Understanding the science of longevity [Review of the book The Long and the Short of It, by Jonathan Silvertown]

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In one broad sweep, this packed book reminds us that everything and everyone eventually dies – the real question is how long does it take? By comparing humans with both animals and plant forms, the book highlights theories of longevity across all species and then dwells on the future of the human lifespan. Touching on seemingly different themes of evolution, demographics, aging, rising life-expectancies, heredity, evolution and species suicide, the book builds a big-picture view of longevity across all living species. It eventually touches on the implications on the science of aging and human immortality.

Jonathan Silvertown, a professor of evolutionary ecology at the University of Edinburgh, has made a brave and conceptually difficult attempt to tie together the disparate areas of senescence, lifespan and death across all species of life. He uses these linkages to answer questions that relate to the causes of aging and varying life-expectancies across species. Hypotheses that have been used to provide answers as to why organisms' senesce are meticulously broken down while interspecies comparisons are made. He examines nearly ninety different forms of species ranging from fruit flies to redwoods to explain why they have such different lifespans and why evolution has not favoured immortality.

Mr. Silvertown starts the book by noting the long-standing interest in the varying lifespans of different species. He quotes the words that were carved in 1272 in the Great Pavement at Westminster Abbey:

"If the reader wittingly reflects upon all that is laid down \ He will discover here the measure of the primum mobile \ the hedge stands for three years \ add in turn dogs and horses and men \ stags and ravens, huge sea monsters, the world \ each that follows triples the years of the one before."

Like a puzzle, the book covers different themes in an attempt to provide a coherent explanation of longevity. These themes include aging, interspecies comparisons, role of inheritance in longevity, the natural world phenomena, natural selection and the process of aging at the molecular level. This scientific foundation is interspersed with witty and satirical poetry ranging from Dylan Thomas and Alfred Tennyson to the Roman poet Seneca, among others.

The book contains nine chapters that can be broken down into two parts. In the first part, Mr. Silvertown showed how life evolved from ancestral primitive microbes to animals, fungi, plants, algae, and humans underlying the critical process of single cell division. He moves on to aging and provides an interesting perspective on the different and rising life-expectancies of men and women. He notes the paradoxical fact of how longevity and senescence can occur at the same time. Some parts of this longevity puzzle lies in the genes. This has given rise to scientific efforts to find the 'longevity gene' and to understand the genetic role of diseases.

In the second part, the author moves on to explain the role of evolution and natural selection in explaining the different lifespans of species. There is an interesting discourse on

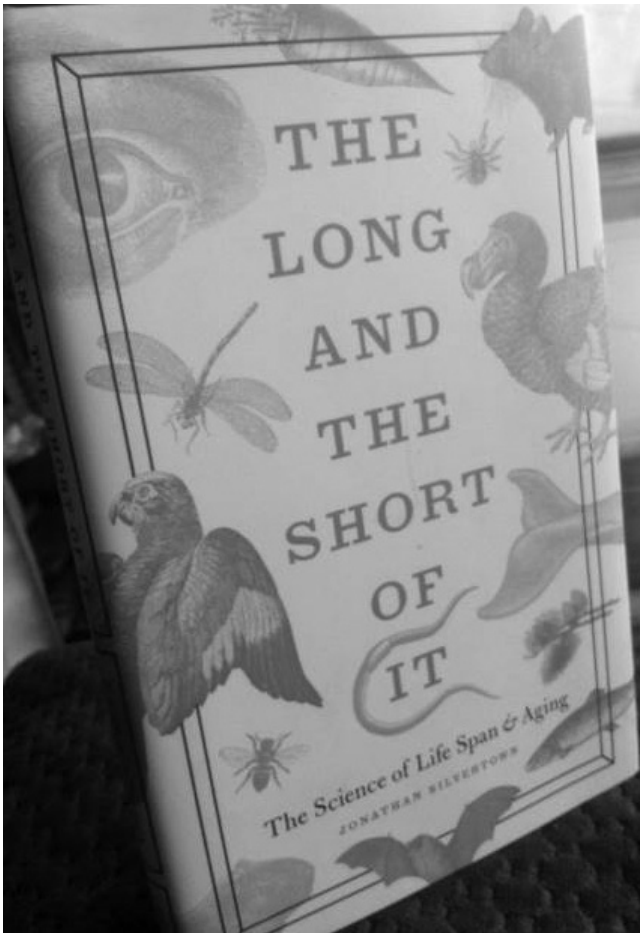

Figure 1. *The Long and the Short of It - The Science of Life Span and Aging* by Jonathan Silvertown. University of Chicago Press. 208 p. C$32.44. *Photo Credit: Mayvis Rebeira, 2015*

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the longevity of trees, some of them capable of living for over a thousand years. He provides an insight into the existence and significance of semelparity or once-only reproduction of some species. Mr. Silvertown refers to the salmon's final journey upstream and interweaves the concept of adaptive death to the benefit of human civilization. By investigating the natural history of lifespan of these various species, the author was able to formulate answers to why we, as humans, live this long and why we eventually have to die. The book ends by noting the effect of human-caused factors such as income inequality on life-expectancy.

"The Long and the Short of It" could benefit more if the author expanded on economist Robert Fogel's work on 'technophysio evolution' which describes the synergy between changes in human physiology and technological advancements. In the last century alone, human lifespan experienced a sharp upward trajectory due to the discovery of germ theory and the arrival of vaccines, better quality nutrition and improved public health infrastructure such as access to clean water. Changes in human physiology have resulted in both increased body-size and capability of human organs. Such changes have contributed significantly to the increase in life-expectancy over the past three centuries.

All in all, the flow and quality of reasoning in this book is impressive. It is scientific (twenty-six pages of references) yet readable as it interweaves biological science and evolutionary history with several interesting anecdotes. It is comprehensive with references to a wide variety of species which enables the author to provide a detailed exposé on the paradoxes of life, survival and death. It moves rapidly between topics, partly due to the sheer amount of information that is covered in the book. For a moment, it enables the reader to step back and marvel at the scientific mosaic which the author has carefully constructed to explain the different lifespans of species and how the power of natural selection can allow for senescence and death.

The topic of longevity is especially pertinent in current times given the health policy issues that can arise from rising life-expectancy of the population and the corresponding increasing demands on resources. It is therefore an intriguing read to understand the complex reasons behind this fact of life.