

# The Time of Our Lives: Why Ageing is Neither Inevitable nor Necessary

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As a geriatrician, I did not expect to learn a lot from a book on aging written for the intelligent layman. But I was wrong.

Tom Kirkwood, one of the world's foremost researchers into the study of human gerontology, has written a book that looks deeply and clearly into this fascinating subject—which he rightly calls “one of the last great mysteries of the living world.” And, as I tell my medical students, whoever unlocks this secret will no doubt be a candidate for the Nobel Prize in Medicine.

In the preface of this slim volume [Time of Our Lives: Why Ageing is Neither Inevitable nor Necessary] Kirkwood lists the questions that he promises to answer: Why do we age? How does aging happen? Why do some species live longer than others? Do some parts of the body wear out sooner than others? Why do women live longer than men? Why do women have a menopause half way through their life span?

Even if the above-listed puzzles interest neither you nor your patients, this final one should exercise us all, “Can science slow my aging process, or help me age better?” We may not want to grow old, but as a wag once put it, “I prefer old age to the alternative.” And, if most of us will try to postpone this particular alternative for as long as possible, how can we hope to age “successfully?”

On the latter subject, the self-help shelves of your local Chapters outlet fairly groan with books touting all kinds of nonsense on the subject. But if you want a clear, concise and scientific answer to the last question for you and your patients, read this book.

Early on, Kirkwood dispels a pernicious notion that unfortunately many gerontologists milk for all it's worth; that is, that the demographic changes we are observing constitute some kind of a

catastrophe. That soon the world will comprise a majority of balding cripples demanding an ever increasing portion of the health and social services budgets. As Kirkwood puts it, “There is an unfortunate tendency to see the graying of the world's population as a disaster in the making instead of the twofold triumph that it really is. Firstly, we have managed—not a moment too soon—to begin to bring soaring population growth numbers under control. Secondly, we have succeeded—through vaccination, antibiotics, sanitation, nutrition, education and etc—in bringing death-rates down.”

One of his major points is that despite the rapid increase in the growth of the 80 plus age group, there is increasing evidence (originally from the United States but now supported by Canadian and European data)<sup>1</sup> that the period of sickness and disability concentrated at the end of life is actually getting shorter, not longer, as life span increases. These new data add further support to the optimistic prognostications of Crapo and Fries' “Squaring of the Curve” hypothesis.<sup>2</sup> In sum, this theory suggests that while maximum life span has not changed much over the past few millennia, average life expectancy (at every age) has increased in the last two hundred years. More to the point, healthy life expectancy has lengthened so that more and more old people are living longer and healthier lives, with the period of end-of-life disability shrinking concomitantly.

One of the most interesting chapters, entitled “What's in a Name?”, attempts to define aging and to distinguish it from disease—not an easy task. And Kirkwood admits that despite our supposed familiarity with the process, “...the precise concept of ageing is slippery to grasp, like a bar of soap in a bath.” He begins by

quoting a British biology professor, J.M. Smith, “Ageing is a progressive, generalized impairment of function resulting in an increasing probability of death.”

But we cannot make much sense out of this definition until we understand why we age and how our cells, organs and body gradually lose function. This chapter begins, as do all in the book, with a relevant, pithy quote, in this case from Eubie Blake, the famous jazz musician, on reaching age 100: “If I'd known I was gonna live this long, I'd have taken better care of myself.”

Kirkwood attempts to answer the “why” question by elucidating his now famous “disposable soma” theory. The fact that all mammalian species have a fixed maximal life span (e.g., rat: 4 years, elephant: 70 years, Homo sapiens: 120 years) was adduced to support the hypothesis that we are all endowed with “killer” genes, activated by some kind of an internal clock. According to this school of thought, when our time is up, our genes do away with us.

However, Kirkwood does not accept this theory and musters impressive data to refute it. He explains that it is not our genes that actually destroy us—this does not make biological sense. Rather, their function from the evolutionary point of view is actually to keep us going for as long as possible. In the end, it is our bodies (the soma) and not our genes (germ-line) which are disposable. The genes have evolved to invest “...enough in maintenance to enable the organism to get through its natural expectation of life in a wild environment in good shape.” From an evolutionary point of view, from which Kirkwood and others insist we must view aging, more than this minimal investment is a waste.

Furthermore, the theory goes on to suggest that there may be design constraints which favour the organism when young at the expense of its long-term durability. A good example would be the

central nervous system's once-only development of a fixed network of neuronal connections set down early in life. Despite cell loss over the years and a lack of the usual repair mechanisms, which are present in many of the rest of our organs, the expanded human brain works well for nearly a century but finally begins to "break down" in very old age.

In the end, "natural selection in the wild is not much concerned with late-acting mutations, which may accumulate unchecked within the genome."

He also clarifies the fascinating connection between aging and cancer. After all, the incidence of most tumours rises asymptotically with age and both involve cellular regulatory systems. At first, Kirkwood disposes of the notion that aging is some kind of anti-cancer mechanism:

"It is not. And yet there is a real connection between ageing and cancer, which has, I believe, much to do with the fundamental distinction between the germ-line and the soma. Somatic cells are cheaply made and disposable, but each somatic cell contains within itself the genetic wherewithal to become germ-like again. Cancer is an accidental reversion to a germ-like state."

Therefore, Kirkwood continues, "The same general mechanisms that protect against cancer protect against ageing. This is why long-lived species [such as *Homo Sapiens*], with their better cellular protection, get cancer later than short-lived species [such as the rat]."

This book explains a complex and fascinating subject with both clarity and panache. Kirkwood, an accomplished scientist, also enjoys the unusual ability for such a professional of being able to write clearly and well. For example, in describing the semelparous form of reproduction (familiar to us through the antics of the salmon) where the parent gives birth and then dies shortly thereafter, he describes in some detail the case of the octopus.

After the babies hatch, the female octopus loses interest in feeding herself and dies shortly thereafter. Kirkwood writes: "In the case of the mother octopus, it is not at all clear why she does not resume normal feeding when the little octopuses hatch. It is not as though she is rushed off her feet—all eight of them—ministering to her little one's needs. All she does is die."

Another example of his way with words relates to the menopausal pituitary's upsurge in FSH and LH in an attempt to get the aging ovaries to cycle once again. As Kirkwood puts it, "...the glandular equivalent of yelling over the telephone at someone who is deaf."

My favourite example of his literary style involves Kirkwood's description of the sperm, the main job of which, as we know, is merely to race up the Fallopian tubes seeking out an egg to fertilize. "...and it is therefore no surprise that sperm have evolved to become little more than DNA packages with big outboard motors."

Ageing is a fascinating yet paradoxically still understudied subject. Perhaps like its related subject death, we tend to deal

with the topic via the psychological mechanism of denial. But how and why we grow old is too interesting and too influential a subject to be ignored for much longer. Kirkwood's book is a good beginning for anyone interested in what will inevitably happen to them and their patients.

And, of course, we must never forget that aging is a process, indeed a long drawn out and relative one. As Oliver Wendell Holmes at age 92 had to say on seeing a pretty girl pass by, "What I wouldn't give to be seventy again!" ♦

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## References

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