

SOFTWARE AND MIND

Andrei Sorin

EXTRACT

Introduction: *Belief and Software*
Section *The Mechanistic Myth*

**This extract includes the book's front matter
and part of the introductory chapter.**

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This section examines the history, fallacies, and consequences of the mechanistic doctrine.

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SOFTWARE
AND
MIND

The Mechanistic Myth
and Its Consequences

Andrei Sorin

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Don't you see that the whole aim of Newspeak is to narrow the range of thought?... Has it ever occurred to you ... that by the year 2050, at the very latest, not a single human being will be alive who could understand such a conversation as we are having now?

George Orwell, *Nineteen Eighty-Four*

Disclaimer

This book attacks the mechanistic myth, not persons. Myths, however, manifest themselves through the acts of persons, so it is impossible to discuss the mechanistic myth without also referring to the persons affected by it. Thus, all references to individuals, groups of individuals, corporations, institutions, or other organizations are intended solely as examples of mechanistic beliefs, ideas, claims, or practices. To repeat, they do not constitute an attack on those individuals or organizations, but on the mechanistic myth.

Except where supported with citations, the discussions in this book reflect the author's personal views, and the author does not claim or suggest that anyone else holds these views.

The arguments advanced in this book are founded, ultimately, on the principles of demarcation between science and pseudoscience developed by philosopher Karl Popper (as explained in "Popper's Principles of Demarcation" in chapter 3). In particular, the author maintains that theories which attempt to explain non-mechanistic phenomena mechanistically are pseudoscientific. Consequently, terms like "ignorance," "incompetence," "dishonesty," "fraud," "corruption," "charlatanism," and "irresponsibility," in reference to individuals, groups of individuals, corporations, institutions, or other organizations, are used in a precise, technical sense; namely, to indicate beliefs, ideas, claims, or practices that are mechanistic though applied to non-mechanistic phenomena, and hence pseudoscientific according to Popper's principles of demarcation. In other words, these derogatory terms are used solely in order to contrast our world to a hypothetical, ideal world, where the mechanistic myth and the pseudoscientific notions it engenders would not exist. The meaning of these terms, therefore, must not be confused with their informal meaning in general discourse, nor with their formal meaning in various moral, professional, or legal definitions. Moreover, the use of these terms expresses strictly the personal opinion of the author – an opinion based, as already stated, on the principles of demarcation.

This book aims to expose the corruptive effect of the mechanistic myth. This myth, especially as manifested through our software-related pursuits, is the greatest danger we are facing today. Thus, no criticism can be too strong. However, since we are all affected by it, a criticism of the myth may cast a negative light on many individuals and organizations who are practising it unwittingly. To them, the author wishes to apologize in advance.

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Preface

This revised version (currently available only in digital format) incorporates many small changes made in the six years since the book was published. It is also an opportunity to expand on an issue that was mentioned only briefly in the original preface.

Software and Mind is, in effect, several books in one, and its size reflects this. Most chapters could form the basis of individual volumes. Their topics, however, are closely related and cannot be properly explained if separated. They support each other and contribute together to the book's main argument.

For example, the use of simple and complex structures to model mechanistic and non-mechanistic phenomena is explained in chapter 1; Popper's principles of demarcation between science and pseudoscience are explained in chapter 3; and these notions are used together throughout the book to show how the attempts to represent non-mechanistic phenomena mechanistically end up as worthless, pseudoscientific theories. Similarly, the non-mechanistic capabilities of the mind are explained in chapter 2; the non-mechanistic nature of software is explained in chapter 4; and these notions are used in chapter 7 to show that software engineering is a futile attempt to replace human programming expertise with mechanistic theories.

A second reason for the book's size is the detailed analysis of the various topics. This is necessary because most topics are new: they involve either

entirely new concepts, or the interpretation of concepts in ways that contradict the accepted views. Thorough and rigorous arguments are essential if the reader is to appreciate the significance of these concepts. Moreover, the book addresses a broad audience, people with different backgrounds and interests; so a safe assumption is that each reader needs detailed explanations in at least some areas.

There is some deliberate repetitiveness in the book, which adds only a little to its size but may be objectionable to some readers. For each important concept introduced somewhere in the book, there are summaries later, in various discussions where that concept is applied. This helps to make the individual chapters, and even the individual sections, reasonably independent: while the book is intended to be read from the beginning, a reader can select almost any portion and still follow the discussion. In addition, the summaries are tailored for each occasion, and this further explains that concept, by presenting it from different perspectives.



The book's subtitle, *The Mechanistic Myth and Its Consequences*, captures its essence. This phrase is deliberately ambiguous: if read in conjunction with the title, it can be interpreted in two ways. In one interpretation, the mechanistic myth is the universal mechanistic belief of the last three centuries, and the consequences are today's software fallacies. In the second interpretation, the mechanistic myth is specifically today's mechanistic *software* myth, and the consequences are the fallacies *it* engenders. Thus, the first interpretation says that the past delusions have caused the current software delusions; and the second one says that the current software delusions are causing further delusions. Taken together, the two interpretations say that the mechanistic myth, with its current manifestation in the software myth, is fostering a process of continuous intellectual degradation – despite the great advances it made possible.

The book's epigraph, about Newspeak, will become clear when we discuss the similarity of language and software (see, for example, pp. 409–411).

Throughout the book, the software-related arguments are also supported with ideas from other disciplines – from the philosophies of science, of mind, and of language, in particular. These discussions are important, because they show that our software-related problems are similar, ultimately, to problems that have been studied for a long time in other domains. And the fact that the software theorists are ignoring this accumulated knowledge demonstrates their incompetence.

Chapter 7, on software engineering, is not just for programmers. Many parts

(the first three sections, and some of the subsections in each theory) discuss the software fallacies in general, and should be read by everyone. But even the more detailed discussions require no previous programming knowledge. The whole chapter, in fact, is not so much about programming as about the delusions that pervade our programming practices, and their long history. So this chapter can be seen as a special introduction to software and programming; namely, comparing their true nature with the pseudoscientific notions promoted by the software elite. This study can help both programmers and laymen to understand why the incompetence that characterizes this profession is an inevitable consequence of the mechanistic software ideology.

