



THE PROMETHEAN ILLUSION

**The Western Belief in
Human Mastery of Nature**

Bob Tostevin



THE
PROMETHEAN
ILLUSION

**The Western Belief in
Human Mastery of Nature**

Bob Tostevin

The Promethean Illusion

*The Western Belief
in Human Mastery of Nature*

BOB TOSTEVIN



McFarland & Company, Inc., Publishers
Jefferson, North Carolina, and London

LIBRARY OF CONGRESS CATALOGUING-IN-PUBLICATION DATA

Tostevin, Bob, 1944–
The Promethean illusion : the Western belief in human
mastery of nature / Bob Tostevin.
p. cm.
Includes bibliographical references and index.

ISBN 978-0-7864-6063-2

softcover : 50# alkaline paper (∞)

1. Science — Miscellanea. I. Title.
Q173.T67 2010
500 — dc22

2010034845

British Library cataloguing data are available

© 2010 Bob Tostevin. All rights reserved

*No part of this book may be reproduced or transmitted in any form
or by any means, electronic or mechanical, including photocopying
or recording, or by any information storage and retrieval system,
without permission in writing from the publisher.*

Cover image © 2010 Shutterstock

Manufactured in the United States of America

McFarland & Company, Inc., Publishers
Box 611, Jefferson, North Carolina 28640
www.mcfarlandpub.com

For my son Erik, who told me I should write this book

Acknowledgments

Since this book springs from the doctoral dissertation I wrote at York University in Toronto many years ago, my thanks come in two bundles- one for those who oversaw the original study and another for those who recently have helped in various capacities to bring this work to press.

The first bundle: Thanks go especially to Christian Lenhardt, my dissertation supervisor and friend, whose trust allowed my thinking complete freedom to cut its own paths in directions of its own choosing. Thanks go also to Grey Hodnett, Ed Weissman, David Shugarman, and Brent Rutherford, all of York University, and to Alkis Kontos of the University of Toronto.

The second bundle: I am grateful to a number of my colleagues at the Pembroke Hill School in Kansas City, Missouri. Thanks go to Barbara Judd and Steve Salinger, who some time back read an intermediate draft of two chapters; to Lorraine Gordon, Kathy Ketchum, Elizabeth McIntyre, and Tom Medlock, who each read one or another portion of the manuscript and made helpful suggestions; and to Lauren Rosenfield, who provided some practical help, and especially Jeanette Jones, who has given general advice and technical assistance on a number of occasions. I also am grateful to the Pembroke Hill Alumni Association for the summer grant that some years ago provided me an entire summer to accomplish work bridging the dissertation and the present book.

Outside the Pembroke Hill community I owe thanks to Oliver Lenhardt in Toronto and Dre Bergerson of the University of Missouri at Kansas City, who each provided good advice relating to publication. But among the many who helped then or now, two stand alone: Stan Draenos, my lifelong comrade-in-thought, and Lisa, my dear wife and lifelong partner. Thanks go to Stan for always being there with probing insight and wise counsel. And thanks go to Lisa for her many loving gifts, not least of which is the room she has always made in our home for me and my thoughts to find solitude together.

Table of Contents

Acknowledgments	vii
Preface	1
Introduction	5
1. Mastery in the Making	13
2. Authorizing Human Dominion	33
3. Ironies of Scientific Progress	58
4. Science in the Land of Sometimes and Perhaps	89
5. Elusive Elements of Organic Change	116
6. Ecological Detective Stories	149
7. Planetary Thinking	174
Conclusion: Rethinking Our Being with Nature	207
Notes	227
Bibliography	247
Index	257

Preface

This book is the evolution of a doctoral dissertation I wrote in the mid-1970s when ecological consciousness was first crystallizing around newly revealed facts of our wreaking environment, havoc and placing ourselves in danger. That work drew material from the ecological crisis, but its focus was on our culture's belief in humankind's possible mastery of nature. What struck me at the time and has remained so clear to me ever since is the persistence of this belief in the face of a continuing- and worsening -crisis. Indeed, programmatic proposals to master nature both then and now are entertained as solutions to ecological crisis. And then there is the more prosaic but no less telling idea that, given the right kind of institutional support, science and technology can handle nature in virtually any circumstances. My own thinking at the time stood completely at odds with such understanding. It still does.

