



## La vida al límite.

CARLOS PEDRÓS-ALIÓ  
 2013. CSIC, Madrid, Spain  
 142 pp, 13 × 20.5 cm  
 Price: 12 €  
 ISBN 978-84-8319-807-0

The characters created by John le Carré (George Smiley) and Ian Fleming (James Bond 007) live their lives on the edge and to do so they—especially the ineffable 007—rely on sophisticated, clever devices that allow them to fight and triumph against the malevolent forces with which they are confronted. Of the two, Smiley is much more discreet and his challenges are those of the real world, as they arise from the Cold War. But for both men, life always hangs by a thread. Perhaps even more interesting than the heroes from novels and cinema are the flesh and blood individuals who during their lives were faced with extreme situations; some were able to overcome them whereas others met with their death. The first paragraph of *La vida al límite* summarizes the tragic self-perception of a man's end. That man was Robert Falcon Scott, who was hopelessly trapped in the open and frozen environment of Antarctica.

The limits of life that interest Carlos Pedros-Alió are, however, of another kind. In his book, he delves in the bacterial world, which for many years has captured his mind... certainly not fatally. Based on his first-hand experience, as a long time researcher in microbial ecology, he shares his knowledge of how bacteria resist and adapt to extreme environments, where no other forms of life can be found. To appreciate how that is possible, it is necessary to understand the structure and physiology of cells, both prokaryotic and eukaryotic, and their evolutionary changes. Of equal importance is to understand the complexity and characteristics of the physical environment inhabited by the so-called extremophiles. The author's passion for his subject is clear, as evidenced in the many examples aimed at facilitating our understanding and enhanced by the pinches of humor sprinkled through the text.

The accumulation of knowledge requires a degree of culture and learning, both of which we typically begin to acquire in high school. What we ourselves must contribute, however, is interest and curiosity. This small—by size—popular-science book on microbiology and microbial ecology builds on our knowledge and piques our curiosity; as such, it will no doubt interest both experts in this field of science and anyone curious about it. To explain what is life, the author begins, literally, at home; specifically, with a look inside our refrigerators and at our spice racks.

From almost the beginning of microbiology, microbiologists have been immersed in two crusades aimed at refuting two prominent misperceptions of microbes. One is to make us realize that microbes are by no means inferior to the rest of life, whether human, animal, or plant. The other is to allow us to appreciate that microbes are many other things besides pathogens and that our own survival depends on them. The author engages in both of these battles with a simple sentence that follows his discussion of obsolete classification systems. “So, the great diversity of life is among microorganisms, not among toucans and orchids of the tropics, but in the multitude of bacteria, archaea and microscopic eukaryotes living in all parts of Earth.” And the reason for this greater diversity of microorganisms is the 2500 million years during which they were the only living beings on Earth. That was more than enough time for them to develop an astounding number of survival strategies, including the ability to carry out metabolic activity at temperatures as low as  $-20^{\circ}\text{C}$ . Prokaryotic life also occurs in the deep, in deep subsurface and deep sea environments, by exploiting  $\text{CO}_2$  fixation, oil degradation, and ni-

trogen fixation as nutrient sources. In South Africa, for example, the bacterium *Desulfuromaculum* and the archaeal *Methanobacterium* were detected in mines nearly 3.5 km below ground level. There are also suggestions that bacteria have overcome even further limits to life, but these observations await confirmation. The nature and function of the cellular pathways that enable bacterial survival and even growth in extremes of temperature, pH, salinity, radiation, dryness, etc., are truly awe-inspiring.

*La vida al límite* is an example of how research itself has evolved in response to new contributions, both methodological and theoretical, that reflect the talent and curiosity of researchers eager to ask “What if... ?” and to design experiments that will guide them to the answer. But the author ends his book by also asking the question “what is that for?” and even devotes the final chapter to finding out the answer.

After reading this short but lovely book, one is left with a few questions of one’s own: Why, given the joys and contributions of science to our daily lives, and to life itself, is it recognized and promoted in advanced countries, but not in Spain? Why is it so difficult, for the public and especially for politicians, to understand that science is a cornerstone in a

country’s development? The knowledge gained from basic scientific research will have myriad applications in our future. Ignoring these long term-benefits and instead focusing on those to be had in the short-term encourages and supports mediocrity. In fact, the book points out some of the long-term applied benefits of research, which are abundant and have been derived from the efforts of researchers willing to do the hard work without thought of immediate reward.

Thus, in addition to those interested in microbiology and microbial ecology, *La vida al límite* is highly recommended to politicians, either in the government or in the opposition, as well as their distinguished advisors. For these non-scientists, who might claim that their time for reading is limited, I would suggest that they read pages 130–137. But one hopes that in doing so their curiosity and appreciation will be awakened and that they will read this book, from cover to cover. In any case, his/her secretary can make them a summary that they are able to understand even minimally.

**Carmen Chica**

INTERNATIONAL MICROBIOLOGY

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