The book is divided into chapters, the chapters into sections, and some sections into subsections. These parts have titles, so I will refer to them here as *titled* parts. Since not all sections have subsections, the lowest-level titled part in a given place may be either a section or a subsection. This part is, usually, further divided into *numbered* parts. The table of contents shows the titled parts. The running heads show the current titled parts: on the right page the lowest-level part, on the left page the higher-level one (or the same as the right page if there is no higher level). Since there are more than two hundred numbered parts, it was impractical to include them in the table of contents. Also, contriving a short title for each one would have been more misleading than informative. Instead, the first sentence or two in a numbered part serve also as a hint of its subject, and hence as title.

Figures are numbered within chapters, but footnotes are numbered within the lowest-level titled parts. The reference in a footnote is shown in full only the first time it is mentioned within such a part. If mentioned more than once, in the subsequent footnotes it is abbreviated. For these abbreviations, then, the full reference can be found by searching the previous footnotes no further back than the beginning of the current titled part.

The statement “*italics added*” in a footnote indicates that the emphasis is only in the quotation. Nothing is stated in the footnote when the italics are present in the original text.

In an Internet reference, only the site’s main page is shown, even when the quoted text is from a secondary page. When undated, the quotations reflect the content of these pages in 2010 or later.

When referring to certain individuals (software theorists, for instance), the term “expert” is often used mockingly. This term, though, is also used in its normal sense, to denote the possession of true expertise. The context makes it clear which sense is meant.

The term “elite” is used to describe a body of companies, organizations, and individuals (for example, the software elite). The plural, “elites,” is used when referring to several entities within such a body.

The issues discussed in this book concern all humanity. Thus, terms like “we” and “our society” (used when discussing such topics as programming incompetence, corruption of the elites, and drift toward totalitarianism) do not refer to a particular nation, but to the whole world.

Some discussions in this book may be interpreted as professional advice on programming and software use. While the ideas advanced in these discussions derive from many years of practice and from extensive research, and represent in the author’s view the best way to program and use computers, readers must remember that they assume all responsibility if deciding to follow these ideas. In particular, to apply these ideas they may need the kind of knowledge that, in our mechanistic culture, few programmers and software users possess. Therefore, the author and the publisher disclaim any liability for risks or losses, personal, financial, or other, incurred directly or indirectly in connection with, or as a consequence of, applying the ideas discussed in this book.

The pronouns “he,” “his,” “him,” and “himself,” when referring to a gender-neutral word, are used in this book in their universal, gender-neutral sense. (Example: “If an individual restricts himself to mechanistic knowledge, his performance cannot advance past the level of a novice.”) This usage, then, aims solely to simplify the language. Since their antecedent is gender-neutral (“everyone,” “person,” “programmer,” “scientist,” “manager,” etc.), the neutral sense of the pronouns is established grammatically, and there is no need for awkward phrases like “he or she.” Such phrases are used in this book only when the neutrality or the universality needs to be emphasized.

It is impossible, in a book discussing many new and perhaps difficult concepts, to anticipate all the problems that readers may face when studying these concepts. So the issues that require further discussion will be addressed online, at www.softwareandmind.com. In addition, I plan to publish there material that could not be included in the book, as well as new ideas that may emerge in the future. Finally, in order to complement the arguments about traditional programming found in the book, I have published, in source form, some of the software I developed over the years. The website, then, must be seen as an extension to the book: any idea, claim, or explanation that must be clarified or enhanced will be discussed there.

The Mechanistic Myth

1

In this book we are concerned with one particular myth – the *mechanistic* myth; and we are especially concerned with its latest manifestation – the *software* myth. Mechanism is the belief that everything can be represented as a *hierarchical structure*; that is, as a structure of things within things. This is true, we are told, because every entity is necessarily made up of simpler entities, which are in their turn made up of even simpler ones, and so on, down to some basic building blocks.

Thus, if we want to understand a complex phenomenon, all we have to do – according to the mechanistic doctrine – is discover what simpler phenomena make it up. Then, for each one of those, we must discover what phenomena make *it* up, and so on. Clearly, if we continue this process to lower and lower levels of complexity, we are bound to reach, eventually, phenomena simple enough to understand intuitively. So, by understanding those simple phenomena and the process of simplification that revealed them, we will understand the original, complex phenomenon. Ultimately, working in this fashion, everything that exists in the world can be understood.

Similarly, if we want to build a complicated machine, all we have to do is design it as a combination of subassemblies. Because the subassemblies on their own are simpler than the whole machine, they are easier to design and make. Then, we design the subassemblies themselves as combinations of simpler subassemblies, the latter as combinations of even simpler ones, and so on, down to some small parts that can be made directly.

If we want to study a set of related entities – the people in an organization, the parts stored in a warehouse, the various types of animals – all we have to do is depict them with a hierarchical classification. We divide them first into several categories in such a way that all the entities in a category share a certain attribute. Then, we divide each category into several smaller ones on the basis of a second attribute, and so on, until we reach some categories where the entities share all their important attributes and are therefore very similar. In the case of an animal classification, for example, we may divide them into wild and domestic, the domestic ones into types like horses, chickens, and dogs, each type into various breeds, and finally each breed into individual animals.

If we wonder how linguistic communication works, we start by noting that language is made up of sentences, sentences are made up of clauses, and clauses are made up of words. Words correspond to the facts that exist in the world – nouns for objects, verbs for actions, adjectives for properties, and so on. Thus, since everything in the world can be represented as a hierarchical structure, it

seems that what we do when communicating is create hierarchical structures of linguistic elements which correspond to the structures that exist in the world.

Finally, if we want to create large and complex software applications, we must start by breaking them down into modules. We then break down each module into smaller ones, and so on, until we reach some simple software constructs, which we can program directly. This method, clearly, allows us to implement the most complex applications with skills no greater than those required to program the smallest constructs.



