Introduction

This book presents a very brief version of the story of life on Earth. The recent emergence of humankind and of human civilisation is an integral and vitally important part of this story. It is a story of overarching significance for every one of us and for society as a whole; yet it is known and understood by only a small section of the human community. I believe that, were it to be embraced by the dominant cultures across the world, the prospects for the future of humankind would be greatly enhanced. I refer to this story as the bionarrative.

The bionarrative, as presented here, is based on a conceptual approach to the study of human situations known as biohistory. Biohistory is the study of human situations, past and present, against the background of the history of life on Earth. It covers the basic principles of evolution, ecology, inheritance, and health and disease, and it pays special attention to the evolutionary background of our species; it recognises
the immense ecological importance of the emergence in evolution of humankind’s most distinctive biological attribute, the capacity for language and culture.  

The human capacity for culture, and therefore culture itself, are products of biological evolution. Culture is created and stored in human brains, and it is entirely dependent for its existence on the processes of life within the human body and in the ecosystems that support us. Through its influence on human behaviour it has big impacts on other forms of life. Human culture is thus a biological phenomenon that is intimately connected with other parts of the living system. Yet academia has separated culture off from the rest of the living world. The humanities and the life sciences are studied and taught by different groups of people who have little to do with one another.

The central theme of biohistory, then, is life — not only in the evolutionary past, but also as the source and mainstay of everything that goes on in human society today. Civilisation and all its institutions, economic arrangements, technologies and works of art are manifestations of life, and all are totally dependent on life processes.

I refer to the understanding of the bionarrative as biounderstanding. I am among those who believe that shared biounderstanding across the global community is an essential prerequisite for the future well-being of humankind. At present, however, biohistory is not recognised as a bona fide subject in academic circles. It does not appear in school curricula and it does not feature in university degree courses or research programs.

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1 The word ‘culture’ has many, rather different, meanings. Here it is used to mean the abstract products of the capacity for culture, such as learned language itself and the accumulated knowledge, assumptions, beliefs, values and technological know-how of a human population. This use of the term is consistent with the first definition of culture given in the Collins Dictionary: ‘The total of the inherited ideas, beliefs, values and knowledge, which constitute the shared bases of social action’ (Collins Dictionary of the English Language (1979), Collins, Sydney, Auckland and Glasgow).

2 Although, of course, most products of culture, like buildings, works of art, books and computers, are not part of life.

3 Over recent decades, a growing number of writers have emerged who could well be described as biohistorians. René Dubos comes first to mind. Others include, Jared Diamond and Tony McMichael. Biohistory, however, has yet to be developed systematically as a field of learning, and it is a long way from occupying the central place it warrants in educational programs at all levels.
Conceptual framework

Biohistory takes as its starting point the history of life on Earth. In the beginning there was no life and only the physical world existed. Then, perhaps around 4.5 billion years ago, the first living organisms came into being. Eventually, over many millions of years, there evolved an amazing array of different life forms. Among these, emerging some 200,000 years ago, was Homo sapiens.

Through the processes of biological evolution, the human species acquired a distinctive and extraordinarily significant biological attribute, which is unique in the animal kingdom. This is the ability to invent, memorise and communicate with a symbolic spoken language. The aptitude for language eventually led to the accumulation by human groups of shared knowledge, beliefs and attitudes. That is, it led to human culture.

As soon as human culture came into existence it began, through its influence on people's behaviour, to have impacts not only on humans themselves but also on other living systems. It evolved as a new kind of force in the biosphere, which was destined eventually to bring about profound and far-reaching changes across the whole planet.

A conceptual framework reflecting this approach is depicted in Figure 1.1. The arrows in this figure simply mark pathways of influence. They do not represent flows of matter or energy. Although this conceptual framework is based on the sequence of happenings in the history of life on Earth, it can also be applied to the here and now.

