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978-0-521-55427-5 - The Measure of Reality: Quantification and Western Society, 1250-1600

Alfred W. Crosby

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Western Europeans were among the first, if not the first, to invent mechanical clocks, geometrically precise maps, double-entry bookkeeping, exact algebraic and musical notations, and perspective painting. By the sixteenth century more people were thinking quantitatively in Western Europe than in any other part of the world. They thus became world leaders in science, technology, armaments, navigation, business practice, and bureaucracy, and created many of the greatest masterpieces of Western music and painting.

The Measure of Reality discusses the epochal shift from qualitative to quantitative perception in Western Europe during the late Middle Ages and Renaissance. This shift made modern science, technology, business practice, and bureaucracy possible. It affected not only the obvious – such as measurements of time and space and mathematical technique – but, equally and simultaneously, music and painting, thus proving that the shift was even more profound than once thought.

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Take away number in all things and all things perish. Take calculation from the world and all is enveloped in dark ignorance, nor can he who does not know the way to reckon be distinguished from the rest of the animals.

St. Isidore of Seville (c. 600)

And still they come, new from those nations to which the study of that which can be weighed and measured is a consuming love.

W. H. Auden (1935)

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Preface

This is the third book I have written in my lifelong search for explanations for the amazing success of European imperialism. Europeans were not the cruelest and not the kindest imperialists, not the earliest and not the latest. They were unique in the degree of their success. They may retain that distinction forever, because it is unlikely that one division of the world's inhabitants will ever again enjoy such extreme advantages over all the rest.

Cyrus the Great, Alexander the Great, Genghis Khan, and Huayna Capac were great conquerors, but they were all confined to no more than one continent and at best a wedge of a second. They were homebodies compared with Queen Victoria, on whose empire (to resuscitate a very old cliché) the sun literally never set. The sun also never set on the empires of France, Spain, Portugal, the Netherlands, and Germany in their heyday. The explanations for this triumph, popular in Europe circa 1900, were fueled by ethnocentrism and justified by Social Darwinism. They were, simply, that those members of the human species most subject to painful sunburns were the most recent, highest, and, in all likelihood, final twigs on the exfoliating tree of evolution. Pale people were the brightest, most energetic, most sensible, most aestheti-

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cally advanced, and most ethical humans. They conquered all because they deserved to.

That seems hilariously unlikely today, but what other explanations are there? I have written books about the biological advantages that the white imperialists enjoyed. Their diseases mowed down American Indians, Polynesians, and Australian Aborigines. Their animals and plants, cultivated and wild, helped them to “Europeanize” wide expanses of the world and make them comfortable homelands for Europeans.¹ But as I played out my role as a biological determinist, I was nagged by the impression that Europeans were incomparably successful at sending ships across oceans to predetermined destinations and at arriving at those destinations with superior weaponry – with, for instance, cannons superior to those of the Ottomans and the Chinese; that they were more efficient at operating joint-stock companies and empires of unprecedented extension and degree of activity than anyone else – that they were in general far more effective than they should have been, at least as judged by their own and others’ precedents. Europeans were not as magnificent as they believed, but they were able to organize large collections of people and capital and to exploit physical reality for useful knowledge and for power more efficiently than any other people of the time. Why?

The textbook answer is, put simply, science and technology, and that was certainly true for generations and still is in large parts of the world. But if we gaze back through and beyond the nineteenth century to the beginnings of European imperialism, we see little of science and technology as such. Westerners’ advantage,

¹ *Ecological Imperialism: The Biological Expansion of Europe, 900–1900* (Cambridge University Press, 1986); *The Columbian Exchange: Biological and Cultural Consequences of 1492* (Westport, Conn.: Greenwood Press, 1972); *Germes, Seeds, and Animals: Studies in Ecological History* (Armonk, N.Y.: Sharpe, 1994).

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I believe, lay at first not in their science and technology, but in their utilization of habits of thought that would *in time* enable them to advance swiftly in science and technology and, in the meantime, gave them decisively important administrative, commercial, navigational, industrial, and military skills. The initial European advantage lay in what French historians have called *mentalité*.

During the late Middle Ages and Renaissance a new model of reality emerged in Europe. A quantitative model was just beginning to displace the ancient qualitative model. Copernicus and Galileo, the artisans who taught themselves to make one good cannon after another, the cartographers who mapped the coasts of newly contacted lands, the bureaucrats and entrepreneurs who managed the new empires and East and West India companies, the bankers who marshaled and controlled the streams of new wealth – these people were thinking of reality in quantitative terms with greater consistency than any other members of their species.

We look upon them as initiators of revolutionary change, which they certainly were, but they were also heirs of changes in *mentalité* that had been fermenting for centuries. This book is about those changes.

Writing this book has been a major battle for me, and I never would have completed it without my many allies. I owe the Guggenheim Foundation and the University of Texas for time and money, and I owe the Library of Congress for access to its stacks and the advice and counsel of its staff. I owe Brenda Preyer, Robin Doughty, James Koschoreck, and André Goddu for checking over the chapters pertaining to their respective specialties. Martha Newman and Eduardo Douglas waded through the entire manuscript and saved me many errors. I owe very special thanks to Robert Lerner, who read the whole manuscript carefully and long

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stretches of it meticulously, and pulled me back from many a precipice. Finally, there is my Cambridge editor, Frank Smith, who read my book as many times as I wrote and rewrote it, a Sisyphean ordeal.

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