



Brock Biology of Microorganisms, 9th ed

MICHAEL E. MADIGAN, JOHN M. MARTINKO, JACK PARKER

2000. Prentice Hall, Upper Saddle River, New Jersey

992 pp, 28 × 22 cm
Price: US\$ 70.00
ISBN: 0-13-081922-0

The first edition of *Biology of microorganisms* (BOM), by Thomas D. Brock, was published in 1970. It was a textbook for introductory courses on microbiology, but it was not “another” textbook on the subject. Its novelty lay in the approach given by Brock by emphasizing the functional, ecological, evolutionary relationships of microorganisms and the activities of interests to humans that microbes undertake. I had the privilege of “discovering” and translating into Spanish (*Biología de los microorganismos*, Ed. Omega, Barcelona, 1973) that first edition of by then so “obscure” textbook, just after finishing my Ph.D. Although previously Brock himself had published *Milestones in Microbiology* (editor, 1961), *Microbial Ecology* (1966) and many significant scientific papers and reviews, he was practically unknown in Spain, not to mention the subject of that book. In *Microbial Ecology*'s preface, Brock wrote: “the field of microbiology has undergone revolutionary changes in recent years due to the impact of new developments in cell and molecular biology. Microbes make excellent research tools for the study of many fundamental biological problems, and work along these lines is now being vigorously pursued. [...] The task of microbial ecology is to provide an understanding of the place of microorganisms in nature and in human society. In the past, microbial ecology has been fragmented into a number of subfields, such as soil microbiology, food microbiology, marine microbiology, medical microbiology, etc. I believe it is now possible, and desirable, to integrate these fields...”

Since the 4th edition of BOM (1984), other authors joined Brock in his venture, and in the 8th and 9th editions he passed the torch to Madigan, Martinko and Parker, co-authors in the 7th edition, sure that they would maintain the authority, clarity and wide coverage which were characteristic of the book. Although Brock's name was no longer among the authors, it was incorporated to the title, and is now definitely linked to the textbook.

Each new edition of the BOM / BBOM has been thoroughly revised and updated following the pace of microbiological advances. Although BBOM covers different fields of applied microbiology, emphasizing topics such as medical microbiology and biotechnology, microorganisms have always been the main characters of the book, not for what they

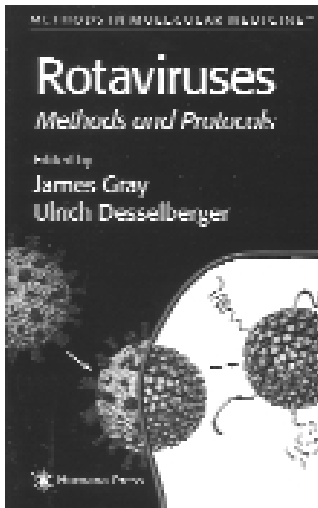
do, but for what they are. Some changes in the two latest editions as well as the new organization of the 9th edition follow the recommendations of the Education Division of the American Society for Microbiology (ASM) for teaching introductory courses. Setting up a companion website was an innovation of the 8th edition of BBOM, which turned out to be a most helpful pedagogical aid. This website (www.prenhall.com/brock), which includes complementary material for each chapter, has been now reviewed and expanded with new learning aids, such as the “Testing Center”, which allows students to assess their own knowledge by taking “virtual exams” on all units of material. Thousands of on-line questions are available, taken from authentic examinations in universities that use BBOM as a textbook resource. The bibliography for each chapter has been expanded, and it is possible to gain direct access to many bibliographic sources through the Internet. The lists of references at the end of each chapter, however, has been removed, and they are available only at the BBOM website. Probably this is not an inconvenience for American students and for those in other developed countries, who have easy access to the www. Several supplements are also available to the instructors. I especially recommend the set of full color transparencies, whose number has increased from 250 in the 8th edition to 275 in the 9th. Instructors whose classrooms are wired for the use of laptop computers can also take advantage of the CD-ROM, which contains practically all the figures and tables of the book.

