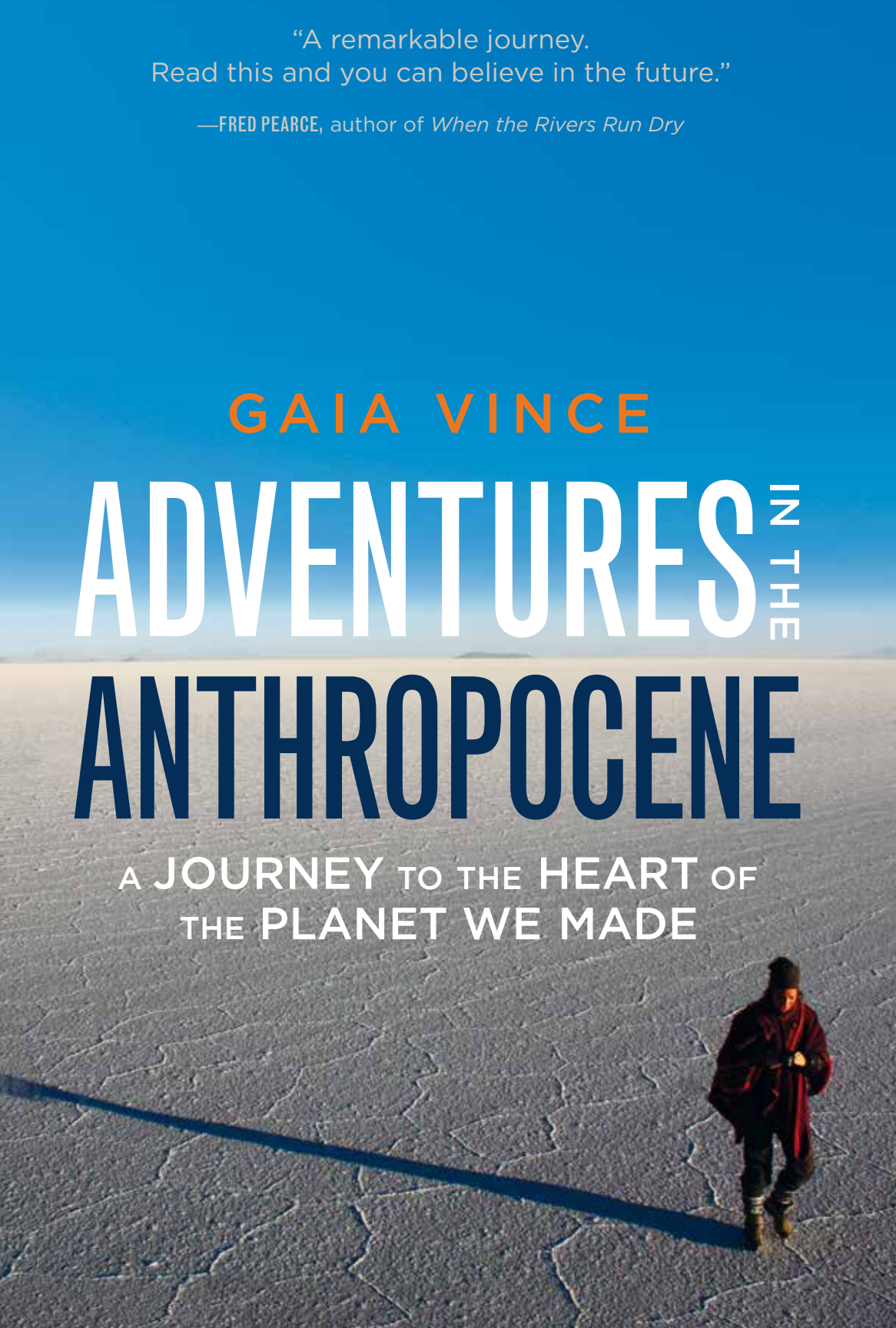
"A remarkable journey.
Read this and you can believe in the future."

