

Cambridge University Press

978-1-107-01725-2 - Living in a Dangerous Climate: Climate Change and Human Evolution

Renée Hetherington

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Living in a Dangerous Climate

Living in a Dangerous Climate provides a journey through human and Earth history, showing how a changing climate has affected human evolution and society. Is it possible for humanity to evolve quickly, or is slow, gradual, genetic evolution the only way we change? Why did all other *Homo* species go extinct while *Homo sapiens* became dominant? How did agriculture, domestication, and the use of fossil fuels affect humanity's growing dominance? Do today's dominant societies – devoted as they are to Darwinism and survival of the fittest – contribute to our current failure to meet the hazards of a dangerous climate? Unique and thought provoking, this book links scientific knowledge and perspectives of evolution, climate change, and economics in a way that is accessible and exciting for the general reader. This book is also valuable for courses on climate change, human evolution, environmental science, and environmental economics.

Renée Hetherington obtained a BA in business and economics from Simon Fraser University in 1981; an MBA from the University of Western Ontario in 1985; and an interdisciplinary PhD in anthropology, biology, geography, and geology from the University of Victoria, British Columbia, in 2002. She was awarded a Canadian National Science and Engineering Research doctoral fellowship for her work reconstructing the paleogeography and paleoenvironment of the Queen Charlotte Islands/Haida Gwaii. The Canadian Social Sciences and Humanities Research Council subsequently awarded her a postdoctoral fellowship for her research relating climate change to human evolution and adaptability over the last 135,000 years. She has been coleader of International Geological Correlation Program project 526, "Risks, Resources, and Record of the Past on the Continental Shelf." She and her husband Bob are partners in RITM Corp., a consulting company committed to helping organizations, especially in the resource sector, reach their potential while recognizing that we live in a changing world. She ran for office as a Member of the Canadian Parliament in 2011 and is currently a member of Shadow Caucus with the Federal Liberal Party of Canada. Renée is the coauthor (with Robert Reid) of *The Climate Connection: Climate Change and Modern Human Evolution* (Cambridge University Press, 2010). She lives with her family on Vancouver Island.

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“... very important and valuable book that will help people realize how dangerous times are and why they are dangerous. [It explains] what we as humans are doing to make the changes more destructive ... [and how] our evolutionary perspective as a species ordains us to want to continue our self-destructive ways.”

– Fred Roots, Chair of the Canadian National Committee for the UNESCO
Man and Biosphere Programme

“Renée Hetherington marshals evidence from anthropology, biology, and earth science to discuss the imminent fate of the human species. She argues that we are our worst enemy, caught in the mental gridlock of a neo-Darwinist, market-based capitalist system that is preventing us from dealing with impending serious climate change and the possible collapse of the ecosystems that support us. Yet Hetherington offers hope – *Homo sapiens* is the most adaptable of animals; we can, if we choose, deal with the most serious challenge our species has faced. Hetherington challenges us to act. Failure to meet the challenge would be the ultimate irony for the most intelligent life form that has ever graced Earth.”

– John J. Clague, Director, Centre for Natural Hazard Research, Simon
Fraser University, Canada

“This book addresses the history of climate variability and recent anthropogenic climate change on the background of human evolution; discusses the links between climate, migration, and agriculture; and assesses the dominant paradigm, the economic connection, dangerous attitudes, and the main new dangers due to climate change impacts. Written from an interdisciplinary perspective, this important and well-written scientific book deserves a wide public audience of students, citizens, and opinion leaders in society, business, and politics to counter the well-financed campaign of economic lobbyists and climate skeptics who ignore the impact of non-action on future generations.”

– Ursula Oswald Spring, National Autonomous University of Mexico; lead
author of the IPCC

“A wide-ranging and thought-provoking exposition that explains the human condition, from our evolution to our inability to deal with current, let alone future, climate change in the face of an imperfect financial system. Dr. Hetherington is a skilled storyteller who provides a factual yet, at times, personal account that integrates several fields of endeavor and leaves worrying questions about how we will cope with the challenges of the future. A highly readable and understandable synthesis that should have wide appeal.”

– Allan R. Chivas, GeoQuEST Research Centre, School of Earth and
Environmental Sciences, University of Wollongong, Australia

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Foreword: Evolution and the Human Condition

ROBERT G. B. REID

While the twentieth century stands out in history for two world wars, numerous local wars, genocides, and political revolutions, there were little-considered developments that present us in the twenty-first century with even more menace. Because they have crept up on us slowly, instead of with the instant and obvious catastrophic effects of war and revolution, most of us tend not to notice them or to discount their effects. I refer to the environmental consequences of global warming, deforestation, soil erosion, the degradation of ocean fisheries, expanding populations, and inflated economies.