The emergent ecological crisis opened my eyes to the essentially elusive character of nature's causalities in the life-world. So many of those causalities slip through our manipulative hands and operate unseen right before our watchful eyes. Common sense accompanied this awareness and immediately told me that nature itself ultimately eludes our grasp. Common sense told me so, with the major assist from the political thinker Hannah Arendt and the environmentalist Rachel Carson. Arendt and Carson certainly make strange intellectual companions: the one, a German political theorist whose philosophical tutelage came under Martin Heidegger and Karl Jaspers; the other, a New England naturalist given to the smells, sounds, and feel of the wilderness. Yet each from her own perspective threw light upon what has remained for me the plain and simple truth of the crisis of the natural life-world. Arendt observed from her theoretical standpoint that we are acting into nature in unprecedented ways and setting in motion natural processes whose outcomes we can neither foresee nor control. Carson revealed in her empirical studies how our multifarious intrusions into nature are corrupting the life-world and creating a massive global experiment over which we have no control. And so, via a dissertation far narrower in scope and much less historical, we come to the present book.

This work is not an investigation of the crisis of the natural life-world. Over and against the modern West's belief in humankind's domination of nature, it is the reality of nature's ultimate independence from human will that interests us in these pages. More precisely, we are concerned with the jarring collision of two realities, those being our continuing belief that nature is subject to our willful control and nature's manifest refusal to abide by this belief. Three matters needing investigation arise here. First, how is it that we in the modern West have assumed the posture of the master towards the slave in our relationship to nature? What gave rise to the belief that we can establish our dominion over this planet Earth? Second, of what does the illusion of mastery consist? What does conquest of nature mean in our most fundamental, instrumental encounter with nature, and how do we come up short? And third, why does any of this matter? How does the illusion of human dominion over this Earth blind us to what we need to see if we are to act sensibly? These are the essential questions driving this study and organizing its material.

To my knowledge there has been no systematic study attacking belief in mastery. Those who have been critical of humankind's domination of nature from the standpoint of social theory or philosophical critique generally have left the possibility of instrumental control intact. Ecologists, on the other hand, often will advance arguments about the impossibility of environmental control, but

nothing in the critical ecological literature has systematically undertaken to either subvert belief in mastery or pursue the dangers the master's attitude poses for our continuing interactions within the natural lifeworld. This book proposes to do both. That is the argumentative cast of what follows. Beyond this study also is an interpretation of our modern instrumental relationship to nature, analyzed through the lens of science and told as a story connecting the nature and development of modern science with Western culture. While this study is no history of modern science, it does place the instrumental character and meaning of science within a historical-cultural perspective that focuses its material on the theme of mastery. We want to understand how it is that the modern West can be so hugely successful and yet so limited, so knowing and yet so blind, in its instrumental relationship to nature.

Environmentalists and ecologists critical of the modern world's instrumental relationship to nature often fault the machine metaphor, or, more broadly, the mechanistic thinking arising with modern science. Mechanistic thinking offends nature in thought by denying it the reality of its lifeworld, while it abuses that life-world in practice by disregarding its intricate balance and manhandling its phenomena. The argument in these pages sympathizes with this critical concern but stays distant from it. This book is not interested in nature's well-being simply because nature transcends all such human concerns in the same way it ultimately transcends the reach of our instrumental power and command. Nature is entirely indifferent to our offensive treatment: given its scale, it is above all that, given its duration, this too will pass. Far from being any slave, nature receives our instrumental intrusions in its own time by its own measure and reacts on its own terms. The egregious mistake in our understanding and attitude towards nature is the belief that we can, in fact, command nature; that we either are or can become masters of this planet Earth. Truth be known, far from being obedient to our will, nature in many ways will have its own way with us. This book is also about this truth.

Nature's having its own way with us, at least in some ways and to some extent, is exactly what needs to be understood if we are to become truly sensible in our instrumental relationship to nature. Our illusion of mastery is dangerous because it blinds us to the nature of our real ignorance in so many cases where we act without any possible knowledge of the consequences of what we are doing, either to ourselves or to the life-world upon which we are dependent for our own well-being. In these cases nature itself will tell us what we need to know, and it will do so according to its own elusive causalities and in its own time. Arendt and Carson articulated this point so many years ago, and yet by and large, we ultimately remain immune to its sensibility. Following their lead, this book will spotlight nature's independence from scientific command, but only after investigating how it is that the idea of mastering nature took hold of Western culture, first as legitimate belief and later as an illusion.