—**FRED PEARCE,** author of *When the Rivers Run Dry*

GAIA VINCE

ADVENTURES IN THE ANTHROPOCENE

A JOURNEY TO THE HEART OF THE PLANET WE MADE



ADVENTURES IN THE ANTHROPOCENE

GAIA VINCE

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A JOURNEY TO THE HEART OF THE PLANET WE MADE

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For Nick

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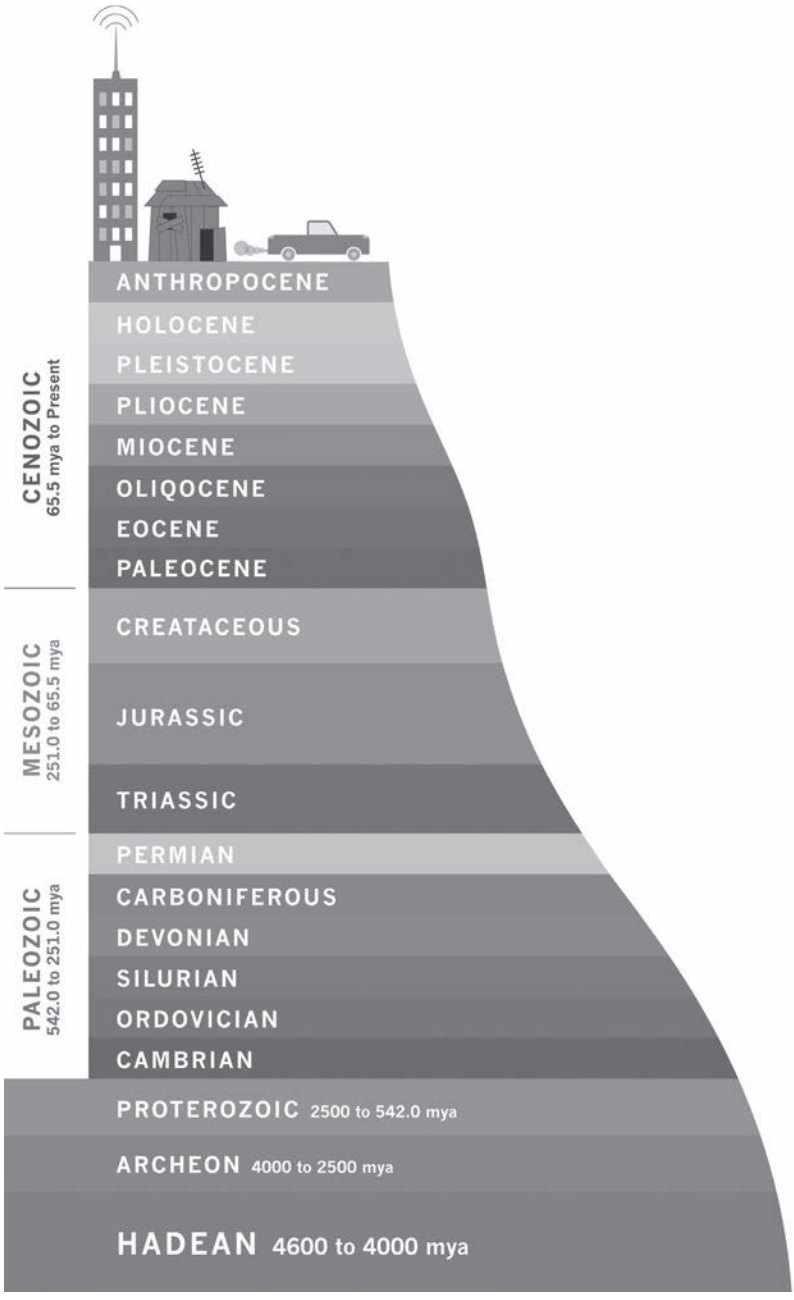
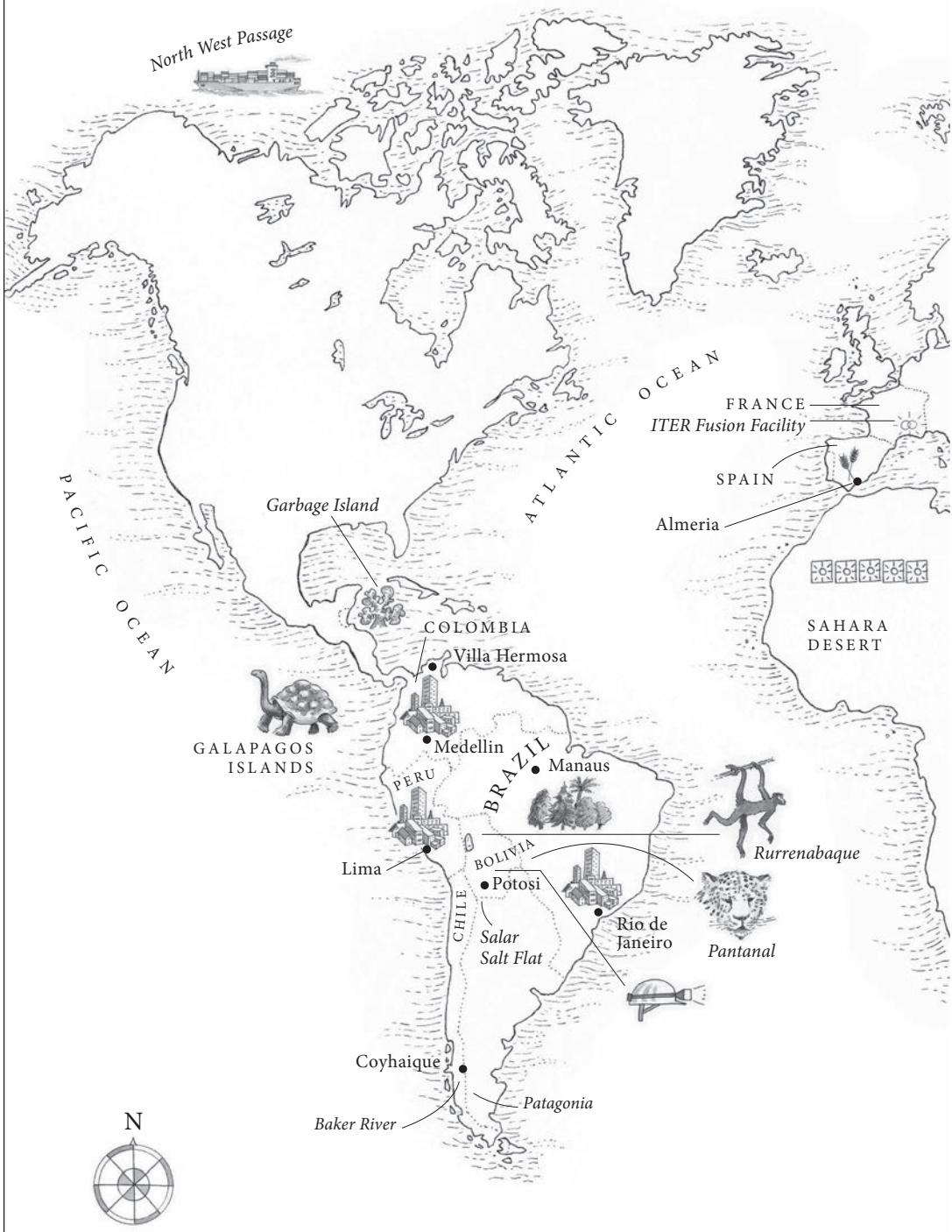
GEOLOGICAL TIMESCALE

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GALAPAGOS ISLANDS
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Potosi
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Tianjin
Eco-city
PACIFIC OCEAN
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Pun Hills
Raj Samadhiyala
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LAOS
Soroti
Lake Turkana
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Kiribati
Maasai Mara
INDIAN OCEAN
AUSTRALIA
Port
Augusta