It appears, thus, that the mechanists are right: everything in the world can indeed be represented with a hierarchical structure. The explanation for this versatility lies in the two principles that constitute the mechanistic philosophy: reductionism and atomism. Reductionism assures us that everything can be represented as a combination of simpler things; at the same time, atomism assures us that there is an end to this reduction, that we will eventually reach some *elementary* entities, which cannot be further divided into simpler ones. Together, therefore, these principles assure us that every problem can be solved.

The term “mechanism” derives from the fact that in the seventeenth century, when this philosophy was established, the elementary entities were believed to be the simplest *mechanical* entities; namely, bits of matter. All phenomena, in other words – from those encountered in the study of mechanics to those encountered in the study of minds and societies – were believed to be reducible, ultimately, to the phenomena associated with the motion of bits of matter.

Formal reductionism still claims this, although the idea is so absurd that most scientists today avoid discussing it. In any case, rigorous mechanism – that is, a reduction to truly elementary entities – is too difficult to practise, so it is an easier variant that has been adopted in universities as “the method of science.” This form of mechanism employs *partial* reductionism, and academics like it because it can make trivial activities resemble scientific research. Thus, to explain a given phenomenon we no longer have to *actually* reduce it to some basic, indivisible entities; we are free to end the reduction at any convenient level, and simply *call* those entities elementary. Theories grounded on this method explain nothing, of course; but they *look* scientific, so the method is very popular.

Mechanism is also described as a method that leads to precise and complete explanations – *mathematical* explanations, in particular. It is easy to see why mathematical models are logically equivalent to the hierarchical structures of mechanism: Mathematical systems are themselves based on hierarchical

structures. In a given system, a complex theorem can be expressed as a combination of simpler theorems, which can then be reduced to even simpler ones, and so on, until we reach the premises, axioms, and basic elements upon which the system is founded. Thus, since we can always invent a mathematical system whose entities correspond to entities from the real world, a phenomenon that can be represented with a hierarchical structure can also be represented mathematically.

And indeed, those aspects of the world that have been successfully explained through reductionism and atomism also have exact, mathematical models. They include the subjects studied by sciences like physics, chemistry, and astronomy, and their applications – engineering, manufacturing, construction. Mechanism and mathematics, however, have been far less successful in other areas. Sciences like biology, physiology, and medicine benefit to some extent from mechanistic theories, but their main problems are non-mechanistic. As for those sciences that study human phenomena – psychology, sociology, linguistics, economics, politics, history, anthropology – their problems are almost entirely non-mechanistic. Finally, our software-related activities, despite their dependence on computers and hence on engineering, entail largely non-mechanistic problems.

So the mechanistic principles only *appear* to be universal. In reality, they are useful for some phenomena and useless for others. In three hundred years of mechanistic philosophy, *not one* mechanistic model was successful in the human sciences. Countless mechanistic theories have been advanced, and more are being advanced today than ever before, but when a theory fails no one tries to understand the reason. The response, invariably, is to start working on another mechanistic theory. Reductionism and atomism have been so successful in those fields where they do work that science is now universally identified with mechanism. For most of us, science means simply the attempt to extend the success of mechanism to every other aspect of the world. So an individual is perceived as scientist simply if pursuing a mechanistic theory. No one cares whether the theory works or not, or whether mechanism is valid at all in that particular field. Thus, while known as the method of science, mechanism is now largely the method of charlatanism.

2

The obsession with finding a mechanistic representation for every aspect of the world is especially silly in view of the fact that it is quite easy to see why mechanism *cannot* explain every phenomenon. All that the researchers have to do is study with an open mind any one of their failures. For, when mechanism

fails, the reason is always the same: the phenomenon is too complex to be represented with a neat structure of things within things. We will examine these failures in the following chapters, but from what we have discussed so far we can already recognize why mechanism is limited.

In the hierarchical structure that is the mechanistic representation of a phenomenon, what determines the relations between levels is the totality of attributes possessed by the structure's elements. Thus, for the structure to provide an exact and complete explanation, the elements must possess these attributes in such a way that the relations we see in the structure are the *only* relations between them. But this is rarely true.

The entities that make up the world possess *many* attributes, and are therefore interrelated in many different ways. For certain types of phenomena, though, a few of these attributes, and the resulting relations, are much more important than the others. Thus, if we agree to *ignore* the other attributes, a hierarchical structure will provide a useful approximation of reality. For these phenomena, then, we note that mechanistic theories work. Putting this in reverse, for certain types of phenomena there are *many* attributes that give rise to important relations and cannot be ignored. For those phenomena, then, we note that mechanistic theories fail: they *cannot* be usefully approximated with a hierarchical structure.

Recall the earlier examples. Hierarchical classifications of things are possible only if we take into account *some* of their attributes (one attribute, or a small set of attributes, per level) and ignore the others. It is impossible to include *all* their attributes in one classification. Thus, animals can be divided into wild and domestic, into types, and into breeds, as we saw. But this is just *one* way to represent them. The biological classification – dividing animals into classes, orders, families, genera, and species – is based on different attributes, and the resulting hierarchy is different. Tigers and horses belong to different categories (wild and domestic) in one classification, but to the same category (class of mammals) in the other. Clearly, there are many ways to classify animals, all valid and useful; and each classification can take into account only *some* of their attributes. It is impossible to represent *all* their attributes in *one* hierarchical structure. The totality of animals and their attributes is, therefore, a non-mechanistic phenomenon. A mechanistic representation – one structure – is valid only if we agree to study animals from one narrow perspective; it becomes useless as soon as we remember their other attributes.

Similarly, we can represent an appliance as a hierarchy of parts and sub-assemblies only if we restrict ourselves to those attributes that determine their position and function in that appliance. For, the same parts and subassemblies form at the same time *other* hierarchical structures, based on other attributes – their cost, or supplier, or life expectancy. We purposely design appliances in

such a way that the other attributes can be ignored in the manufacturing process. But the attributes *are* important when we study the appliances from *other* perspectives. And the other hierarchies are usually different from the one that represents the physical and functional attributes; for example, parts made by the same supplier may belong in different subassemblies, and parts belonging in the same subassembly may have different life expectancy. It is impossible to represent the parts and *all* their attributes in *one* hierarchical structure. Again, a mechanistic representation is valid only if we can restrict ourselves to one view.