Introduction

Western culture has never evidenced much comfort in its thinking about nature or our relationship to it. Indeed, the West's understanding of civilization betrays a decided discomfort with our relationship to nature, to say the least. The word civilization does not find its meaning on natural soil, but on artificial ground belonging to the city, to *civitas*, the creation of human artifice. Civil life stands beyond what is natural just as the walls surrounding cities before modern time maintained a protective distance from nature and its threats. Of course, there have been significant naysayers of such a cultural posture. One might think of Rousseau and his call for us to return to the nature within us, or, more recently, of Freud and his concern for the price the nature within us exacts for our repression of its insistent presence. Western culture itself avowedly embraced nature in the art and literature of the first half of the nineteenth century when Romanticism shaped sensibility through the umbilical cord connecting life and death in human experience to the beautiful and sublime in nature. Yet however significant such thinkers and cultural movements may have been, Western culture by and large has never been particularly hospitable to the things of nature. This discomfort with nature, in fact, has become downright adversarial in modern time, as we have taken it upon ourselves to subdue and forcefully dominate all that is natural beyond ourselves. As modern cities have expanded beyond those old walls, rendering them demarcations of *Die Altstadt* for tourists and visitors, so in modern time our emboldened stance towards the natural world "out there" has arrogantly taken upon itself the claim of conqueror. We moderns in the West generally believe that we can command nature, that we are masters of this planet Earth.

Mastery of nature is a modern, Western belief. There is little question regarding its Western character. Siddhartha Gautama surely subscribed to no such belief as he received enlightenment beneath a bodhi tree. The Buddha's path to nirvana was mastery over the self, not nature. Nor did Lao Tse have any such presumption as he prescribed for each of us the wisdom of "going with the flow," so to speak. For him, as for his societally oriented counterpart Confucius, harmony was the call of life and meaning. More broadly, neither African cultures nor Mesoamerican civilizations could possibly have even come close to imagining domination of nature in their totemic, propitiatory religions. Humankind's dominion over nature in its origin and character is a distinctively Western belief, pure and simple. Granted that, there remains, however, the matter of its modernity. And this matter is by no means so plain and clear on the face of it.

Contrary to the position taken here, there are generally two lines of argument against the modernity of the belief in our domination of nature. Not surprisingly, given that we are dealing with Western culture, one argument looks back to Athens while the other looks to Jerusalem. The first perspective sees the idea of conquest originating in Greek philosophy and myth. Belief in human domination of nature is discernible in the Greek presumption that thinking can philosophically capture the nature of reality within a conceptual net. Entirely disparate though they are, both Heidegger's thinking and the critical theory of the founding generation of the Frankfurt School shared this insight into Greek philosophy.' As to mythology, Prometheus and Daedalus both point towards the idea of conquering nature in their claiming for man matters or powers belonging to the gods, and in each case an immense price is paid for such hubris. Hubris generally calls forth nemesis in Greek understanding and nemesis suggests the very limit of Greek presumption. Puny man must not overstep the bounds established by the gods. The very idea that men might presume the powers of the gods is punishable.

and pride is the very source of Greek tragedy.

Pride also goeth before the fall as we turn from Athens to Jerusalem, though here the Fall was capitalization. Jerusalem gives us Genesis, wherein God grants to his greatest creation dominion over the fish and fowl of the Earth. The ancient Hebraic rendering of "dominion" appears open to question, however, as some suggest that the word originally had nothing to do with domination, but meant 'stewardship.' In other words, Genesis textually recalls God's charging humankind with caring for the land and animals He was placing in their hands. In any case, it is Christianity, not Judaism, that makes the telling point for those who argue from religious tradition against the notion that mastery of nature is a modern belief. Here too scriptural text is important because God creates Man in His image, which lifts humankind above everything else in Creation. Humankind thereby gains power over the less material of this Earth, and even allowing for stewardship etymologically, this argument can cite the Christian humanism of Ficino and Pico, early Renaissance neoPlatonists for whom the idea of dominion clearly contained the god-like presumption of the master.' Then there is an altogether different argument coming out of Jerusalem, one that primarily concerns history rather than the inverse anthropomorphism of God's creating Man in His image. In this view, the moderns' sense of history as a process of continuing material betterment recapitulates early (Judeo-)Christian eschatology. This argument sees a cultural linkage between Christianity's supposed "linear" view of time and the moderns' belief in progress. Standing outside of the cyclical view of time characteristic of Greek thought, early Christianity introduced history as a process in time. The problem here, however, is that the early Christians had no narrative temporally connecting past, present, and future as an ongoing process of related events.⁴ Events, not process, counted; not history as such, but specific events like the Fall, Resurrection, and the Day of judgment mattered, nothing else. By whichever argumentative path one chooses to follow out of Jerusalem, one ultimately arrives at the birth of modern science and the modern Prometheus—who is Christian, of course.