ADVENTURES IN THE ANTHROPOCENE

INTRODUCTION: THE HUMAN PLANET

Four and a half billion years ago, out of the dirty halo of cosmic dust left over from the creation of our sun, a spinning clump of minerals coalesced. Earth was born, the third rock from the sun. Soon after, a big rock crashed into our planet, shaving a huge chunk off, forming the moon and knocking our world on to a tilted axis. The tilt gave us seasons and currents and the moon brought ocean tides. These helped provide the conditions for life, which first emerged some 4 billion years ago. Over the next 3.5 billion years, the planet swung in and out of extreme glaciations. When the last of these ended, there was an explosion of complex multicellular life forms.

The rest is history, tattooed into the planet's skin in three-dimensional fossil portraits of fantastical creatures, such as long-necked dinosaurs and lizard birds, huge insects and alien fish. The emergence of life on Earth fundamentally changed the physics of the planet.[1] *Plants sped up the slow*

breakdown of rocks with their roots, helping erode channels down which rainfall coursed, creating rivers. Photosynthesis transformed the chemistry of the atmosphere and oceans, imbued the Earth system with chemical energy, and altered the global climate. Animals ate the plants, modifying again the Earth's chemistry.

In return, the physical planet dictated the biology of Earth. Life evolves in response to geological, physical and chemical conditions. In the past 500 million years, there have been five mass extinctions triggered by supervolcanic eruptions, asteroid impacts and other enormous planetary events that dramatically altered the climate.[2] *After each of these, the survivors regrouped, proliferated and evolved. The diversity of plants, animals, fungi, bacteria and other life on Earth is richer now than at any point in time.*[3]

And us? Anatomically modern humans didn't arrive until nearly 200,000 years ago and it was touch and go whether we would survive. But something pulled us through, the something that differentiated us from the other species in this shared biosphere and made us so successful that we now rule our world: the human brain. We're more intelligent and use tools better than the other animals. And humans can make and control fire. Ever since the first human lit the first spark, our destiny as the most powerful species was assured. Having this external source of energy, which we could move wherever we chose, gave us power over the landscape, protection from other animals, allowed us to cook our food, keep warm and, ultimately, take over the world.

For thousands of years, humans shared the planet with Neanderthals and our other cousin species. A supervolcanic eruption at Toba in Indonesia 74,000 years ago nearly wiped us all out – the human population shrank to a few thousand. But, by 35,000 years ago, truly modern humans, indistinguishable from people alive today and littering caves and rocks with signs of their culture, had emerged and migrated out of Africa. Thus began the heroic ascent of man.

In the Stone Age, our impact as a species on the planet was limited to some extinctions – particularly of large mammals – and some local landscape

changes, such as the burning of forests. Technologies were primitive and minimal, and were fashioned entirely from renewable materials. Over the following centuries, our impact grew. Farming was invented around 10,000 years ago (about 300 generations ago; world population: 1 million), transforming some regional landscapes as human-bred plant varieties replaced wild flora. Around 5,500 years ago (world population: 5 million), cities were built and the first great civilisations emerged. The Industrial Revolution in Europe and North America, which replaced the labour of humans and beasts with machines, started having a measurably global impact about 150 years ago (world population: 1 billion), as large volumes of carbon dioxide from fossil fuels were released into the atmosphere.

Nothing, however, compares to the scale and speed of our planetary impact since World War Two, driven by population expansion, globalisation, mass production, technological and communications revolutions, improved farming methods and medical advances. Known as the Great Acceleration, this rapid increase in human activity can be seen across a vast range of things, from the number of cars to water use.[4] *It took 50,000 years for humans to reach a population of 1 billion, but just the last ten years to add the latest billion.*

This rapid transformation spurred social and economic development – a century ago, life expectancy in Europe was less than fifty years, now it's around eighty years. But the Great Acceleration has been a filthy undertaking. Pea-souper smogs shrouded cities like London killing thousands, acid rain poisoned rivers, lakes and soils, eroding buildings and monuments, refrigerant chemicals ate away at the protective ozone layer, and carbon dioxide emissions changed in the global climate and acidified the oceans. Our voracious plundering of the natural world has led to massive deforestation, a surge in extinctions and destroyed ecosystems. It has produced a deluge of waste that will take centuries to degrade. In a single lifetime we've become a phenomenal global force and there is no sign of a slowdown – in fact, our extraordinary impact on the planet is only increasing.