Sentences appear to form a neat hierarchy of clauses and words only if we take into account the syntactic structure and ignore the *meaning* of the words. For, the things represented by words possess many attributes, and are therefore related through many structures. Consequently, the words themselves are related through many structures, which are different from the syntactic one. It is impossible to depict, with a syntactic structure alone, everything that a sentence can convey.

Finally, software applications appear to form perfect hierarchies of smaller and smaller entities (modules, blocks of statements, statements) only if we study them from the perspective of *one* attribute. The attributes of a software entity are such things as files, variables, subroutines, and business practices. Software entities possess many attributes, and are therefore related through many structures – one structure for each attribute. The programming theories attempt to simplify programming by forcing us to view each application as a neat hierarchical structure of software entities. Thus, since applications consist in fact of multiple, simultaneous structures, it is not surprising that the theories keep failing.



Mechanism, then, is not the solid scientific concept it is believed to be. Its prestige is due largely to its early successes in the exact sciences, and especially to its successes relative to the scholastic doctrines of the Middle Ages, which it was displacing. Just as the religious philosophy had been accepted for centuries as the absolute truth, the mechanistic philosophy was seen now as an absolute method – a method that can explain everything. Mechanism became, in effect, a new religion. It seems that societies cannot exist without some great ideas to inspire them – ideas that people can accept blindly.

Most of us perform both rational and irrational acts, but the two kinds appear to us equally important. In the easier pursuits, when our knowledge guarantees success, we are completely rational and follow only sound and proven principles. But in difficult pursuits, when our knowledge is insufficient,

we behave irrationally. Irrationality, thus, emerges when we have no proven theories to rely on: if we wish to understand a given phenomenon but lack the necessary knowledge (and if, in addition, we believe that all phenomena can be understood as we understand the simple ones), we are bound to invent a fantastic concept and use *it* as explanation. This is how myths are born. People are always in need of myths, because there is always much that is unknown or unpredictable, in any society. Consequently, people always display a blend of rational and irrational thinking, rational and irrational activities.

We like to justify our acts by basing them on accepted concepts, but we are less keen on justifying the concepts themselves. As a result, we perceive the two kinds of activities, rational and irrational, as equally effective. The former become pursuits like science and business, while the latter make up pursuits like magic and superstitions. But the *individual* activities that make up these pursuits are very similar: they are always logical and consistent, always grounded on an accepted concept. The difference is only that the concept is a valid theory in one case and a fantasy in the other.

Thus, as we will see in the course of this book, it is possible for a person, and even an entire society, to engage in activities that are perfectly logical *individually*, while the body of activities as a whole constitutes a delusion. So, to judge whether a certain pursuit is rational or not, it is not enough to study the logic of the *individual* activities which make up that pursuit.

In chapter 3 we will learn that the best way to distinguish between rational and irrational pursuits is by studying, not the successes, but the *falsifications* of an idea. Just as important is how people *react* to these falsifications. Serious researchers react by doubting the idea. Most people, however, react by ignoring the falsifications, or by contriving ways to cover them up. They never admit that the idea has been refuted. This shows that, for them, the idea is not a rational pursuit but a belief.

Astrology, for instance, has been around for thousands of years, and we could always show that it doesn't work. All we have to do is note the predictions made in the course of a year, and then count how many actually materialized. Believers, though, never do this. Similarly, today we can note the mechanistic claims in a field like linguistics, economics, or software, and count how many match reality. But, again, believers never do this. Mechanism continues to be trusted, regardless of how successful or unsuccessful it is.

We will see that it *is* possible to distinguish between the two types of thinking, the scientific and the pseudoscientific. And we will see that what the mechanists do is simply ignore the falsifications, just like the traditional pseudoscientists. Thus, our mechanistic theories – while embraced by famous scientists, taught in respected universities, and practised throughout society – form in reality a new kind of pseudoscience.

The conclusion must be that mechanism does not function as scientific doctrine in our society, but as myth. It is precisely the lack of doubts that betrays its mythical status. When a method works, we are not afraid to debate it, modify it, or replace it with a better one. Only concepts that cannot be proved become unquestionable truths. Were mechanism perceived merely as an important research method, we would rely on it in those fields where it is useful, and seek other methods in those fields where it fails. But this is not what we see. Mechanism is considered the *only* valid method of science, in *all* fields. Academics are trained to think mechanistically, and are expected to pursue only mechanistic ideas, regardless of whether these ideas are useful or not. Moreover, non-mechanistic ideas are dismissed as “unscientific,” even if shown to be useful. We have redefined science, in effect, to mean simply the pursuit of mechanism. And as a result, our academic institutions have degenerated into a self-serving bureaucracy.

Recall the earlier quotations: modern societies are founded on myths, just like the primitive ones; myths are the most important form of collective thinking; myths are thought to express absolute truth; myths serve as models and as justification for all human action; and so on. Thus, if science and its applications – especially the pursuits we call technology – serve as warrant for our actions and decisions, and if science is grounded on mechanism, then, for us, mechanism serves the purpose of myth. When we judge something as important or unimportant, as useful or useless, as moral or immoral, as valid or invalid, simply by invoking a scientific or technological concept, we judge it in effect by invoking the mechanistic myth.

3

Myths can be good. When people possess only limited knowledge, as in a primitive society, most phenomena they observe are unexplainable. They have nothing to lose then, and much to gain, by attributing these phenomena to some mythical powers. The myths replace their anxiety and fears with a sense of confidence and security. The fact that this confidence is based on false assumptions does not detract from the value of the myths, since the primitives cannot arrive at the correct explanation in any case. If they wish to understand what caused a certain disease, for example, and they know nothing about microorganisms, the assumption that it was caused by sins, or demons, or black magic, is quite effective. As they cannot *cure* the disease, these beliefs provide at least the comfort of knowing its origin. With this comfort they are in a better position to face other problems, so they can accomplish more in those fields in which they *are* knowledgeable.