Renée Hetherington confronts us with these present, if not clear, dangers, as well as with the risks of living beyond our means. She ranges from an intimate subjective point of view to a scholarly analysis backed with solid evidence. Her two-pronged approach to these problems arises from her knowledge of climatological history and from her belief that because economics and business are devoted to Darwinism and survival of the fittest, they are partly to blame for the failure to meet the growing hazards that are going to make the world a more dismal place in which to live.

Following her argument that the dynamic stabilities of biological, political, and economic systems, which fit into the Darwinist mold, tend to resist progressive change, she points out that they can only be disequilibrated by unpredictable natural catastrophe or by objective analysis and resolute action on the part of humankind. She tells us how natural disasters shaped the future of evolution, and she provides the objective analysis required for resolute action.

As an evolutionist, I appreciate how Hetherington points out some of the flaws of current evolutionary theory based on natural selection, suggesting that some biological change can occur nonrandomly, regardless of adaptiveness. She argues that some biological

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change can be interpreted in terms of the Lamarckian concept of “the inheritance of acquired characteristics.” She also reasons that some evolution can be directly driven by the environment.

I applaud the distinction she makes between adaptation and adaptability. The two are hopelessly confused in the public mind as well as in the writings of anthropologists and archeologists. The *adaptations* with which neo-Darwinists work are random, genetically fixed mutations that require the approval of natural selection to become general species characteristics. *Adaptability* is what the individual organism can do to respond physiologically and behaviorally to change. In the case of humans, the proper application of intelligence is part of our adaptability. The distinction is particularly important in the context of this book, because, as Hetherington points out, the process of adaptation and natural selection in the strict sense is much too slow to respond to sudden environmental alteration. In contrast, the adaptable organism can do something about it instantly. Unfortunately for humans, tradition, ritual, and “sticking to tried and true ways” – what Renée Hetherington calls “the dominant attitude” – can obstruct effective action, despite our potential ability to respond effectively to change.

A prevalent theme of this book is the concept of the “hopeful monster,” proposed by Richard Goldschmidt in 1933. He believed that some kinds of mutation could produce radically new plants and animals. They “hoped” for an ability to reproduce their novel qualities and for conditions to which they could be adaptive. The hopeful-monster hypothesis was rejected by neo-Darwinist gradualists who thought that every change was small and judged fit by natural selection before being added to the genomic repertoire. As Hetherington points out, Darwin was well aware of “monstrosities” that arose suddenly during animal breeding. Although he used artificial selection (i.e., what farmers do when they decide particular plants and animals are more suitable for their purposes) as a model for his evolutionary theory, he rejected natural monstrosities as aberrations because they did not fit in with his concept of gradual evolution by natural selection.

A monstrosity that is unfit in the Darwinian sense can nevertheless survive if a farmer or horticulturist provides appropriate conditions. Likewise, in nature, unfit monsters can get by if they can find such conditions for themselves. If the monsters’ hopes are realized, they become “successful monsters”; their populations, environmental distribution, and diversity expand, and they become registered in the fossil record. The evolution of our vertebrate ancestors provides us with numerous examples of the episodic, sudden changes that Goldschmidt

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envisioned, albeit few and far between. However, as successful monsters, we humans have periodically mapped roads to our own downfall without taking significant action to forestall such fates. In the case of the present danger, it will affect the entire population of Earth.

In writing this book, Renée Hetherington mobilizes her interdisciplinary background in business administration, anthropology, climatology, and biology. It is a fresh look at a subject that has been tackled with little success by many others – a new way of seeing. In addition to her scientific knowledge, she draws on personal experience, sometimes poignant, sometimes entertaining. She writes in plain language rather than scientific jargon and makes her work accessible to most readers.

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This book grew from my desire to make my and Robert G. B. Reid's recent book, *The Climate Connection: Climate Change and Modern Human Evolution*, accessible to a broader audience. For years, Robert and I met weekly over lunch to discuss evolution, the environment, and humans. His support and encouragement never wavered, even after he became ill. I deeply appreciate all that he has done to assist and encourage the success of my work, including writing the foreword for this book.

Our discussions frequently benefited from the contributions of Richard Ring and numerous other faculty and students from the University of Victoria biology department, who joined us in our discussions. Researchers in Andrew Weaver's University of Victoria climate modeling lab gave me the opportunity to stray into uncharted territory, and with the support of the staff – particularly Michael Eby, Wanda Lewis, and Ed Wiebe, postdoctoral fellows at the time – Jeff Lewis and Kirsten Zickfeld, and students, I gathered the research that contributed to the writing of this book. My appreciation also extends to Tina Sherlock, public services librarian at Quest University, who graciously provided me access to library resources.

The many colleagues, public citizens, and students with whom I have spoken and to whom I have lectured at elementary schools, universities, and scientific institutes asked questions that provoked me to search for clear, insightful responses and helped me focus on the critical issues.

