

## Book Review

### THE BIOLOGY OF LIFE SPAN: A QUANTITATIVE APPROACH

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LEONID A. GAVRILOV and NATALIA S. GAVRILOVA

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Reviewed by William A. Pryor

Biodynamics Institute, Louisiana State University, Baton Rouge, LA 70803-1800, U.S.A.

This is an interesting book, full of tables and data and polemical in its approach. It is divided into six chapters: "Introduction"; "Individual Differences in Lifetime"; "The Human Life Span"; "Species-Specific Life Span"; "The Search for the Mechanisms which Determine Life Span"; and "Mathematical Models of Life Span." There is also a short and useful conclusion.

One attractive feature of this book is an appendix containing 30 pages of tables of life expectancy data for all animals for which reliable data are available. In addition, the book lists biochemical factors that show a positive correlation with life span (such as brain superoxide dismutase), factors that show a negative correlation (such as red blood cell reduced glutathione peroxidase [Px]), and factors that show little or no correlation (such as red blood cell copper). These tables alone make the book of considerable value.

The authors are critical of much of the published work on life span and challenge many of the accepted concepts. For example, they reject the idea that a fixed maximum length of life applies to a given species. They also reject the idea that "an increase in life span . . . will only lead to more acute economic problems" (p. 9). The authors also are critical of the lack of use of what they term "the colossal archive of exact data on human life span . . . that is available" (p. 17). The lack of use of these data, the authors suggest, leads to mistaken concepts. For example, "It is believed, without any proof, that for every biological species there is a life span limit, independent of the conditions of its existence, beyond which survival is impossible" (p. 18).

The authors also challenge Hayflick's concept of a finite doubling time for cells in culture. They even challenge that the idea is original with Hayflick: "Since practically no reference was made to Swim's original works, Hayflick's articles were accepted as the first and decisive refutation of Carrel's myth that cells are capable of unlimited division" (p. 215). The authors state that in 1978 they revised the "Weismann-Swim-Hayflick (WSH) concept," resulting in the following conclusions: (1) The death of cells in early phases is an artifact. (2) The basic cause of the Swim-Hayflick phenomenon in vitro is the accumulation in the culture of postmitotic cells that are unimpaired from a metabolic point of view. (3) "When the whole evolving cell population is taken into account, the accumulation of postmitotic cells in the culture is not accompanied by a reduction in the absolute number of dividing cells" (p. 216).

The conclusion of the book is, in a way, the most striking section. The authors report (a fact unknown to this reviewer, at least) that in 1978 the American gerontologist Johan Bjorkstan asked Senator William Proxmire to place before the US Congress a proposal that the US military budget be cut by 50%, that the Soviet Union agree to do the same, and that the freed funds be spent for research on aging. The authors comment, "Unfortunately, this proposal was not supported by the American administration in view of the complications in superpower relations which existed at that time" (p. 291). The authors end this section (which was written before the recent revolution in the Soviet Union) with a hope that greater funding for gerontological research will develop in the future.

We now know that military expenditures in both America and the former Soviet Union will be severely reduced in the coming decade. However, the difficulties in translating this reduction into increased funding for science in general, and gerontological research in particular, are vast and well known. Among the

difficulties are economic chaos in the former Soviet Union (and perhaps in America, too, with its overwhelming four trillion dollar debt) and competing societal needs (such as feeding an increasingly hungry and restless population).