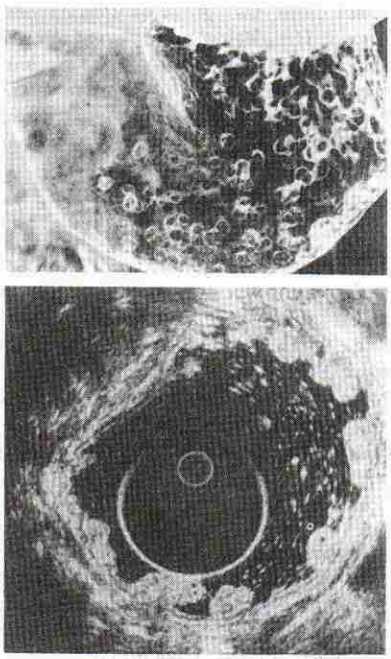
regret that, despite the book's size, many topics receive fairly superficial coverage. For instance, the principles of meta-analysis (chapter 104) are well documented, but insufficient technical detail is given for the reader to know how meta-analysis is actually done. Interim analyses (chapter 69) are carefully justified, but the statistical principles behind rules for deciding to stop a trial get only brief general mention. Curiously, the case for randomisation appears briefly and half heartedly in an early chapter, so that those unfamiliar with the crucial role of randomisation in ensuring unbiased comparisons of treatment might be unconvinced. However, many other aspects—for example, safety data, management of multiple trials, developing a trial protocol—receive substantial treatment in a highly informative style.

The book's most striking feature is its size. Its weight of 3·1 kg is fine for a reference library but is a major problem for those who like to vary where they read. Though of considerable value to specialists in pharmaceutical clinical trials, the book is likely to be too daunting for the general medical reader, who would benefit more from a snappier account of the scientific rationale, methods, and current desirable practice of controlled clinical trials.—STUART J POCOCK, *professor of medical statistics, London School of Hygiene and Tropical Medicine*



Gastric polyps shown by radiography (above) and endoscopic ultrasonography (below), a new imaging technique. From *The Stomach*, edited by S Gustavsson *et al* (Edinburgh: Churchill Livingstone. ISBN 0-443-04417-1).

When your time's up

The Biology of Life Span: A Quantitative Approach.
L A Gavrilov, N S Gavrilova.
(Pp 385; £62.)
Philadelphia: Harwood Academic Publishers, 1991.
ISBN 3-7186-4983-7.

"How is it possible to understand what life is without explaining why it is limited in time and what these limits are?" This is among the questions posed in the Gavrilovs' ambitious work. Their aim is to make a major contribution to the biology of the human life span: their hope is that a programme dedicated to extending human life should be built on this foundation.

They emphasise the importance of quantitative observation, and much of the book is based on analyses of life tables. The Gavrilovs conclude that, between the ages of 20 and 80, mortality patterns in human populations generally follow the Gompertz-Makeham law (see box) and that life tables from laboratory species follow a similar pattern. The evidence they present broadly supports these conclusions (less well for the sexes separately than together). The Gompertz-Makeham model disaggregates mortality into two components, one age dependent (the Gompertz function) and the other a constant. Declines in mortality, it is argued, have been associated with falls in "background" mortality while the age dependent component has remained unchanged, suggesting it is biologically regulated. The authors recognise that "biological" in this context means that part of mortality which, as yet, human endeavour has been unable to alter. Ecological influences are explicitly included in the term "biological," and social factors are held to operate only through their influence on human ecology.

As the authors emphasise, mortality in the oldest age groups does not increase exponentially with age. The Gavrilovs are scathing about hypotheses of "rectangularisation of mortality" and associated "compression of morbidity" and challenge their mathematical and experimental underpinnings. They reject the concept of any fixed species specific maximal life span on empirical and theoretical grounds and contend that there are no grounds for speaking of aging at the cellular level. Experiments that have apparently shown limits to cell replication in vitro reflect, in the authors' view, differentiation (dilution with postmitotic cells) rather than aging. The authors' thesis is that organisms show a progressive cascade-like deterioration until they reach a "one foot in the grave" state, when they succumb to the first challenge. Attempts to reduce mortality from a particular cause are pointless as mortality from other causes will show a compensating increase. The scientific challenge is to tackle biological deterioration and so reduce the risk of death at all ages—that is, reduce the Gompertz component of mortality.

Many of these ideas are familiar, but the book amounts to more than the sum of its parts because of the broadness of the authors' views. The Gavrilovs are not squeamish about challenging the views of other scientists and are unlikely to suffer the fate of Swim,[1] whose work, they think, was undervalued owing to his lack of enterprise in propagandising his results. This makes for lively reading, but non-specialists may find the mathematical sections difficult, particularly as the authors have a penchant for devising their own methods. The book is also rather patchy, and there are some startling omissions, presumably reflecting an East-West knowledge gap. (Smoking is not mentioned once, although quite detailed attention is paid to cause-specific sex differentials in mortality.) In short, the book does not contain the answer to "life, the universe, and everything" but many will find an excursion into it stimulating.—EMILY GRUNDY, *lecturer in gerontology, Age Concern Institute of Gerontology, King's College, London*

1 Swim HE. Microbiological aspects of tissue culture. *Ann Rev Microbiol* 1957;13:141-6.

The Gompertz-Makeham law

Gompertz formula

A mathematical expression devised by Benjamin Gompertz in 1825 as a model for the age specific pattern of mortality. The formula implies an exponential increase in the probability of dying with age, which Gompertz suggested corresponded with "increased inability to withstand destruction."

Makeham formula

A mathematical expression devised by W H Makeham in the 1860s. Makeham found that mortality could be better represented if, in addition to the exponential increase in death with age suggested by Gompertz, a constant term to represent causes of death that were not dependent on age was added to the probability of dying.

Definitions adapted from Pressat R, Wilson C. *The dictionary of demography*. Oxford: Basil Blackwell, 1985.

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