THE SPIRAL OF CLIMATE
CONTENTS

Prologue
11 Exploring the histories of the Mediterranean
   Emanuela Guidoboni

17 1. Antiquity
    Third millennium BC–fifth century AD

19 Great droughts of the ancient Mediterranean

25 Weather forecasts in antiquity

28 Climatic explanation of Mycenaean decline

30 Weather forecasts in ancient Greece

32 The Bible can help us understand the past climate of the eastern Mediterranean

36 Were the ancients aware of changes in the climate?

41 Earth’s climatic zones in ancient theories

46 Cool, rainy phase between the tenth and fourth centuries BC

50 Could the ancients affect the climate?

62 A Roman Warm Period

65 Climate of the Italian Peninsula at the dawn of the “dolce vita”

69 Large water surfaces attenuated aridity: natural environments and inhabited lands
2. FROM THE EARLY MEDIEVAL COOLING TO THE END OF THE WARM PERIOD
SIXTH–FIFTEENTH CENTURIES

Early medieval views of the weather and of the shape of the earth

Earth and its climatic zones in medieval Christian cartography

Transition to a colder climate between the sixth and eighth centuries: glaciers increase, floods and marshes threaten plains

Natural environment in the early Middle Ages

To mitigate the climate, many resorted to storm-making magicians and saints

Was the climate different in the eastern Mediterranean?

Volcanic eruptions and cooling

Temperatures rise again: the Medieval Warm Period

Representation of terrestrial climates in Arab cartography, and the “gridding” of the earth

Different effects of the rise in temperature

Highs and lows of the Nile: an indirect climatic indicator

1234: The year of the great cold

Scourges of mild winters: invasions of grasshoppers and other insects

Increased extreme events during the fourteenth century: severe cold, poor harvests and the Black Death

The flood of the Tiber in Rome

Shipwrecks and maritime insurance

Effects of the Black Death and a new phase of cooling: a correlation hypothesis

Temperature perception: how people protected themselves from the cold

Collective religious rites as “climatic indicators”: propitiatory processions

Invention of humidity and wind gauges
3. BEGINNING AND END OF THE LITTLE ICE AGE
SIXTEENTH–MID-NINETEENTH CENTURIES

The Little Ice Age sets in: rain, cold and hunger

An Arab traveler describes the climate of northern Africa in the early sixteenth century

The great famine of 1590–1591

Governments respond to subsistence crises by strengthening food-rationing systems

Wine production on the wane: the beverage of saints and penitents becomes more popular

The Po and Tiber in full spate

Three Alpine hamlets abandoned because of glacier advancement

Farmers versus herders: grasshoppers as part of a social conflict

The cooler and rainier climate favored the spread of corn

Meteorology’s journey from natural philosophy to science

Early scientific measurements of temperature, pressure and precipitation

Climate and natural disasters in the Ottoman Empire

The long and harsh winter of 1709: one million dead in Europe

Relationship between illnesses and climate in eighteenth-century medicine

Mucilage in the Adriatic Sea in the eighteenth century favored by the climate

Variations in the water level of the Venetian Lagoon “captured” by painters

The turbulent “Maldá anomaly”

A flexible fiscal system “spies” on agricultural losses caused by meteorological adversities

The year without a summer and the birth of Frankenstein: 1816

The Arno once again invades defenseless Florence: the great flood of 1844
A nineteenth-century physician investigates the relationship between illnesses, cures and climate in history

Instrumental observations open a new era

4. Another warm phase
The last one hundred and fifty years

The onset of global warming

Droughts in the early twentieth century

Lack of preventive measures and the climate: the great floods of the twentieth century

Perception of heat and cold, and artificial temperature

Epilogue
Climate, science, and responsibilities
Antonio Navarra, Enzo Boschi

References

Name index

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The climate, its changes, and the ability to make effective weather forecasts are not exclusively modern concerns. Mediterranean civilizations have been struggling to understand the climate and its relationship with human activities, to predict the weather and to protect themselves from its fury, for millennia. Today, we wonder what the ancients thought of climate change, of which they sometimes seemed aware, and how their theories on the shape of the earth and its representations affected their understanding of the climate of our planet. We also ask ourselves whether the environmental modifications triggered by human activities in the past—such as deforestation, river diversion, and land reclamation—had a bearing on the climate, or whether the scale on which these changes occurred was so small as to be inconsequential.