Thanks to the importance of myths, the individuals who provide myth-related services – magicians, shamans, astrologers – enjoy great respect. Their knowledge, limited as it is to myths, is necessarily specious. Nevertheless, just as the myths themselves fulfil a vital function in society while being in fact unreal, the services provided by these experts are crucial even while being specious. The experts, as a result, become a powerful elite. But this position is well-deserved: if a society benefits from its myths, and if the practice of myths requires a certain expertise, then the individuals who possess this expertise are as essential to society as the myths themselves. Thus, when the myths are good for a society, an elite whose existence depends on these myths is a good elite.

Myths, however, can also be bad. A society may reach a point in its evolution where enough knowledge has been accumulated to attain better explanations than what the myths can provide. Most likely, the new explanations include mythical elements of their own, rather than being completely rational. Even so, being closer to reality, they constitute an improvement. In retrospect, then, the practical benefits of abandoning the old myths are obvious. But the actual transition is difficult. The old myths are usually part of a belief system that had guided society for generations, and it takes more than the promise of an improvement to abandon them. So the same myths that hitherto *served* society are now turning *against* it, by preventing it from enjoying the benefits of the new knowledge. The good myths become bad.

The elite too – those experts whose privileged position depends on the myths – is now turning against society. Because they would be redundant without the old myths, the experts continue to praise their value even as society no longer needs them. Whereas formerly they were *practising* those myths, now they are *enforcing* them. They describe this struggle as an effort to preserve some proven social values, but in reality it is their own privileges that they want to preserve. Thus, when the myths turn from good to bad, the elite too becomes bad.

The best-known transition in Western history is the Renaissance and the Scientific Revolution, which took place between the fifteenth and seventeenth centuries. This is when modern science, expressed through the mechanistic philosophy, replaced the religious myths that had dominated Europe for more than a thousand years. One of the most remarkable aspects of this transition is the ferocity with which the church – guardian of the old myths – fought to prevent it. Previously, the church was perhaps a good elite, insofar as myths like the idea of salvation could provide some comfort in an age when science had little to offer. But now that the real benefits of the growing knowledge exceeded the emotional benefits of myths, the only way the church could maintain its power was by suppressing that knowledge. This was the task of the Inquisition.

Thus, regardless of how one feels about the value of the religious myths in earlier times, we all agree that obstructing the truth, and torturing and burning alive innocent people, is not something that a good elite would do. The myths, and with them the elite, had become bad.



The foregoing analysis should help us to recognize that a similar transition is taking place in our own time. What is being defended now is *mechanism* – the very myth that was being *repressed* in the earlier transition. And the elite struggling to maintain its power is embodied now in our educational institutions – our universities, in particular. The academic bureaucrats are the greatest beneficiaries of the mechanistic myth, as this myth affords them a privileged position in society regardless of whether their activities are useful or not. So it is not surprising to see them defend the mechanistic ideology as fiercely as the church was defending earlier the religious one.

When astrology was important, astrologers retained their position regardless of whether their predictions were correct or not; when alchemy was important, alchemists continued to be trusted regardless of whether their transmuting methods worked or not; and when religion was important, the church bureaucracy retained its power regardless of whether its promises of salvation materialized or not. Today, *mechanism* is important, so we continue to trust and respect the academic bureaucrats even as the mechanistic theories are failing. As we will see in the following chapters, it is quite easy to prove that these theories are fraudulent; and yet we treat their defenders as scientists, not as charlatans.

As part of its power, the academic elite controls education. And it has used this monopolistic position to turn the process of education into a process of indoctrination: all we are taught is what can be explained mechanistically. Thus, while promoting knowledge, intelligence, and creativity, the academic elite has redefined these qualities to mean, not the utmost that human minds can attain, but merely the skills needed to follow the mechanistic ideology: knowledge of the latest mechanistic theories, the intelligence to appreciate the mechanistic principles, and the creativity to accomplish a task with mechanistic methods alone. Mechanism is not just *practised* – it is *enforced*. Together with the corporations (the other beneficiaries of the mechanistic myth), and protected by irresponsible governments, our universities have brought about a social order that is, in effect, a new form of totalitarianism.

Totalitarian ideologies differ in detail, but their goal is always the same: to create a perfect society. For us, this means a society founded upon solid, mechanistic principles. We have already proved the value of these principles in

certain areas – in the exact sciences, for instance, and in manufacturing – so all we have to do now is extend their use to every other aspect of human life.

Here is how we can accomplish this: Since everything can be represented with hierarchical structures, we can improve our performance by breaking down all challenges into simpler and simpler ones. In the end, we will only need to deal with the terminal elements of these structures; that is, with trivial issues. In practice, the structures will be embodied in theories and methods, and the terminal elements will be some simple rules. Thus, just by obeying these rules, anyone will be able to perform tasks that previously demanded much knowledge and experience.

Better still, once we represent our problems with hierarchical structures, we can build devices that embody these structures. Then, to solve a given problem, all we need to know is how to operate a device. The skills required to operate devices are easier than those required to solve problems, so we will all be more productive: first, because devices eliminate the lengthy learning periods we needed in the past, and second, because devices are faster, more accurate, and more dependable than humans.

Finally, with our latest invention, computers, we can implement even those structures that are too large or too complex for the traditional devices. Thanks to the power and versatility of software, practically every human endeavour can be translated into a series of easy acts – the acts required to operate a software device. From simple calculations to difficult decisions, from personal concerns to business issues, we can have a software device for every task. Various types of knowledge are now being incorporated into these devices, and made available to us through easy-to-use menus, lists, buttons, and the like; in other words, through a hierarchical structure of selections, and selections within selections, corresponding to the hierarchical structure that is the knowledge itself. So, just by purchasing a software device, we will be able to perform almost any task without having to develop that knowledge in our own minds.



Our idea of a perfect society, then, is one where all human affairs have been reduced to the simple acts required to follow methods and to operate devices. The methods and devices are developed by various elites – experts who know how to translate the complexity of the world into concepts simple enough for us to understand. The responsibility of the elites is to represent the world with exact, mechanistic theories; and *our* responsibility is to obey these theories. Anything that cannot be represented mechanistically is unscientific, and hence devoid of value. Thus, as our goal is endless progress, we cannot

afford to spend any time with non-mechanistic notions, even if we might otherwise enjoy it.