E. Fred Roots, science advisor emeritus with Environment Canada, dug up and presented me with climate policy research papers and notes extending back more than twenty-five years, providing me with perspective on the current climate debate.

My deepest appreciation goes to my editor, Matt Lloyd, and the rest of the team at Cambridge University Press, who provided excellent

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advice and assistance. Matt believed in this book long before it was written; he gave me the encouragement and flexibility to write it and the opportunity to publish it.

My sincere gratitude is extended to Audrey McClellan, my personal editor, who has worked with me and this book over several years, thoughtfully and professionally guiding me to my objective of making scientific knowledge and ideas accessible to the general public. My appreciation also extends to Bhavani Ganesh and the Newgen Knowledge Works production team, as well as to Fred Goykhman of PETT Fox Inc. for his copyediting and editorial assistance.

Adam Monahan and Robert G. B. Reid provided thoughtful and insightful scientific reviews of earlier versions of this book, which have improved its clarity and content.

I sincerely appreciate the insights provided by John Tapping, who reviewed and provided contributions for the “Capitalism and Democracy” chapter and the assistance of Ryley Tapping and the Hernandez family for providing access and insights to Maya culture in Mexico.

The complexities of my father’s life stimulated some of the personal anecdotes and thoughts on survival of the fittest, and those of my mother’s life drew me to ponder the capacity and benefits of human compassion.

My dear friend Marion Farrant offered me encouragement, advice, and support from the outset and reviewed numerous versions of this book; without her, this book would never have been written.

My sons, John and Ryley, provided me opportunities to write and do research. They gave willingly of their time and support, love, and compassion; they also give me hope and optimism for the future of humanity.

My husband, Robert, the love of my life, has never wavered in his support and love. He personifies my compassionate and tolerant theoretical jargon.

Any errors, omissions, or inconsistencies are solely my responsibility and in no way reflect on the contributions made by all the people I have mentioned and the many I have not named here but appreciate nonetheless.

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Preface

Given things as they are, how shall one individual live?

Annie Dillard, *For the Time Being*

This is a book about humans, the rise of our civilization, and the development of our economic system. It is about our relationship with Earth, the species with whom we share this planet, and the climate that influences Earth's environment. It covers a diverse range of subjects; its relevance is applicable across disciplines and cultures; its implications are vital. I have tried to convey the scientific evidence, which is frequently buried in research journals inaccessible to the general population, in language that is as nonscientific as possible in an effort to make clear to the reader the brutally pressing reality that what matters most is how each of us lives our life, particularly as it relates to climate, our economy, and the increasing dominance of humans on Earth.

Charles Darwin's theories of survival of the fittest and natural selection form the dominant paradigm against which recurring new species – "hopeful" monsters – perplexingly arise and, sometimes, survive. Others, like all previous *Homo* species described in Chapters 2 through 4, did not survive. Individual examples described in Chapters 11 through 15, some more hopeful than others, serve as opportunities to review our perspective of Darwin's theories, which dictate that humanity's burgeoning presence represents expanding wisdom and fitness, yet simultaneously feed an omnipresent denial of death and destruction.

Chapters 5 and 6 take the reader on a historic journey with our ancestors as they migrate from Africa to Eurasia and then on to the Americas. Early efforts to control the effects of a changing climate through agriculture and early civilization are revealed in Chapters 7

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and 8. The distinction between adaptation and adaptability and how dominance prevails during climate stability, whereas flexibility is critical during rapid climate change, are discussed in Chapter 9. Chapter 10 delves into the wonders and follies of natural selection and survival of the fittest. Given these connections between humans and climate, Chapters 16 and 17 review what the environment holds for humanity today and tomorrow.

I discuss the similarities between the underpinnings of economic theory and evolutionary theory in Chapters 18 and 19 and why economic and societal dominance cannot be guaranteed during periods of significant change and instability. I also remark on the impact of human dominance in a world where climate change is not new but is part of the natural change ubiquitous in Earth's history, pointing out that climate change has often coincided with the extinction of once-dominant species.

In the closing chapters, I reflect on our place on Earth today, on our capacity to effect change, and on our ability to live in a dangerous climate. Storm clouds brew on the horizon. In the past, we rarely worried about our footprint – a wave would always come and wash it away. Now, increasingly, the waves fail to clean up our mess, or they come as tsunamis, obliterating everything in their wake.

To a considerable extent, humans remain oblivious to the consequences of dominance, perhaps because we still survive or, alternatively, because we are ever hopeful. Yet, irrespective of *Homo sapiens*' capacity to intellectually and behaviorally adjust to our new reality, Earth does not have a preference for a dominant species. It does not care which rules the day. Change is its wardrobe.