In this model, ‘Humankind’ is placed at the top of the scheme, supported by the ‘Rest of the biosphere’ at the base. The ‘Rest of the biosphere’ is made up of two broad categories of variables — the ‘Physical world’ and ‘Living organisms’.
Figure 1.1 A conceptual framework
Source: Stephen Boyden
‘Humankind’ is separated into four sets of interacting variables as follows:

- ‘Human population’
  This category of variables describes the state of the human population at any given time. It includes such variables as population size, health statistics, and geographical distribution.

- ‘Human activities’
  This group of variable covers all kinds of human behaviour including, for example, farming, manufacturing, retailing, travelling, using energy of one kind or another and making war. Human activities clearly have impacts on humans themselves as well as on other living organisms. They are determined partly by the biological characteristics of humans. The prevailing culture is also a major determinant of human activities.

- ‘Prevailing culture’
  This consists of the shared beliefs, knowledge (including knowledge of language, of technologies and of how things work), values and priorities of a human population. It is a major determinant of human activities and, therefore, has important indirect impacts on living systems, human and otherwise.

- ‘Societal arrangements’
  This group of variables is another aspect of human culture. It includes such items as legislation, government regulations, the economic system, the institutional structure of society and educational programs. Societal arrangements are largely determined by, and to some extent determine, the characteristics of the prevailing culture.

We will have this framework in mind from Chapter 3 onwards and, especially, when considering options for the future in Chapter 7.

The framework as described above is applicable to a human population. It can also, with appropriate modifications, be applied at the level of a small group of humans or, even, at the level of the individual. In the case of the individual the ‘prevailing culture’ would be replaced by ‘personal culture’, although the prevailing culture is an important feature of an individual’s personal environment.
Figure 1.1 also includes the set of variables designated ‘Human artefacts’, by which we mean ‘things made by humans’, including books, buildings, roads, machines and electronic devices, as well as clothes, utensils and works of art.

A key aspect of the biology and ecology of human ecosystems of great relevance to their sustainability is the patterns of flow of energy and materials in the biophysical system between human populations and the biosphere, between different human groups in the system, and between different components of the biosphere. The ecological sustainability of an urban settlement is, in the long term, largely a function of its pattern of inputs of materials and energy sources, and outputs of waste products. The analysis of these flows will be increasingly used by planning authorities in formulating policies for achieving ecological sustainability.

There are also flows of information within the cultural system that are of immense biological significance. These flows determine patterns of human activity, which in turn have impacts on the flows of materials and energy in the biophysical system and, in particular, between society and the rest of the biosphere.

I will now briefly draw attention to two crucially important biohistorical themes, each of which will be discussed in more detail in later chapters.

Watersheds in evolution

The evolution of life on Earth has been marked by a series of crucial watersheds, each of which changed the living world forever. Especially important among these were the development of photosynthesis, the appearance of cells with nuclei, the development of multicellularity, the beginning of sexual reproduction and the invasion of land by life forms.

The most recent crucial watershed in biological evolution was the emergence of the human capacity for language and culture. Human culture eventually developed into a new and extremely powerful force in the living world — with far-reaching consequences for life on our planet.
Cultural evolution, like biological evolution, has been marked by a series of watersheds, each of which ushered in a new and different ecological phase of human existence (Box 1.1). Although the distinctions between these four ecological phases are not always sharp, and some societies do not fit neatly into any one of the four categories, the classification is a useful one.4

The first of the cultural watersheds was the shared knowledge of how to make use of and, up to a point, control fire. The deliberate and regular use of fire was an important feature of ecological Phase 1 of the history of our species, the Hunter–Gatherer Phase, which lasted for around 8,000 generations.5 During this time, *Homo sapiens* spread from Africa and, by 13,000 years ago (possibly much earlier), our species had reached all five habitable continents.

The second cultural watershed began around 12,000 years ago and led to the Early Farming Phase (about 480 generations). This was indeed a turning point in cultural evolution. Without it, the spectacular developments in human history since that time would have been impossible.