Sensitivity to these issues and to this kind of scholarly research has grown of late. While data on Mediterranean countries continue to be scarce, we have attempted to set off on a journey through time to see how human beings reacted to climate changes and extreme events over a long period and over a large area. Efforts to adapt to changes in the climate and to endure its vagaries in the face of the damage and risk it involves are no novelty. But just how affected by these challenges were past civilizations?

When one thinks of the many non-weather-related calamities that afflicted societies in the past millennia, it may seem as if climate changes and extreme events had little or no additional impact. Regardless of the climate, negative economic cycles and subsistence crises were common, not unlike sudden demographic changes, wars, disastrous earthquakes, widespread incurable diseases and epidemics, which killed a large percentage of the population. What did the climate have to do with any of that? The social and cultural reactions to climate change in the Mediterranean area in history may seem an obscure matter, made inaccessible both by the distance in time and by the myriad other elements worthy of attention. This field of study may appear to be utterly challenging, if not unfathomable.

Yet the climate and its changes played a fundamental role in agricultural production, as shown by the historical studies on transalpine Europe in the last five centuries. Authoritative European historians have pieced together the climate and analyzed the complexities of local production and culture, singling out the features of the historical climate and its changes, which invariably spurred answers and adaptations, challenged the population and triggered new social dynamics,
often affecting the already precarious balance of local communities. Emmanuel Le Roy Ladurie, Christian Pfister, Dario Camuffo, Pierre Alexandre, Mariano Barriendos, Luca Bonardi, and their many talented collaborators contributed to this brilliant European historiography. Pfister has masterfully cast light on the contours of the Little Ice Age (sixteenth–mid-nineteenth century) and its repercussions on the economy of transalpine regions.

Can the impacts of the climate be assessed with the same degree of accuracy for more distant times? Are there specific Mediterranean features in this history that differ from those of transalpine Europe and northern Italy? As current societies find themselves involved in changes they may have brought upon themselves or accelerated, these issues have recently gathered momentum. Is the global temperature rising as never before? Or does it seem that way because we are drawing data from too small a time window?

Unfortunately, the available data on antiquity and on the Middle Ages in the Mediterranean are not even remotely comparable to instrumental measurements of temperature—or to information derived from indicators and proxies—used to reconstruct the history of the last five centuries. In this respect, historical investigation and archeological fieldwork on the period before the Little Ice Age will prove invaluable.

This journey through time is not “the history of the climate in the Mediterranean,” which remains to be written. Today, only partial data are available, and the little that is known we owe to sporadic historical and climatological research. Will the climate of the last two millennia be the subject of a multidisciplinary research by historians, archeologists and climatologists? We hope so, because there are too many unanswered questions and too many gaps in the data collected on the Mediterranean to be able to produce a definitive scientifically sound historical reconstruction of the climate.

**Climate as an entry point to reflect about the past**

By setting off on this journey through time, we aim to sketch the trends of the climate over a long period and, albeit in a piecemeal fashion, to cast light on social scenarios and pry into some of the cultural reactions to the climate and to extreme events, and their interactions with the human environment.

As with other natural phenomena, climatic events have been the subject of studies and theories, they have had a bearing on the material life of populations, affecting the agricultural production to such an extent—both positively and negatively—that ancient agronomists wrote *annus fructificat, non tellus* (“the year bears fruits, not the earth”). From Theophrastus (fourth–third century BC) to the climate theorists of the eighteenth century, to whom the *Encyclopédie* attributed great authority, it was believed that the weather had a greater influence on farming than the quality of the soil.

Mediterranean cultures of the past devoted much thought to the climate, incorporating it in their theories and cognitive frameworks. This book explores but some aspects of climate, such as its relationship with health, or its alleged relationship with certain human features (the distant origin of what we now know to be an outdated determinism). But the common thread that runs through the centuries and bespeaks the social relationship with the climate is the continuous effort to forecast the weather, the millenary obsession of humankind.
In antiquity, divinatory arts concerned themselves with the observation of atmospheric phenomena and the attempt to foresee them. On the one hand, natural phenomena were viewed as powerful omens, mysterious symbols of things to come. On the other hand, agricultural communities depended exclusively on natural energy resources, and thus droughts, bad weather, and invasions of harmful pests could spoil harvests and cause subsistence crises, much like wars and dreaded foreign aggressions.

