

Sample Translation

*The Recreation of the World. The Rise of  
Modern Science Explained*

(De herschepping van de wereld. Het ontstaan  
van de moderne natuurwetenschap verklaard.)

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## Introduction – The Old World and the New

If you, reader, had been born, say, two or more centuries ago, the chances are that you would have been poor, indeed extremely poor. You would have spent your whole life working the land, with no hope or prospect of change. Except for the odd tenacious survivor, your numerous children would have predeceased you. You would have taken it for granted that you would probably not live beyond the age of about forty-five. Your home would have been a country hovel, heated in winter with whatever firewood you had managed to gather. The only source of other comforts would have been the few coppers you had hoarded. Apart from everyday conversation, infant wailing and the clucking of chickens, you would have been surrounded by silence, broken every so often by a clap of thunder, communal singing, the occasional drums and trumpets of passing armies, or perhaps the tolling of a solitary bell. You would have believed firmly and unquestioningly in the literal existence of spirits or gods, or a single God, as the guiding or all-determining force in life and especially after death.

You would, in short, have lived in what is sometimes called the Old World, as distinct from the New World you and I inhabit, which has made both of us richer, and next year may make us richer still. Ours is a world where goods are easily available everywhere; we own a wide selection of them and can shortly replace them by even more state-of-the-art versions. We have a much greater life expectancy and mostly die of different diseases. We live surrounded by noise. We are parents of a few, carefully planned and properly vaccinated children, who have every chance of living even longer than us. Even among the diminishing number of regular churchgoers, by no means everyone manages to believe in the literal truth of the texts read out during the service. We feel this life is all we have, since with the best will in the world we can form no clear picture of life after death. And so on and so forth. If you set off on your travels for the once unheard-of purpose of attending a conference or taking a holiday, you reach your destination by air, train or car in a few hours – not after days or weeks or months

on board a pitching and tossing ship, or as the culmination of an expedition along sandy paths or worse terrain, in dread not of tailbacks or punctures but of ambush by gangs of masked robbers.

The modern way of life I have outlined here is everyday reality for you and me. For the majority of the world's population it is a different matter – or rather, it is at present, since the minority for whom the picture just evoked is already a reality is growing rapidly, while the dwindling majority of those wholly or partly excluded from that way of life now aspires to many of the material advantages that we enjoy. What is more, their aspiration has become a perfectly realistic one. Even if today's poor do not cherish it for themselves, they do so for their children or their children's children. The leap from the Old to the New World will, or so it seems, be an attainable goal for all within a few generations.

This of course raises the question of the historical origins of that leap. When, where, how and for what reasons was it first made?

The first two questions are not difficult to answer: the origin of the modern world is a Western phenomenon, and the first signs began to manifest themselves in Great Britain around 1780. As a result, within a century, the face of Europe and the United States changed almost beyond recognition.

Precisely how the process of modernization developed and in particular how a New World was actually able to detach itself from the Old, and why it took place in that specific, European civilization, rather than in China or India or the Islamic world – are questions that pose great problems for the historian. The last hundred years or so have seen the appearance of a succession of studies devoted to this complex of questions. We shall leave these aside here. This book limits itself to answering a single aspect of these questions that is often overlooked or dismissed but that is nevertheless essential. Be it directly or indirectly, modern science is always to be found in the series of contrasts I have listed.

Take two of those contrasts: between modern noise and pre-modern silence, and between modern unbelief and pre-modern literal belief in a life after death that is conceivable in concrete terms. The latter contrast hinges on our awareness

of abstract natural laws, which operate according to fixed rules, in circumstances that are defined precisely in advance – laws of the kind that have continued to characterize nature-knowledge since Newton. Those laws have made the notion of a God or gods concerned with our personal welfare highly problematic. Whether modern science actually *imposes* something like a ‘scientific worldview’ remains to be seen (I examine the question more fully at the end of this book). But it is quite evident that it conflicts with the view of the world espoused by the traditional world religions.

The former contrast, between pre-modern silence and modern noise, does not embody the tension between a pre-scientific worldview and one that has been partly formed by modern science. It is the tension between pre-modern craftsmanship, founded on empirical wisdom, and our modern science-based technology. From my first visit to the *Archeon* archaeological theme park I remember the main building, later demolished, but mainly the prehistory area right behind it, at that time still separate from the rest. I recall the unearthly silence when you entered it, the sensation of being completely out of earshot of pop radio stations, muzak, the beeping of reversing lorries or the neighbours’ power drill, and the salutary feeling of not having to blot all this out, even subconsciously. True, in its place there was zooming traffic on the roundabout a few miles away, but that was monotonous enough to be pushed into the background without any noticeable effort. Result: silence, pre-modern silence.

Noise, obviously, has always been with us; in ancient Kaifeng or Rome the din must have been considerable, probably around the clock. But it was easy to escape it: all you had to do was leave the city. More importantly, that din was not an expression of wilful self-anaesthesia or the use of the volume control to blast out mindless, vacuous decibels at will. Not only is our modern world full of inescapable noise, but for the first time in history the special form of basically pleasant sound that we call music has become part of the background din. How could our daily experience of noise change so radically? What was behind it? *Who* was behind it? Who disrupted a centuries-old pattern, which may have

manifested itself slightly differently from place to place in the world, but whose underlying features were universal?