If we doubt the efficacy of this scheme, we only need to recall the progress we have made in our *manufacturing* activities. From the handful of simple consumer products available two hundred years ago, and which few people could afford, we have arrived at today's astounding array of sophisticated products, which almost anyone can afford. And we have accomplished this, not by *increasing*, but by *reducing*, the knowledge and skills of the workers who make these products. The secret for the great progress in manufacturing is found, as everyone knows, in concepts like the assembly line (which permits us to employ unskilled workers and to control their output), division of labour and narrow specialization (which permit us to reduce each individual's education and training, and hence the cost of employment), and, in general, fragmentation of the labour process (which reduces all types of work to simple, routine activities, eliminating the dependence on personal skills or initiative) and scientific management (which creates a rigid environment, where everyone is forced to work in the manner dictated by a superior).

These principles are, clearly, an application of the mechanistic ideology: from a rather haphazard series of activities, the manufacturing process has been turned into an exact system – a system that can be represented with a hierarchical structure. In this structure, the elements are the various components, stages, persons, and activities, and the efficiency of this arrangement is assured by the mechanistic concept itself. So there can be little doubt that, to be as efficient in the other fields as we are in manufacturing, we must follow the same principles. We must modify the entire society to resemble, so to speak, a giant factory: each person, each act, each thought, must be designed to function as an element in a giant structure of things within things. We are currently in the process of implementing this idea in our educational and business activities; and soon we will extend it to all social and personal affairs.

Thus, while this may seem paradoxical, it is a fact that if we want to become more efficient we must be *less* knowledgeable, *less* skilled, *less* experienced. It is our natural tendency to gain knowledge that slows progress. So we must stop trying to develop such old-fashioned qualities as expertise or individuality, and admit that we can accomplish more by being an insignificant part in a great whole. We must allow the elites, who have proved the value of this idea in fields like manufacturing, to design that great hierarchical social structure for us. And we must restrict ourselves to those activities which they prescribe.

This ideology – totalitarianism – is quite old, in fact, and was always appreciated by enlightened leaders. The reason it seems new is that only in the twentieth century it became practical on a large scale. The first attempts,

Communism and Nazism, were rather crude and violent. They were *political* movements, and failed. We learned from these mistakes, however, and we rely now on universities and corporations, instead of political institutions, to implement it. Our totalitarianism is better, and it will succeed.

4

Despite its obvious benefits, totalitarianism is not without critics. The first objection concerns the process of dehumanization that inevitably accompanies it. Thinkers of various outlooks – philosophers, sociologists, science-fiction authors – have been warning us for a hundred years that we are being turned into automatons. The vision of a society where human beings are treated as parts of a giant machine, and restricted to some simple and repetitive acts, is not very appealing – even if this is done in the name of efficiency or progress.

As answer to this objection, we point to the great improvements in standard of living and in life expectancy that all sections of society have enjoyed thanks to totalitarianism. Thus, as in any social project, our decision to pursue this ideology amounts to a compromise: we are trading more and more aspects of our humanity for greater and greater prosperity. This has worked out well so far, and there is no reason to doubt that we can continue this trade in the future. Besides, people don't seem to mind this dehumanization: following rules and methods is easier than developing expertise, and most of us are quite happy to be merely parts of a whole, as this absolves us from responsibility for our acts and choices.

More recently, a second objection has arisen to the totalitarian ideology. This objection concerns the environmental problems associated with infinite progress. Specifically, we are reminded that, even if we agree to become full-fledged automatons in our unending quest for prosperity, we may never get there. Growth is limited by such factors as increasing pollution and diminishing natural resources, so the assumption that an ideology which worked in the past will continue to work in the future is invalid. In other words, our ideology is wrong, not so much because it dehumanizes us, but because at the current rate of growth we will destroy ourselves by ruining the environment *before* we do it by becoming automatons.

Unlike the first one, this objection is gaining in popularity, owing largely to the ease with which we can delude ourselves that we care about the environment. All we need to do is read books and articles, watch television documentaries, and discuss the issue from time to time – while keeping our lifestyles and expectations unchanged. This stratagem permits us to feel

concerned and involved, without having to give up anything. In reality, an endless increase in prosperity is possible only through an exponential growth in production and consumption. To prevent the environmental problems, therefore, we would have to reduce our prosperity even more than we would have to in order to prevent our dehumanization. And we already saw what is our attitude on the latter. People who agree to pay for prosperity by living their lives as automatons are not likely to renounce the same prosperity for the benefit of future generations. So, despite its apparent popularity, the second objection will not stop the spread of totalitarianism any more than the first objection did in the past.

It is not these two objections that ought to preoccupy us, however, but a *third* one; namely, the risk that the totalitarianism we are being offered may not be at all what it is said to be. We believe the problem is simply whether the price we pay for progress and prosperity is too high, while the real problem is whether we are getting anything at all for this price. The elites justify the totalitarian ideology by telling us that it is grounded on mechanistic, and hence scientific, principles. But if these principles are becoming less and less useful, the elites are deceiving us – regardless of the price we are willing to pay.

The justification entails a succession of ideologies: mechanism, scientism, utopianism, totalitarianism. The belief in mechanism leads to scientism – the application of mechanistic concepts in the study of minds and societies, where they cannot work. Then, despite the failure of their theories, the mechanists conclude that society can be greatly improved by actually implementing these theories; so, scientism leads to utopianism. Finally, everyone agrees that the only practical way to carry out this project is through totalitarianism: by allowing an elite to control all aspects of society.

Totalitarianism, thus, is justified by pointing to its origin, mechanism. Our infatuation with mechanism is so strong that even when noticing its failures, or its harmful consequences, we still do not question the ideology itself. So we accept and respect the idea of totalitarianism, even when criticizing it, simply because we believe it to be scientific. We have no evidence that totalitarianism works, but we cannot help trusting those who advocate it.

5

The declining usefulness of mechanism has engendered a new phenomenon: charlatanism practised in the name of science or in the name of business. This charlatanism consists in the promise to solve a non-mechanistic problem with mechanistic methods. Since mechanism is universally accepted as “the method of science,” we trust implicitly anyone who invokes the mechanistic principles.

