Death to Biologists

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"In the last analysis it is our conception of death which decides our answers to all the questions life puts to us."

- Dag Hammarskjold

Death and dying are of fundamental importance to biologists and medical doctors. Yet, their study is a backwater of research that deserves far more attention. In a PubMed search, "aging" papers outnumber "dying" papers by 10 to 1, and "sex" outnumbers "dying" by 20 to 1.

Death and dying are not being taught, either. Of the three top-selling human biology textbooks, each running to about 500 pages, two devote just half a page to death, the other none. Matters are worse still in the 1,000+-pages of human anatomy and physiology textbooks. In the three highest-level books, one devotes three paragraphs to death, one just one paragraph (but it has a nice description of rigor mortis), and the third has a two-sentence description of brain death.

The medical literature is, of course, awash with studies and statistics on the causes of death; however, these deal primarily with death as fatality. From the number of cases of leprosy or tularemia by state to oddities such as "Fatal hot coffee scald of the larynx"[1] and "Injuries due to falling coconuts,"[2] the causes of death are collected, collated and published. Here, science intersects sociology and politics. A person in the United States or Europe is likely to live into his or her late seventies and die of heart disease or cancer; infectious disease, often swiftly fatal yet preventable or treatable elsewhere, is the probable end in many African nations. The top life expectancy is 83.5 years, in tiny European Andorra; the lowest is 30.8 years, in Botswana, courtesy of AIDS.

Some aspects of death *are* well researched. At the molecular level, programmed cell death (PCD) has been dissected rigorously over the last few years, and at the population level death and reproduction rates have been key to understanding many issues in ecology and evolution. But there is a glaring gap between the two, namely at the level of individual organisms. The revelation of PCD as a complex, orderly component of life sent a shockwave through the scientific community, but it failed to galvanize a systematic study of the likely highly coordinated failures in organ systems and homeostasis that constitute dying.

So we're left with a good grasp of the factors that terminate individual lives, but little idea about what sets the range. For example, why do chickens live 15 years and

Amazonian parrots live to 80? Also lacking is knowledge of the mechanisms by which death comes about. These are huge gaps; death is as rudimentary a quality of biological existence as sex. It is an inbuilt necessity for the turnover of species and the plasticity of adaptation.

Studies of mortality and of the process of dying will provide insights into the organization of biological systems. And it is not outrageous to imagine that they may also provide new approaches to temporarily staving off the inevitable.

There may be a third contribution. Right now a biologist might be able to rattle off the intricate molecular steps of apoptosis, yet be totally unprepared for the progression to death of a loved one. Nonbiologists, perhaps excluding psychologists, almost certainly have still less knowledge. Indeed, the only widely available views on death are religious ones. Might a scientific perspective on mortality, dying, and death provide a valuable, complementary perspective?