Understanding how the weather worked and attempting to predict it, or to anticipate its changes, have kept natural philosophers, encyclopedists and scholars busy over the centuries. Extreme weather-related events, be they excessive rainfall, droughts or windstorms, threatened productivity, fragile to begin with because of the difficult economic and social conditions of the time. In the Middle Ages, rural communities, called upon to endure the daily hardships of farming, came up with interesting cultural answers to the challenges posed by the weather. Now nearly a fossil of collective memory in urban culture, these “preemptive” measures against natural calamities survive in some rural areas, where propitiating the heavens to get favorable weather was long part of popular piety. Pagan propitiatory rites—rampant outside cities well into the early Middle Ages despite condemnation by the Church—were later passed down to Christianity through devotion to saints, some of whom came to be perceived as “specialized” in meteorological events. The need to oppose the harshness of the climate and the desire to obtain better weather kept very ancient prayers and collective rites alive for centuries: rogations, the origins of which date back to the fifth century AD, continued to exist into the modern era, when they became public processions organized by local governments.

But the greatest answers to these challenges—not always attested to in written sources, as Diego Moreno and Tiziano Mannoni point out—were the preventive measures put into practical effect in rural areas, and the science of agronomy at large: terracing slopes, managing waterways, and keeping forests healthy. We seem to have lost our grasp of this “syntax” of land management, often neglected or downright vilified in our day. But these solutions very aptly protected the human environment and shielded communities from disaster. We can still see how severely the land is washed away in the event of heavy rainfall where these measures were not put into place. Meteorological events turn into calamities where the environment proves unable to provide adequate answers.

**Historical roots of climatology**

Meteorology began to take root in the Middle Ages, although its development was neither steady nor unopposed, subjected as it was to natural philosophy and astrology. As a science, meteorology lagged behind other branches of knowledge. Was it intellectual and religious “viscosity”—the die-hard presence of the erudite tradition, which turned to the ancients for guidance—that inhibited experimentation and new applications? Intellectuals of the age of Enlightenment dwelled on the climate and attempted to give currency to meteorology, seeking a connection between anthropological features, the climates of the earth, and seasonal variability. The vices and virtues of nations were correlated with the existence of different climatic belts. This geographic determinism, which at least had the merit of being devoid of moral judgment, was not very different from that advocated by Hippo-
crates and his school over two thousand years before (fifth–fourth century BC). These ideas and prejudices were extremely long-lived, paralleled in their longevity only by the Aristotelian theory on the origin of earthquakes.

The study of climate was thus slower than others to embrace the viewpoint of science. Nonetheless, in the background, climate was taken into account and investigated by medicine, which sought correlations between the weather and health. Climatotherapy was an important field of medicine in the late 1800s, when the “right” climate was seen as a therapeutic tool for the many diseases drugs were powerless to cure.

When did the climate become the subject of scientific observation, and when were systematic attempts at measuring it first carried out? In Italy, these attempts started rather early, but they were discontinuous. Operative for roughly fifteen years between 1654 and 1670, the first meteorological observation network, the well-known Medicean Network, was promoted by the Grand Duke of Tuscany Ferdinando II de’ Medici (1610–1670) and the Accademia del Cimento (1657–1667). Daily measurements of temperature did not take place only in Italian cities (Florence, Pisa, Parma, Bologna and Milan), but also in Innsbruck and Warsaw. The tool observers used to this end was a small Florentine thermometer, filled with alcohol.

The first continuous measurements of temperature, humidity and pressure date back to the early 1700s. Italy can pride itself on having one of the most ancient instrumental series of all of Europe: priceless manuscript records, some of which preserved at the University of Padua, were kept in Bologna and in the city of Padua itself starting in 1716. Such precociousness in instrumental data collection bespeaks a proclivity for innovation, which was able to reach its full potential and to become widespread only during the following century. The ability to measure the variables that make up the weather gradually changed the way people thought of the climate, and turned weather forecasting into a subject of scientific study. Yet it was only in the mid-1960s that climatology began using physics and mathematics, and elaborating important predictive models (see the Epilogue).

