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Tamas Fulop  Sherbrooke, Que.
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Facts and Theories

Volume Editors

Ladislas Robert  Paris
Tamas Fulop  Sherbrooke, Que.

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Preface

Speculations on aging are certainly an ancestral preoccupation of humanity. There are reliable traces of such reflections on people having reached very old age, from the ancient civilizations of Egypt and Mesopotamia where writing was invented, from about 4,000 years before modern times. We had the opportunity (L.R.) to write a book on the ‘invention’ of time and of its theorization by early civilizations up to modern times [1]. The Egyptians invented millennia ago the widely used sentence pronounced frequently all over the world as a birthday wish: ‘…I wish you to live up to 120 years…’ Closer to us, in the well-known *Natural History* of Pliny the Elder [2] with a long chapter on very old people, as also in the Bible, with poetic exaggerations. But Pliny was critical of such exaggerations and did not hide his skepticism about personalities of exceptionally long life [2]. Citing Hesiod, he states: ‘The question “who are the men who enjoyed the longest life?” is covered by a considerable uncertainty, both to the location of the country as well as the diverging matters on this subject, pouring out on human life several facts I consider fantasist …’

The more or less unconscious motivation for such exaggerations is certainly the ancestral fear of death. The extraordinary development of the human brain as compared to the one of our closest relatives, the higher anthropoids compared with the chimpanzee, endowed humans with the capacity to realize our finitude, the fear of death. The minimal difference between the human and chimp genomes was enough to endow the human brain through an extraordinary complexification of its wiring with new ‘inventions’, such as aggressiveness within the species and the fear of death. This was however also the motivation for continued search for and ‘inventions’ of natural ‘drugs’, mostly from plant extracts, aimed at the fight against disease, and most importantly, at achieving longevity. Surprisingly, this tendency did not disappear with higher civilization and scientific technology. Even in our times, half a century since the discovery of the double helix and the genetic ‘program’, several recent books, some written by well-known scientists, predict the possibility to live up to 150 or even 250 years in a near future. Such predictions are in sharp contrast with the recent evolution of human longevity, and the number of ‘supercentenarians’, aged 110 years, is not increasing in the predicted proportions. Recent statistics put their number worldwide at less than 70. There is however a constant increase in centenarians,
for reasons more closely analyzed later in this book. It is evident that the unconscious fear of death is still at work even in some of the best minds of the scientific community. At a more reasonable level, the new discipline of ‘anti-aging medicine’ is thriving all over the world. When it first appeared, its initiators were the object of a lawsuit for unethical promises, won by the suing scientific community of experimental gerontologists. However, this did not stop the emergence of this ‘new’ medical discipline, promising longer and healthier life, based on hormones, improved cosmetics and neutraceuticals. Beyond well-founded criticism, these facts can be considered as a proof that a large part of the society is striving for longer and happier life.

Experimental and clinical gerontology has achieved considerable progress in understanding the cellular-molecular aspects of the aging process as well as the etiology and treatment of age-related diseases. This progress, to which all coauthors of this volume contributed in their respective fields, renders reasonable a conceptual appreciation and evaluation of these advances, from the genetic-cellular level to clinical diagnostics. Speculation is welcome but only if it is based on experimental or clinical acquisitions, ‘facts’. By facts we mean repeated, confirmed observations and experiments on age-related modifications of biological processes. Some of these underlie the age-dependent increasing susceptibility to disease, the decay of the organism. One of these relationships between age-dependent modifications at the cellular-molecular level and altered health and diseases explains the distinction between longevity and aging, often confounded but deserving separate analysis as will be discussed later in this volume.

Before closing this introduction, let us restate the basic philosophy of this volume. Gerontological literature is quite rich both in conceptualization as well as in experimental reports. Experimental scientists often consider theorization as sheer speculation. Theoretically minded scientists are closer to philosophy than to experimental science and ignore sometimes basic well-proven experimentally established facts. In between, scientific epistemology takes advantage of the positive sides of these two opposite tendencies. Speculation is welcome if it is based on knowledge obtained in experimental sciences. Sheer unfounded speculation is out of our approach in this volume. Hypotheses and theorization do however underlie and necessarily precede experimentation. No experiment can be valid, if not based on a solid working hypothesis. This type of theoretical basis of experimental sciences should not be ignored. Similar considerations hold also for the interpretation of experimental results. Interpretations followed in most cases by predictions fall again in the realm of epistemology. It should however – and this is the great advantage of experimental science compared to sheer speculation – propose a new approach, a new project for further experimentation. This repeated succession of theoretical considerations resulting in a working hypothesis and experimentation to verify it is the essential proposition of the most popular philosophy of science as proposed by Karl Popper in his famous treatise *The Logic of Scientific Discovery* [3]. According to Popper, the theoretical interpretation of experiments is valid only if it can propose further experiments con-
ceived to overthrow and invalidate the previous interpretations. The history of any experimental science proves the validity of Popper’s concept. For these reasons, we asked our colleagues who kindly accepted to contribute with chapters to this volume to follow this ‘popperian’ concept and approach in their areas of specialization. As experimental gerontology has considerably increased over the last decades, both in breadth and depth, only some of its branches could be covered in this volume. We hope however that all our colleagues will find this volume stimulating for their field of research and for the interpretation of their observations.

Ladislas Robert, Paris
Tamas Fulop, Sherbrooke, Que.

References