Well, the culprits were Hertz and Marconi. Not the sole culprits, of course. The brilliant physicist and the expert engineer did not compose a note of music, never sent electronic drum sounds pounding out of their cars in full stereo. They would have been baffled to find that such a thing could have derived from the discovery of one and the invention of the other. Yet, for all their bewildered dismay, they would have to admit in all honesty that without the theoretical prediction of the radio wave and its concrete application in the ‘wireless telegraph’, none of this could have happened as it did, or for that matter at all. At best they might point to many later scientists and engineers who since their time have hugely expanded their still elementary knowledge of the electromagnetic continuum, and have applied their technical abilities to these insights. Or on the other hand they could go back further in time – Hertz particularly – and single out Maxwell as the pre-eminent theoretician of that electric continuum. Maxwell in turn would refer back to Faraday as the pioneer of systematic research into electromagnetic phenomena, and the latter in turn to Newton as the model for scientific research, and Newton in turn to Galileo as the great trailblazer of a scientific approach that went beyond the merely plausible. Indeed, the historian can find such references to predecessors in their collected works and letters. Hertz was perfectly aware and acknowledged frankly that without Maxwell, he..., just as without Faraday, Maxwell... and so on and so on, all the way back to Galileo. True, Galileo sometimes invoked the ‘divine’ Archimedes as his patron, but by then he knew very well that the way of pursuing science on which he had embarked was broadly speaking the right one, and as such, moreover, had no real precedent.

That brings us to the period around 1600, when the recreation of the world began. This beginning was first and foremost a new way of thinking. For centuries Greeks and Chinese, Europeans and Arabs, monks and laymen, lone thinkers and philosophical schools had reflected with great acumen and

perseverance on the structure of the natural world. Between 1600 and 1640 Galileo, Kepler, Descartes, Bacon and numerous others gave a decisive new twist to traditional thinking, which was often very ingenious but in retrospect did not hold water – not just a theoretical twist, but inextricably bound up with it, a practical one. The kind of reasoning associated with the embryonic modern science that emerged at that time has been called ‘hands-on thinking’. For the first time in world history it became possible to test the reality content of certain statements. ‘You assert  $x$ , but is that what really happens in nature?’ For the first time, in the course of the seventeenth century hands-on thinkers began to explore procedures and practices that enabled them to check whether a plausible-looking assertion was anything more than just a plausible-looking assertion. In this book I try to answer the question how all this happened as it did and what made it possible.

Able historians of science have previously given numerous explanations for the seemingly miraculous series of theoretical and practical breakthroughs. (My own first introduction to the genre was E.J. Dijksterhuis’s *The Mechanization of the World Picture: From Pythagoras to Newton*, published over fifty years ago, but still a splendid account.) I myself drew up a comparative and critical inventory of all those explanations and interpretations in *The Scientific Revolution. A Historiographical Inquiry* (1994). But no responsible, systematic attempt has yet been made to explain why the decisive move towards modern science happened in, of all places, Europe, that latecomer among the great traditional civilisations. Why not in China, why not in the Islamic world, which both possessed advanced scientific traditions? There are enough clichés in circulation, and plenty of glib answers, but as yet there has been no in-depth investigation in which nature-knowledge in the relevant civilisation has been subjected to a systematic comparative approach. In my forthcoming study *How Modern Science Came Into the World. A Comparative History*, I have set out my research findings in full, with the appropriate apparatus of sources and references

to the literature. In the present volume I am not primarily addressing myself to my fellow-historians of science, but to a wider readership.

That wider readership needs no special knowledge to follow the argument I develop in this book. I explain in words the mathematical issues that occasionally arise. Far more important than the knowledge that the reader possesses, is the knowledge that he or she is prepared to put temporarily on hold. I began this chapter with the contrast between the Old and New Worlds. We can conjure up life in the Old World by looking around us and then, one by one, eliminating things. Let's pull out that plug, get rid of the gas oven, ditch the mobile phone. Hey, what's that plastic bin bag doing here? That bike in that wooden shed can go too. The shed can stay, though. In the same way I'm asking the reader to delete a number of modern concepts from his or her brain. Say goodbye to evolution theory, abandon the law of gravity, jettison that table of chemical elements. I must even ask the reader to suspend for now his or her own notions of how our knowledge of nature originated and how that knowledge advances over time. If you've read Kuhn, don't immediately see paradigm shifts everywhere, we'll find in the course of the book whether they are any use to us. If you favour Popper, try abandoning your faithful criterion of falsifiability until you reach the last page. If you're someone who more or less tacitly assumes that the science of the past is virtually the same as that of today, only simpler and containing weird errors that the great scientific heroes of the past have weeded out one by one – then please make room in your brain for a situation where there is no such thing as science. The natural world lies before us unexplored and undiscovered; how are we, through thought and observation, to come to grips with it?