New questions to historians
The questions posed by the scientific research on climate also deeply affect the historical study of this topic. Today, historians are asking themselves whether we are heading toward an exceptionally warm climatic phase, as global meteorological data suggest, because of the increase in atmospheric CO₂ brought about by human activities, or whether previous warm periods were comparable to the present one, or even more severe. How much warmer is the earth getting?

In the first half of the twentieth century, climatologists defined both the Roman Warm Period and the Medieval Warm Period as “climatic optimums.” The word optimum suggested that the warming was an improvement from previous conditions. Temperatures had risen up to a certain point, after which they subsided. This cyclic—and perhaps tranquilizing—image of climate change is absent from the current portrayal of global warming, for instance as carried out by the Intergovernmental Panel on Climate Change (IPCC) in its last two reports, in 2001 and 2007.

The current debate will perhaps reach definitive answers from a scientific point of view in the near future. Light needs to be cast on the fundamental issues
at hand and on the data relevant for the life of human beings steering away from biases and shortcuts. Research is based on sampling techniques and on complex statistical elaborations, and it thus inevitably entails some degree of uncertainty and ambiguity, which should not be disregarded.

The Medieval Warm Period plays a very important role in the present discussion. Was that increase in global temperature part of a cyclic process, or was it simply an “anomaly,” as some contemporary climatologists tend to characterize it, perhaps reductively? Has the earth ever undergone a natural rise in temperature comparable to the present increase? If so, was it more or less intense? Are there non-anthropogenic causes that might contribute to global warming? This riveting topic, still very much in the forefront of international research, could benefit greatly from new findings on the warm periods in history at the hands of historians and archeologists.

What will the earth be like in a few decades, or in a few centuries? It’s still hard to say, and not for lack of trying. According to the recent report by the International Organization for Migration (IOM), in 2050 earth may have to face the challenge and ensuing trauma of two hundred million “climatic refugees.” Today, migrations attributable to environmental causes amount to about fifty million people a year. People are forced to relocate because of environmental crises—pollution, desertification, droughts or other disasters of natural origin—that strain their countries. The IPCC, mandated by the United Nations to synthesize and interpret climatic data from all over the world on behalf of national governments, also points to the increase in human migration as one of the most socially and economically destabilizing effects of climate change. In the past, too, climate changes have triggered migrations and strong variations in the stability of certain areas. And yet these instances, perhaps because of their smaller demographic scale, are perceived as having been less serious. But was their social and environmental impact less severe, or are we merely incapable of adequately assessing it?

Because this book is a fleeting excursion into the spiral of climate change in history, a somewhat shadowy and still uncharted territory, we have suggested a complementary itinerary through the visual arts. Works were chosen not so much to describe atmospheric events or aspects of the environment in a given time and place, as to allude to the cognitive, perceptive and esthetic reality of the periods touched on. With this visual experience, we hope to access the realm of the unsaid, and to provide additional food for thought through the power of suggestion and beauty.

Acknowledgments
This book was born from an exchange between two camps, science and history. At first, it was little more than a game between Antonio Navarra, Enzo Boschi and me: we idly swapped observations and ideas on the climate, thinking nothing of it. In time, though, this exchange turned into a loose outline for something more substantial, fleshed out by increasing amounts of notes and data. I gathered historical sources first, with the help of Cecilia Ciuccarelli. Next came the artwork, the esthetic component of this book, which Antonio insisted on because of his artistic leanings. In the early stages of the project, images for inclusion in the publication were searched with specific competence by Valentina Branchini (now a fellow at the Art Institute of Chicago). Later, it was Maria Giovanna Bianchi who
conducted this work with great passion, and also elaborated graphs and maps. Meanwhile, work began to be carried out to assess the state of knowledge in the field of historical climatology on the Mediterranean: Daniele Lorusso, Marco Pistoresi, Dante Mariotti, and Alberto Comastri took part in this investigation at different times over the course of a few years. I am especially indebted to Alberto for his help on the issues pertaining to the *Medieval Warm Period* in relation to the current climatological debate, of which he is a very attentive, critical and curious observer. In conclusion, I would like to offer my thanks, as well as those of my co-authors and collaborators, to Professor Fabio Roversi Monaco, president of the “Fondazione Carisbo” and formerly rector of the University of Bologna, who made this unusual and experimental book possible with a generous contribution to the *International Program for Environmental and Climate Studies*. 