These perspectives looking towards Athens and Jerusalem do have value in the history of ideas which is essentially a genealogical enquiry. Yet while the history of ideas may invite interest, from our perspective in this study such interest is introductory and nothing more. Mastery becomes important outside of genealogy when it takes hold culturally and roots itself among the people, or at least among large portions of those who are culturally literate. As distinct from the idea of domination, belief in domination became part of Western culture at roughly the time when the modern expansion of cities left the cities' walls behind. In point of fact, cultural belief that human beings might subject this Earth to human control for human benefit—what we call the project of mastery—arrives only with the rise of modernity. Nor should this fact really surprise anyone since, when all is said and done, it is actually quite difficult to imagine any premodern people anywhere assuming the posture and prerogatives of a master towards a slave while looking at nature. Such an attitude crystallized out of the scientific revolution of the sixteenth and seventeenth centuries and assumed wide cultural publicity first in the eighteenth-century Enlightenment and then in the industrial revolution that followed. In short, distinct from the idea of mastery, belief in mastery was born with modern science. It is this belief in the conquest of nature and the attitude towards nature accompanying it that, along with modern science, largely define the focus of the present work.

Stating that belief in mastery crystallized out of the scientific revolution of early modern times means more particularly that it arose upon the experimental foundation of modern science. As Francis

Bacon declared at the turn of the seventeenth century in one of the world's most quotable proclamations, "Human knowledge and human power meet in one; for where the cause is not known, the effect cannot be." 5 Resting upon experimental science, control over nature's causality is the key to modern humanity's domination of nature. Science teachers all over the world knowingly and unknowingly demonstrate such mastery in the laboratory every time they successfully command the effect of an experiment by knowing and manipulating the causality required. It was Bacon's profound insight to realize this crucial point, which makes mastery in some sense "Baconian." It fell nevertheless, to Isaac Newton - or, better, to Newtonian science - to turn Baconian insight into instrumental fact and cultural belief. Newton's work culminated the scientific revolution of the sixteenth and seventeenth centuries, and the science arising in his name governed understanding for the following two centuries. His work delivered to the world on purely secular terms what appeared to be certain truth, and along with this truth came a practical foundation of scientific laws realizing the domination of nature upon specific mathematical-experimental conditions. This dual delivery of secular revelation and mastery of nature underlay the eighteenth-century Enlightenment, and the ongoing belief that modern science authorizes human dominion over this Earth is the legacy of Newtonian science.

Newtonian science authorized modern understanding of nature outside religious traditions and sacred texts and, at the same time, transformed mastery of nature from an idea detectable in the Western intellectual heritage into a cardinal tenet of modern belief. The doctrine of progress so telling of modern belief in general entails the project of mastery; it expresses the notion that the continuing development of modern society progressively subjugates nature in expanding service to human need and public benefit. Well before the completion of the scientific revolution Bacon himself glimpsed this project and gave it fictional form in his *New Atlantis*, the first decidedly modern utopia. In this utopian fragment experimental science harnesses nature by means of "the knowledge of causes" and employs nature's own causal laws in "the enlarging of the bounds of human empire, to the effecting of all things possible."6 Once Newton brought the scientific revolution to full fruition, Bacon's early vision seemed more prophetic than utopian as moderns began looking at nature through the Newtonian laws. The causality of all nature in principle lay vulnerable to experimental grasp as things appeared in the light of Newtonian authority. And beyond the testimony of science itself, as if scientific principle called upon everyday fact for confirmation, late in the eighteenth century the industrial revolution began actualizing the project of mastery in tangible ways that everyone could see and increasing numbers came to enjoy. The industrial revolution picked up steam in the late eighteenth century and advanced pell mell down Tennyson's rails of change throughout the nineteenth century, materializing the project of mastery in the technological dynamism and urbanization of industrial society. With this urbanization, in turn and hardly surprisingly, neither the builders nor the inhabitants of the new cities and emerging conurbations evidenced any interest whatsoever in building new surrounding walls. They simply bulldozed nature and pushed it out of sight beneath the pavement of progress. Indeed, it did not take long for nature to become for many little more than a piece of landscape preserved within city parks; or, perhaps more tellingly, a place needing protection from the forces of progress so that city-dwellers might vacation there.

