historical research design presented here proposes comprehensive study of the period after 1500. But the earlier structures of human society presumably reinforce inequality today, and Project 2 must make appropriate assumptions about them for its post-1500 analysis. These earlier patterns, whether socially constructed or biologically evolved, can be studied only with smaller quantities of data and different research techniques. Two major groups of researchers, the Institute for Research on World-Systems (IROWS) and the Seshat: Global History Databank, are working in different ways on the questions of earlier configurations that reinforce inequality today, as developed in cities, states, and agricultural life.⁶⁵ Other scholars are producing important work on processes of social evolution in early human societies, where social evolution is defined in a variety of ways.⁶⁶ The full task of Project 2 is to combine the results of the global studies of the post-1500 era with the smaller but essential studies on inequality before 1500, to create a fully historical picture of human inequality.

From that basis, Project 3 can seriously address the exploration of human-natural interaction. Natural scientists have already made substantial advances in this domain, especially in ecological studies and in analysis of the human genome. Further research will explore how various aspects of human inequality influence segments of the environment and, inversely, how rising sea levels and depletion of oceanic phytoplankton populations affect human society. As the data collection, editing, and analysis of Project 2 become more developed, it will be wise for historians and other social scientists to imagine themselves also joining Project 3, a collaborative effort to better understand the interplay of humanity and the natural world. Thinking about this objective may enable individuals to identify small pieces of this large project on which they can work productively.

Finally, there is the question of policy formulation and implementation regarding these two great crises. This is a different and difficult issue. In particular, there has been substantial public and official rejection of scientific knowledge in many parts of the world, notably on climate and other environmental issues, but also on questions of social discrimination. If the three projects combine their efforts and succeed in reporting their research results, we do not know how they will be received. Public opinion, popular culture, and the influence of entrenched interests are complex and important issues, and they are clearly beyond the scope of this study. We must recognize that this big question exists, but we cannot presume to answer it. Meanwhile, it does seem that historians have a professional interest in pursuing research to develop

⁶⁵ Since the work of these two groups overlaps that of the CHIA group for the period 1500–1900, a comparison of results for that period will give an indication of the consistency of IROWS' and Seshat's pre-1500 results with the post-1500 results of CHIA. See <http://www.irows.ucr.edu> and <http://seshatdatabank.info/>, respectively. For an overview of Seshat, see Pieter François, J. G. Manning, Harvey Whitehouse, Rob Brennan, Thomas Currie, Kevin Feeney, and Peter Turchin, "A Macroscopic Overview of Seshat: Global History Databank, a Methodological Overview," *Digital Humanities Quarterly* 10, no. 4 (2016), <http://www.digitalhumanities.org/dhq/vol/10/4/000272/000272.html>.

⁶⁶ Flannery and Marcus, *The Creation of Inequality*; Richerson and Boyd, *Not by Genes Alone*; Peter J. Richerson and Morten H. Christiansen, eds., *Cultural Evolution: Society, Technology, Language, and Religion* (Cambridge, Mass., 2013).

knowledge on these evident terrestrial crises. We need verified interpretations of social processes involving inequality; we need interpretations of the functioning of the spheres of the terrestrial system; and we need to know how these global processes interact.

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