

Preface

The Resilient Earth had its genesis in a number of events spanning several years. The authors have been friends and colleagues for more than three decades and, while they have often discussed writing a book together, the timing never seemed quite right. Then, at the start of 2007, the debate surrounding human-caused global warming reached a crescendo. Those who questioned the extent and causes of global warming, other than human CO₂ emissions, were labeled “climate criminals,” “industry stooges,” and “traitors” by ecological activists. Those on the other side of the issue used terms like “hoax” and “scam.”

The shrill level of the “debate” was driven home when Hoffman attended a business meeting. A co-worker asked a seemingly innocent question: “Doug, you're a scientist, what do you think about this global warming thing?” Hoffman framed a fairly neutral reply—“I don't think it's as bad as portrayed in the media, certainly we shouldn't ruin our economy in a panic.” Hearing this, the senior executive present made a sarcastic, scatological remark regarding the offered opinion and stormed out of the room. Taken aback by this emotional reaction, Hoffman resolved to look more deeply into the subject of global warming.

In a matter of days, Hoffman was on the phone to Simmons suggesting that the time to write that often talked about book had arrived, and the topic should be the science of global warming—the real science, not the pseudo-science being reported in the popular media. Simmons immediately agreed and a long distance collaboration, linking coastal Texas and a log cabin in Arkansas, began. The more deeply we delved into the “facts” portrayed in the media the more concerned we became—not from fear of impending ecological disaster, but from the total lack of scientific objectivity, rationality and detachment exhibited by those on both sides of the global warming issue.

As the months past, the viciousness of the rhetoric used by activists and deniers continued unabated, reaching almost religious proportions. News anchors, never noted for their deep scientific

insights, deliriously reported wild speculation about global ecological catastrophes as though they were established scientific fact. Also troublesome was the use of the term “scientific consensus” as a debate stopping argument by both overzealous fanatics and people who should know better.

Having both worked for years on numerous engineering and scientific projects, we resolved to uncover the actual scientific underpinnings of climate science and communicate our findings to a non-scientific audience. During the process of researching and writing *The Resilient Earth*, we were continually amazed with how little of the real science made it into the public debate. Further surprise came from the lack of knowledge among the general public and scientists, some of whom were involved in climatology. We discovered that global warming is a topic much discussed but little understood.

In conversations with colleagues about our progress writing *The Resilient Earth*, we found them astounded when told certain facts—facts such as the Earth had no ice caps for much of its history—or, who was the first person to comment on global warming due to greenhouse gases. At a dinner with colleagues, several participants expressed astonishment when the actual facts and figures regarding CO₂ and greenhouse warming were revealed. “I didn't know any of this!” exclaimed one senior and very respected scientist. How can the public clamor about global warming be so omnipresent while not only laymen, but even scientists seem to be unaware of the facts?

As the facts unfolded, the form and tone of *The Resilient Earth* changed many times. We were constantly amazed by the complex and interrelated nature of Earth's environment. We learned how fundamentally incomplete humanity's actual level of scientific understanding is regarding how our planet's climate system works. We have tried to maintain an even-handed approach while presenting the information contained in this book—to present an undistorted view of the science behind Earth's changing climate. We hope that our passion for both science and protecting the natural world are evident in our words.

Units and Measurements

This is a book about science, and that makes the presentation of facts and figures a necessity. Most of the measurements in this book are given in metric units, since all measurements and quantities found in the scientific literature are expressed using metric units. Since a sizable portion of our target audience resides in the United States we have also frequently stated measurements in the more familiar American units; pounds, feet, miles and temperatures in degrees Fahrenheit (°F). In most cases we give metric translations in parentheses, except when the number of alternate measurements would detract from the readability of the text.

Dealing with scientific subjects ranging from the life-cycle of stars to the chemistry of carbon on an atomic scale, very large and very small numbers must frequently be dealt with. In most situations we have managed to avoid scientific or engineering notation by using common prefixes. These prefixes are used to indicate powers of ten:

peta	1 000 000 000 000 000	P
tera	1 000 000 000 000	T
giga	1 000 000 000	G
mega	1 000 000	M
kilo	1 000	k
milli	0.001	m
micro	0.000 001	μ
nano	0.000 000 001	n

On occasion we have had to fall back on scientific notation, but only rarely.

About The References

Throughout this book you will find numbered references. Many of these references are to scientific articles from refereed journals that are the source for statements and assertions made in the text. Were this book a scientific treatise all the references would come from such sources.

However, *The Resilient Earth* is intended for a wider, general readership audience so we have also included references to sources that non-scientists may find more accessible—magazine and newspaper articles and URLs for online web sites.

Acknowledgments

The authors would like to thank Dr. Terry Talley, Professor Amy Apon, Dr. Rik Faith, Brandon Willis and Alan Rainey for reading over the many early versions of this book and for their helpful comments and criticisms. Thanks to Bob Arrington for his many emails and data sources. We would also like to thank NASA legend, Dr. Rudolf Hanel, for his comments and advice on Chapter 7, Changing Atmosphere Gases, regarding the absorption spectra of CO₂. Thanks also to Dr. Nir Shaviv for kindly answering our inquiries regarding cosmo-climatology. Though we have sought the advice of many, we are solely responsible for any errors or inaccuracies in the text.

Special thanks to Eleanor Simmons for her diligence in editing and reediting the raw text. It took endurance handling two authors 650 miles apart. The cover art is a composite of two photo images; a NASA Hubble Space Telescope image of the giant nebula NGC3603, one of the most massive young star clusters in the Milky Way Galaxy, and an image of Earth and the moon, taken by the Galileo spacecraft while on its way to Jupiter. The composite was made by Hoffman using the GIMP.

Allen Simmons, Rockport, Texas

Doug L. Hoffman, Conway, Arkansas

December 5, 2007