It is against this large backdrop that we must understand the sustainability of belief in mastery. Modern science has shaped the material structure and spirit of the entire modern age, and today the spirit finds sustenance wherever there are new frontiers to conquer: in genetic research

nanotechnology, space exploration, artificial intelligence, biomedicine, and the like. So, too, just as science has done so much to shape our material civilization, the very world we have built stands before our commanding presence on this Earth. Be it in research laboratories, in technologies of production and information processing, or in the steel and glass of our urban environs, human artifice seems everywhere triumphant. Triumphant indeed, and standing there behind this construction, like a master architect, is the mathematical-experimental science that combined knowledge and power in good Baconian fashion to materialize our modern world. Amidst the very astonishing success of such construction, there seems little room to doubt human dominion over the Earth. And for all too many people today, there is comfort in there being little room.

Sometimes contemporary belief in mastery boldly proclaims itself, as we hear in reports of our verging on possession of all kinds of genetic capabilities regarding the elimination of disease, the enhancement of the human being, the indefinite postponement of aging and death, and with all of this the design and control of our species' evolution. Sometimes belief in mastery insinuates itself more subtly, as in the not narrowly held assumption that, given whatever is needed in the way of political and economic support and sufficient time, science "can find the answer" to virtually any problem of nature might pose. Nor is such confidence without the professional support of many experts themselves. If we are to believe Richard Lewontin, a population geneticist who is never anything but forthright, "Natural scientists, in their overweening pride, have come to believe that everything about the material world is knowable and that eventually everything we want to know will be known."⁷ Of course feeding such belief, be it held by scientific experts or by ordinary citizens, are many of the futurists and science writers who are on the reporting beat for this, that, or the other journal, magazine, or video outlet, just looking to publicize the latest and greatest, or most promising "advance" to dazzle us. Constantly we learn of new wizardries on virtually all research fronts. And what effect are such wizardries reported, if not to reinforce belief in mastery via continuing evidence of an amazing progress having no limits?

Beneath the triumph of modern artifice and the continuing wizardries of instrumental knowledge lies another factor sustaining belief in our domination of nature, a grassroots element of belief, as it were. At this grassroots level knowledge and power meet most fundamentally in the manipulative conditions of scientific practice where belief in mastery unites with the scientific attitude experimentally taken towards the things of nature. It is a commanding attitude born of the very success of modern science. Once experimentation evidenced nature's submission to the rule of the master, it then became quite easy to suppress and forget nature's essential independence from human will by simply taking its submission for granted. In other words, it became easy to presume that nature has nothing to say about whether or not its causal secrets are experimentally discoverable and instrumentally manipulable. This presumption takes as its model the relationship between master and slave belonging to the modern institution of human slavery. Within that modern relationship the master himself set the rules to which the slave obediently had to submit. The slave had no voice in any law-making apart from the benevolent consideration a particular master might show his slave. In any case, the master determined what was allowed; he brooked no contradiction of his will. Modeling our scientific relationship to nature on this basis- assuming the attitude of such mastery in the case of nature's causality- however, commits understanding of our relationship to nature to an egregious fallacy. For in this relationship it is not we who write the laws, but nature itself. As Bacon himself wrote, in the same short aphorism where he announced the meeting of knowledge and power, "Natu

Obedience to nature in principle would pose no problem for human dominion if nature's causalities were uniformly exercised according to Newtonian understanding. As long as that understanding might prevail, there was no reason to assume anything but unobstructed progress in our continuing exercise of experimental command over the natural world; and since scientific understanding meant truth as well as mastery, consigning to oblivion Bacon's point of our having to obey nature seemed not problematic. But scientific progress would prove thoroughly ironic as the development of Newtonian physics in the course of over two centuries undermined the claims to both truth and mastery. Those claims dissolved in the early decades of the twentieth century when physical science advanced beyond Newtonian understanding, only to find nature unwilling to yield all of its secrets or be experimentally commanded as if it were a human slave. Later in that century nature voiced even larger objections to the presumption of mastery outside of physics, where biological and ecological phenomena possessed causalities not always reducible to neat, manipulable variables. The thrust of those developments, first within physical science and then in biology and ecology, evidences an inverse corollary to Bacon's point of obedience: to wit, and where nature will not allow its causality to be controlled, we must concede nature's independence from experimental command. We phrase this inverse corollary to Bacon's dictum so as to capture what nature has been telling science for some time now, namely that its causality is not uniform and that it will not necessarily yield its operations to experimental control. Yet we in the West, or at least all too many of us, have not paid much attention: the master's ears have been deaf to nature's voice.