Thus, once we decided to measure the value of an idea solely by its mechanistic qualities, it became impossible to distinguish between serious mechanistic ideas and mechanistic *delusions*.

Mechanistic delusions have always been part of our culture. Until recently, however, their harm was overshadowed by the mechanistic *successes*. Today, fewer and fewer problems have simple, mechanistic solutions, so the harm caused by delusions exceeds the benefits derived from successes.

Totalitarianism, in particular, is a mechanistic delusion. We like totalitarianism for the same reason we like all other mechanistic ideas: because it offers what appears to be simple solutions to difficult problems. However, while the pursuit of an ordinary mechanistic delusion means merely a waste of resources, the pursuit of totalitarianism can lead to the collapse of society. For, if the world is too complex to be improved mechanistically, the claimed benefits are a fantasy, while the price we pay for them is real. Our problems are getting bigger, while our minds are getting smaller: if we restrict ourselves to mechanistic thinking, we leave our non-mechanistic capabilities undeveloped; so we cope perhaps with the simple, mechanistic problems, but the complex, non-mechanistic ones remain unsolved, and may eventually destroy us.

In universities, the charlatanism is seen in the activity known as research. The rule is simple: any work that follows the mechanistic principles of reductionism and atomism is deemed scientific, and is therefore legitimate. Whether these principles are valid or not in a given field, or whether the resulting theories work or not, is immaterial. Thus, when faced with a problem in the human sciences, all one has to do is perceive it as a hierarchical structure. The problem can then be broken down into smaller and smaller parts, until reaching problems simple enough to describe with precision. But this method, borrowed from the exact sciences, fails when applied to human phenomena. It fails because human phenomena consist, not of one structure, but of multiple, interacting structures.

So the researchers are admired for the rigour with which they study those small problems, even while the real problem remains unsolved. Clearly, their only defence is that they are following the mechanistic principles. But why should principles that are useful in modeling the material world be accepted without reservation in the study of minds and societies? As soon as we question the value of mechanism in these fields, any research project grounded on mechanism changes from scientific pursuit to mechanistic fantasy. What stands between perceiving these academics as scientists or as charlatans, then, is only our blind acceptance of the mechanistic ideology.

In business, the charlatanism is seen in the activity known as marketing. The elites, we saw, tell us that our future must be based on an endless growth in production and consumption, and that this can only be achieved through

mechanistic methods. But if, in fact, there is less and less that *can* be discovered or improved mechanistically, the only way to attain the required growth is by replacing the making of useful things with the making of whatever can be made mechanistically (that is, efficiently and profitably). To put this differently, if the old experts – scientists, inventors, entrepreneurs – cannot keep up with our demand for growth, we must replace them with a new kind of experts: charlatans, who know how to make useless things appear important, and thereby help us to delude ourselves that our system is working just as it did in the past.

Thus, from its modest origin as a complement to trade, the process of selling has become more important than the merchandise itself. The fact that it is possible to cheat people, to persuade them to buy something that is not what it appears to be, is now the driving force of the economy. Deceptive advertising – messages purporting to inform while in reality exploiting human weaknesses and ignorance – is no longer limited to domains like fashion or cosmetics, but covers practically all products and services. Dishonest techniques (testimonials and success stories, background music, pictures of happy faces, and the like) are widely employed in order to influence, distract, and confuse. These techniques are logically equivalent to lying (they are needed precisely because the usefulness of those products and services cannot be proved), but we no longer notice this. Language itself has ceased to be a means of communication, and is used as a kind of weapon: words are carefully chosen, not to convey information, but to deceive and to manipulate.

Finally, and most disturbingly, the idea of “selling” has transcended the domain of commerce and is now found in every activity where there is an opportunity to influence people. From what we say in a résumé to what governments say in their policies, from business meetings to military decisions, from lectures and seminars to television news and documentaries, it is vital that we know how to *persuade* our audience; that is, how to *mislead* – how to use special effects so as to make unimportant things appear important, and important things unimportant.

The fact that we have to lie so much ought to worry us, ought to prompt us to doubt our system. We need more and more lies, obviously, because our *real* achievements do not fulfil our expectations. We have experienced continuous growth ever since the Scientific Revolution, and our world view has evolved accordingly: we have yet to accept the fact that there is a limit to discoveries and improvements. We are still making progress, of course, but at a slower and slower rate. Since the exponential growth that we are accustomed to cannot be sustained indefinitely, we are now supplementing the real growth with an imaginary one, based on fantasies. But instead of interpreting the perpetual increase in charlatanism as evidence that our system is failing, we perceive the

charlatanism as a new sort of science, or a new sort of business, and hence its increase as progress.

Much of the current growth, thus, is actually growth in delusions, and in the stupidity necessary in order to accept these delusions. It is as if, having realized that the human capacity for intelligence does not guarantee infinite growth, we are now trying to achieve the same growth by relying instead on the human capacity for stupidity. Like oil and minerals, we treat stupidity as a kind of resource, as something that we can exploit and benefit from. To make the most of this resource, though, human beings must be carefully indoctrinated, in order to neutralize their natural capacity for intelligence. The incessant lies and delusions, then, serve to replace the *reality* that surrounds us with the *fantasies* that – according to the elites – are the world we must strive to create instead.



To summarize, the mechanistic myth has outlived its usefulness. What started as a good myth, helping us to expand our knowledge of the world, has become bad. The same qualities that make mechanism such a useful concept are now turning against us. For, mechanism can only explain *simple* phenomena – those that can be represented with *isolated* hierarchical structures; and in today's world we are facing more and more *complex* phenomena, which can only be represented with *systems* of structures. One reason for the complexity, thus, is that there are fewer and fewer mechanistic phenomena left to be explained. If we want to expand our knowledge today, we must increasingly deal with those phenomena that we chose to ignore in the past – when there were so many simple, mechanistic ones, waiting to be studied. Another reason for the complexity is that, as we keep expanding our knowledge, we are creating ourselves new, non-mechanistic phenomena (the software phenomena are an example).