The third crucial watershed in cultural evolution was associated with the advent of urbanisation. It began around 9,000 years ago (360 generations), but really got underway about 5,000 years ago, when fully fledged cities with populations of tens of thousands were in existence in the Middle East. There were also at this time townships with populations of a few thousand in Peru. This was the beginning of ecological Phase 3 — the Early Urban Phase. For the first time in human history, very large numbers of people were separated from the natural environment and played no role in the acquisition of food. The culture and ecology of these urban dwellers were significantly different from those of hunter–gatherers or early farmers.

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4 The emphasis here is on ecologically significant watersheds. There were also cultural watersheds affecting other aspects of human society. For example, in the sphere of the communication and storage of information, the introduction of writing and, recently, of information technology, were hugely significant watersheds.

5 For the purpose of this discussion, a generation is taken to be 25 years.
The fourth cultural watershed consisted of the 18th-century philosophical movement referred to, misguidedly, as the Enlightenment. I say misguidedly because a more appropriate term would be Partial Enlightenment. The great weakness of the Enlightenment lay in its association with the idea that nature is out there to be conquered.
This fourth cultural watershed led to ecological Phase 4, the Exponential Phase. It has also been called the High Energy Phase or Techno-Industrial Phase, and it has recently been dubbed the Anthropocene.

Ecological Phase 4 is characterised by an exponential increase in the scale and intensity of human activities on Earth. The present pattern is not sustainable ecologically and Phase 4 is destined to come to an end very soon. Its days are numbered; business as usual will lead to the ecological collapse of civilisation.

The four phases are not mutually exclusive and all four can exist at the same time. A few hunter–gatherer societies still exist today, although most of them have been influenced by contact with people from exponential societies. Early farming societies continued to exist throughout the Early Urban Phase, providing city dwellers with food.

Adaptation and maladaptation

In biology, adaptation is defined as the process of change by which an organism or species becomes better suited to its environment. There are several different kinds of adaptation in biological systems. Particularly important are genetic, or evolutionary, adaptation and physiological adaptation.

Genetic adaptation is the kind of adaptation that has given rise to all the species of animals and plants on Earth today, including humankind. It is transgenerational and the main influence on its direction is natural selection.

Physiological adaptation consists of physiological changes in living organisms that render them better able to cope with an existing situation or threat. The heart will beat faster in a threatening situation so that muscles are provided with more oxygen and perform better if needed (e.g. in running away or fighting). Another example is the immune response that enables organisms to fight off invading microorganisms.
In humankind there is another dimension to adaptation: cultural adaptation. Cultural adaptation can be defined as cultural changes that result in humans becoming better suited to their environment. The deliberate use of fire for cooking and as a source of warmth is an early example, as is the later introduction of farming.

There is, however, another side to the picture. Not all changes in genetic material are beneficial and, in fact, the great majority of mutations are harmful. Such instances are referred to as genetic maladaptations.

Similarly, physiological responses can sometimes be harmful. Autoimmune disease is a clear example of physiological maladaptation.

So, too, with culture. As cultures have evolved they have often come to embrace not only factual information of good practical value, but also assumptions that are sheer nonsense, leading to behaviours that are equally nonsensical. That is, cultures often get things wrong. Sometimes these cultural delusions have resulted in activities that have caused unnecessary distress in humans or unnecessary damage to local ecosystems. Such cases are examples of cultural maladaptation.

There have been countless instances of cultural maladaptation in human history, and some of these will be discussed later in this book. They include religious genocide, slavery and European imperialism — all of which have been accepted as perfectly reasonable by large numbers of people for long periods of time.

Biohistory thus alerts us to the need for us to be constantly vigilant — making sure that the assumptions of our society’s prevailing culture are in tune with the processes of life, and that they are not leading us to behave in ways that are against nature or against the interests of humankind.

As we will discuss in later chapters, some cultural maladaptations today are on a scale and of a kind that threaten the continued existence of human civilisation.