What follows in the early chapters of this study is the story of how Western culture came to believe that science authorizes human dominion over this Earth. Part cultural interpretation of modern science, part theoretical analysis of the nature of mastery, our narrative itself in no way approaches the history of physical science, not that there is any qualification here to presume the writing of such a history in any case. Having completed that story, this study in its later chapters then turns to specific biological and ecological case studies that strikingly serve to illuminate the illusory nature of the continuing belief in mastery. No more than our narrative presumes to be a history of science does our treatment of these case studies pretend to be anything nearing an analysis of what lies behind the current crisis of the natural life-world. Our interest in those empirical studies is simply to demonstrate the inverse corollary to Bacon's dictum and, in so doing, to tackle head-on the two major projects of mastery programmatically being proposed today, they being genetic engineering and planetary management. In the end this study's treatment of science and technology will be completely one-sided, its focus being restricted entirely to the limitations of instrumental knowledge. Nothing in this work, however, abuses science or calls for Luddism in any way, shape, or form. Let there be no misunderstanding: the aim here is only to undermine the belief that science authorizes our domination of nature and to expose that belief as illusion.

Anticipating the substance of this study as best we can at this point, one fundamental matter may be elliptically suggestive. We begin our story of modern science with the "quest for certainty" that the philosophy historian Richard Popkin deems the central and defining preoccupation of early modern European thought.' As religion lost authority to govern understanding in early modern time, men sought new ground on which to certify the truth of their knowledge claims. Our study roots its cultural interpretation of science as well as its analysis of mastery in that quest for certainty and sees the

quest's intellectual and cultural fulfillment in the secular revelation and experimental control of nature arriving with Newtonian science. Fast-forwarding now through the development and dissolution of Newtonian science to the midtwentieth century, our culture once more returns to uncertainty. But this return is by no means circular. Whereas modern science at its birth dismissed uncertainty in its claim to truth and mastery, our contemporary uncertainty already has science in it; and, moreover, this very uncertainty manifests our inability to command nature. Our study will closely examine the connections between certain knowledge and mastery on the one hand, and between uncertain knowledge and the absence of command on the other. In the end, short of whatever particular insights this study may offer into our current interactions with the life-world, the present work claims to be a brief but coherent cultural-historical account and analysis of the modern West's instrumental relationship to nature.

Mastery in the Making

The life and thought of sixteenth- and seventeenth-century Europeans lay on the hinge of time for theirs was an experience lived in twilight, in a time between ages. For the late medieval world passing into darkness, it was dusk; for the modern age just coming to light, it was dawn. In such half-light there was little that people could see clearly in common. Anarchy threatened in the realm of belief precisely because no common authority obtained any longer. No longer did the Church of Rome govern the province of European understanding; traditional authority had been eclipsed. The Protestant Reformation had indeed fragmented the very meaning of Christian belief, rendering questions of truth and claims to knowledge sectarian. And if the Reformation needed allies to complete the disintegration of Western understanding, help certainly was forthcoming in the work of Copernicans, whose speculations and discoveries increasingly threw the long-standing Christian-Aristotelian cosmology into doubt; and in the work of global explorers, whose continuing reports of theretofore unknown life forms and newly found cultures overturned many old assumptions about the world and fostered a form of cultural relativism among the more sensitive souls. Amidst such earthshaking speculations and unsettling novelties, there arose deep and widespread uncertainty about what we actually do know about what is real and what is not. Such uncertainty, at once psychological and cultural, was itself that twilight world in which men's understanding lacked common bearings.