Meanwhile, our closest relative, the chimpanzee, is living much as he did

50,000 years ago. Humans are the only creatures to have cumulative culture, allowing us to build on the past rather than continually reinvent the wheel. But, as we fumble about on Earth's surface, hostage to the whims of our phenomenally powerful brains, humanity is undertaking a brave experiment in remodelling the physical and biological world. We have the power to dramatically shift the fortunes of every species, including our own. Great changes are already being wrought. The same ingenuity that allows us to live longer and more comfortably than ever before is transforming Earth beyond anything our species has experienced before. It's a thrilling but uncertain time to be alive. Welcome to the Anthropocene: the Age of Man.

We live in epoch-making times. Literally. The changes humans have made in recent decades have been on such a scale that they have altered our world beyond anything it has experienced in its 4.5 billion-year history. Our planet is crossing a geological boundary and we humans are the change-makers.

Millions of years from now, a stripe in the accumulated layers of rock on Earth's surface will reveal our human fingerprint just as we can see evidence of dinosaurs in rocks of the Jurassic, or the explosion of life that marks the Cambrian or the glacial retreat scars of the Holocene. Our influence will show up as a mass of species going extinct, changes in the chemistry of the oceans, the loss of forests and the growth of deserts, the damming of rivers, the retreat of glaciers and the sinking of islands. Geologists of the far future will note in the fossil records the extinctions of various animals and the abundance of domesticates, the chemical fingerprint of artificial materials, such as aluminium drinks cans and plastic carrier bags, and the footprint of projects like the Syncrude mine in the Athabasca oil sands of north-eastern Canada, which moves 30 billion tonnes of earth each year, twice the amount of sediment that flows down all the rivers in the world in that time.

Geologists are calling this new epoch the Anthropocene, recognising

that humanity has become a geophysical force on a par with the earth-shattering asteroids and planet-cloaking volcanoes that defined past eras.[5]

Earth is now a human planet. We decide whether a forest stands or is razed, whether pandas survive or go extinct, how and where a river flows, even the temperature of the atmosphere. We are now the most numerous big animal on Earth, and the next in line are the animals we have created through breeding to feed and serve us. Four-tenths of the planet's land surface is used to grow our food. Three-quarters of the world's fresh water is controlled by us. It is an extraordinary time. In the tropics, coral reefs are disappearing, ice is melting at the poles, and the oceans are emptying of fish because of us. Entire islands are vanishing under rising seas, just as naked new land appears in the Arctic.

During my career as a science journalist, it became my business to take special interest in reports on how the biosphere was changing. There was no shortage of research. Study after study came my way, describing changes in butterfly migrations, glacier melt rate, ocean nitrogen levels, wildfire frequency . . . all united by a common theme: the impact of humans. Scientists I spoke to described the many and varied ways humans were affecting the natural world, even when it came to seemingly impervious physical phenomena like weather and earthquakes and ocean currents. And their predictions were of bigger changes to come. Climate scientists tracking global warming told of deadly droughts, heatwaves and metres of sea-level rise. Conservation biologists were describing biodiversity collapse to the extent of a mass extinction, marine biologists were talking of 'islands of plastic garbage' in the oceans, space scientists were holding conferences on what to do about all the junk up there threatening our satellites, ecologists were describing deforestation of the last intact rainforests, agro-economists were warning about deserts spreading across the last fertile soils. Every new study seemed to hammer home how much our world was changing – it was becoming a different planet. Humanity was shaking up our world, and as I and others reported these stories,