So the mechanistic myth works against us because it restricts us to mechanistic thinking while our most important problems are non-mechanistic. The past successes of the mechanistic philosophy, together with its irresistible appeal, prevent us from noticing how limited mechanism really is. We are trying to explain everything mechanistically while less and less *is* mechanistic. As a result, we are wasting our resources on absurd ideas, neglecting the real problems. Only *minds* can process complex structures. So, to contend with our current problems, we must develop the highest intelligence and expertise that human minds are capable of. Instead, the mechanistic culture restricts us to novice levels: we are taught to treat every challenge as simple, isolated structures, so we are using only our mechanistic capabilities.

Along with the mechanistic myth, our elites too have turned from good to

bad. The elites defend the mechanistic myth because it is through this belief that they hold their privileged position. Thus, as long as we accept mechanism unquestioningly, all they have to do to gain our respect is practise mechanism. If we judged them instead by assessing the validity or usefulness of their ideas, we would realize how little of what they do is important. We would stop respecting them, and they would lose their elitist position.

So we shouldn't be surprised that our elites praise the mechanistic ideology and cover up the failure of the mechanistic ideas. In the past, when most mechanistic ideas were useful, the elites did not have to resort to lies and delusions; they gained our respect through real achievements. Today, the mechanistic ideas are becoming increasingly worthless; so the only way for the elites to maintain their position is through charlatanism, by *fooling* us into accepting mechanistic ideas.

Mechanism, moreover, has become totalitarian: We are asked now, not just to accept the mechanistic delusions promoted by the elites, but to become devoted mechanists ourselves. Like the elites, we must restrict ourselves to mechanistic thinking and adhere to this ideology regardless of whether our activities are successful or not.

Our totalitarianism, thus, is the ultimate mechanistic fantasy. For, if our problems stem from the declining usefulness of mechanism, it is absurd to attempt to solve them through totalitarianism, which only *adds* to our mechanistic practices. So, when listening to the elites, we are moving in the wrong direction: we are *aggravating* the problems. The elites tell us that totalitarianism is necessary in order to become more efficient. But if it is based on mechanism, and if mechanism itself is less and less useful, how can totalitarianism help us?

6

By way of conclusion, let us speculate on the alternatives to mechanism. We saw earlier that all human societies are founded on myths. For us, since the seventeenth century, the most important myth has been the mechanistic philosophy. Usually described as a shift from religion to science, the transition to mechanism was in fact a shift from religion myths to science myths: all we accomplished was to replace one kind of myths with another. Mechanism is not an ultimate concept, but merely an improvement, a better way to represent the world.

The usefulness of mechanism has been exhausted, however, and it can no longer function as myth: rather than helping us to advance our knowledge, it holds us back now, and allows evil elites to exploit us. There is an urgent need

to abandon it. But it is highly unlikely that, during the next few decades, we can achieve something that no human society ever could – learn to live without myths. The only practical alternative, therefore, is to replace mechanism with a different myth. We must effect, in our lifetime, the next transition: from this naive, seventeenth-century myth, to a modern one, adequate for our time. If we *must* believe in myths, we should at least choose one that can help us to solve *today's* problems.

We will continue to use mechanism, of course, but only where appropriate. What we want to avoid is the mechanistic *delusions*. In those fields where it works, mechanism remains the best method, the best way to represent the world. So what we must do is demote it: from its position as *myth*, to a more modest position, as *method*. Then, we must turn to the *new* myth for inspiration in solving our complex, non-mechanistic problems.

What is left is to decide what belief should replace mechanism as myth. It is obvious that the new myth must be more than just a more sophisticated variant of the mechanistic method. The greatest challenges we face today do not entail merely a larger number of mechanistic problems, or more involved mechanistic problems, but *non-mechanistic* problems. And there is only one way to solve this type of problems: by using our minds. As we will see in chapter 2, our minds excel at solving precisely the type of problems that mechanism leaves unsolved. In our infatuation with mechanism, we have been neglecting these problems. Moreover, we have been neglecting our own, non-mechanistic capabilities: we have been using only a fraction of the capacity of our minds, only what we need in order to think mechanistically.

The next myth, thus, must be a belief in *the unlimited potential of our minds*. Like all myths, this is a fantasy, since the potential of our minds is not unlimited. But we can *believe* that it is; and the very belief will inspire us. In fact, we are using now so little of this potential that, for all practical purposes, it *is* unlimited. Once accepted as myth, the new belief will motivate us to appreciate and to use our non-mechanistic capabilities. And with these capabilities we will accomplish more than we do now.

This process would be similar to the way mechanism itself functioned in the seventeenth century. As we will see in chapter 1, it was its role as myth, rather than its usefulness as method, that imparted to mechanism its strength. It was the *belief* that its potential is unlimited that inspired the seventeenth-century scientists. Had they perceived mechanism as just a new method of research, they would not have had the confidence to propose those radical theories, and the Scientific Revolution would not have happened. Today there are more mechanistic *delusions* than discoveries, so it is obvious that the potential of mechanism is not unlimited. But this fact did not detract from its value in the seventeenth century. All we have to do, then, is undergo a similar process with

the new myth. And this will help us to bring about advances of a different kind: in non-mechanistic knowledge.

If it seems improbable that we can start to believe now in a new myth, we must remember that human societies can adopt any myth. Thus, if we managed to believe for three hundred years that every phenomenon can be represented with a neat structure of things within things (an idea easily shown to be false, as we saw), it shouldn't be so difficult to believe now that the potential of our minds is unlimited.

But regardless of which myth we decide to adopt next, we *must* end our dependence on the mechanistic myth, and on the elites that profit from it. The blind belief in mechanism is destroying our minds, and is preventing us from dealing with our problems. The mechanistic *software* beliefs, in particular, have permitted a powerful *software* elite to arise. In just a few decades, organizations that have in fact little to offer us have attained so much power that they practically control society. As we will see in the course of this book, their power rests almost entirely on mechanistic software delusions, and on the stupidity engendered by these delusions.

Software, thus, has emerged as the most effective means for an elite to enforce the mechanistic dogma. Software should have been our most modern pursuit; instead, degraded by the software elite, it is now merely the most modern way of pursuing a seventeenth-century myth.