Working in that cultural milieu and witnessing the disintegration of old beliefs and traditional modes of comprehension were legions of thinkers who found in such disarray the very reason to think. Numerous thinkers saw in the disagreements dividing people the impossibility of ever establishing any truth, and skepticism enjoyed a new heyday. Many others, thinking differently and wanting to see their way clear of such cultural confusion, sought in various ways and in numerous intellectual disciplines to establish new foundations for human understanding. The key issue in such pioneering efforts was the question of agreement, or common assent: how could people come to some binding agreement on knowledge claims about what is real or what is true? Without any religious accord, on what ground might early moderns commonly stand in their need to speak knowingly of the world around them? Pursuing answers to these questions constitutes the "quest for certainty" that historian and philosophy Richard Popkin deems the chief animating force behind early modern European thought in general! That quest for certainty provides us the compass to be followed in this first chapter, as it will lead directly to the mathematical objectification of reality and to the programmatic manipulation of nature's things. The wonderfully fruitful marriage of these two achievements brought modern science into the world, and with it came authorization of the belief that humankind might exercise dominion over this Earth.

Many mathematical minds and manipulative hands went into this wedding during the time between the middle of the sixteenth century, when Copernicus proffered his heliostatic picture of the universe, and the end of the seventeenth century, when Isaac Newton delivered modern science to the Western world. Most historians of science refer to that gestation period of science as the "scientific revolution" of early modern time, and we will give some brief attention to the scientific revolution

the following chapter.' Our interest in this first chapter, however, lies not with the actual emergence of modern science. Our present focus, rather, will be on the two parties wed in that science: the mathematical objectification of reality, which is most clearly understandable in the work of René Descartes, who lived through the first half of the seventeenth century, and the experimental manipulation of nature's things, which is best grasped in the program for learning that Francis Bacon articulated in his *New Organon* early in that same century. We want to see how Descartes and Bacon each bound the search for truth to the interest in mastering nature.' Whether or not this common enterprise predisposed the objectification of reality and the manipulation of nature's things to marriage does not concern us as much as realizing that when modern science came into the world in Newton's work, it was no accident at all that its birth certificate combined a mathematical claim to certain knowledge with an experimental claim to controlling nature.

Doubt and Uncertainty in Early Modern Time

Investigating Descartes' reflections and Bacon's program for learning first requires our locating their enterprises within the larger context of early modern experience. We need to root their quests for new understanding in the uncertainty surrounding those quests and giving rise to them. And at the beginning of the seventeenth century John Donne versified that uncertainty in oft-quoted lines that spoke directly of the impact Copernicus' ideas had been having on more than just a few:

And new philosophy calls all in doubt,
The element of fire is quite put out;
The sun is lost, and the earth, and no man's wit
Can well direct him where to look for it.
And freely men confess that this world's spent,
When in the planets, and in the firmament
They see so many new; then see that this
Is crumbled out again to his atomies.
'Tis all in pieces, all coherence gone....⁵

Donne's lamentation contextualizes the loss of coherence historically, within the experience of early modern time, but for others like Blaise Pascal, writing a few years later at mid-century, uncertainty revealed the tragic nature of the human condition irrespective of time or place. Whereas Donne's lament was that of an Anglican clergyman, Pascal's reading of uncertainty sprang from his Jansenist and expressed more than a little Augustinian anguish: "Such is our true state.... We are floating in a medium of vast extent, always drifting uncertainly...."⁶ Doubt, uncertainty, and incoherence followed from the Fall, and, for Pascal, the experience he shared with his contemporaries simply made starkly manifest the inescapable state in which human beings- sinners all - are caught and must suffer.

We desire truth and find in ourselves nothing but uncertainty.
We seek happiness and find only wretchedness and death.
We are incapable of not desiring truth and happiness and incapable
of either certainty or happiness.
We have been left with this desire as much as a punishment as
to make us feel how far we have fallen.⁷

Donne's disorientation and Pascal's anguish by no means exhaust the early moderns' interpretation of the meaning or nature of uncertainty. Looking further, we find another Catholic thinker, Michel de

- [read *The Cambridge Introduction to Virginia Woolf* \(Cambridge Introductions to Literature\)](#)
- [*Jennie: The Life of Lady Randolph Churchill* for free](#)
- [click Geo \[FR\], Issue 434 \(April 2015\) pdf, azw \(kindle\)](#)
- [click *20,000 Leagues Under the Sea*](#)

- <http://hasanetmekci.com/ebooks/Toy-Story-Screenplay.pdf>
- <http://kamallubana.com/?library/The-Information-Diet--A-Case-for-Conscious-Consumption.pdf>
- <http://www.khoi.dk/?books/The-Rival-Queens--Catherine-de--Medici--Her-Daughter-Marguerite-de-Valois--and-the-Betrayal-that-Ignited-a-Kingd>
- <http://www.khoi.dk/?books/20-000-Leagues-Under-the-Sea.pdf>