A final complement of the BBOM 9th edition (Appendix 2) may be overlooked by young students not acquainted with microbial taxonomy. It includes the contents of the *Bergey's Manual of Systematic Bacteriology*, 2nd ed., which had not yet been released when BBOM was published. (BBOM's authors acknowledge George Garrity, Bergey's Manual Trust Editor-in-Chief, for having provided the contents prior to publication.) All the genera of Archaea and Bacteria—both having been given the taxonomical category of Kingdom—that had been recognized at the moment of preparation of the *Bergey's Manual* are listed in this appendix, along with the number of species recognized. Bacterial taxonomy has changed dramatically over the 1990s, mainly due to the advances in molecular biology, and this listing can be very useful to situate taxonomically—provided this practice has any meaning in prokaryotes—the least widely known genera in the current bacterial classification.

The BBOM may seem to exceed the needs for a single introductory course on general microbiology. In fact, the book not only contains the fundamental knowledge which must be taught and learnt—regardless of the contents and extent of the subject in the curriculum—, but it also includes information for those students who may wish to expand their knowledge in the topics covered. With its frequent editions, BBOM is always an updated text. Anybody who wishes to have a complete, recent work containing the fundamentals of the biology of microorganisms, be they researchers, instructors, students or professionals, must know, use and have this excellent, comprehensive textbook of microbiological science.

Ricardo Guerrero

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Rotaviruses, Methods and Protocols

JAMES GRAY, ULRICH
DESSELBERGER (eds)

2000. Humana Press, Totowa,
New Jersey (Series: Methods in
Molecular Medicine)

262 pp, 23.5 × 15.5 cm
Price: US\$ 89.50
ISBN: 0-896-03736-3

Rotaviruses, Methods and Protocols, edited by James Gray and Ulrich Desselberger belongs to the already widely praised "Methods in Molecular Medicine" series. As the editors point out in the preface of the book, this issue is among several volumes in this collection that concentrate on a relatively specialized topic: genus *Rotavirus* within the Reoviridae family. However, rotaviruses deserve this attention since they are the most frequent cause of children gastroenteritis worldwide, and a significant cause of infant mortality in developing countries. In fact, the estimated figures surpass one million annual deaths. Recently, a live attenuated vaccine has been licensed in the United States and shortly thereafter withdrawn because it apparently caused gut intussusception to some recipients.

In *Rotaviruses, Methods and Protocols*, we find chapters describing the major techniques currently applied to the study of rotaviruses, covering basically molecular procedures. Some of the authors are well-reputed scientists with recognized experience in the field of rotaviruses. Contrarily to what happened in some other volumes in this series, i.e. *Diagnostic Virology Protocols*, edited by John R. Stephenson and Alan Warnes, where most of the contributors were from the U.K., the authors of *Rotaviruses, Methods and Protocols* are from laboratories from both sides of the Atlantic ocean.

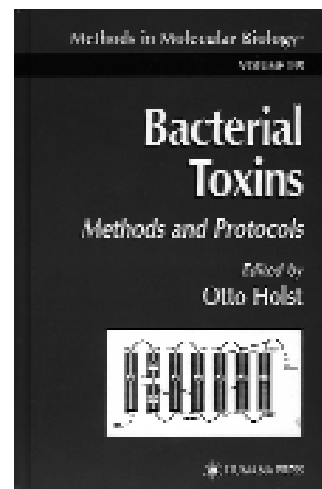
After a good, brief introductory chapter on the basic facts of rotaviruses by one of the editors, U. Desselberger, methods to elucidate the detailed structure of rotaviruses are revised by pioneers in the field such as B. V. Prasad and M. K. Estes. The latter, who is currently the main name in rotavirus research, has also coauthored, with U. Desselberger, a final chapter devoted to future developments. Cell culture techniques, not always simple for the propagation of rotaviruses, appear here with a lot of additional detailed information. The propagation of these sometimes fastidious viruses has enabled the application of techniques such as molecular labeling, blotting and specialized electrophoretic procedures, which are carefully described in the present work. The chapter dealing with methods for the study of virus-receptor interactions—a contribution by H. Greenberg and others—is one of the most innovative chapters of the book. Greenberg has also coauthored a chapter dealing with immunological techniques,

a subject he has shown to master for decades. Three chapters are devoted to the use of animal models for the study of rotavirus pathogenesis; they are contributed among others by L. S. Saif and P. Offit. In recent years, methods for the production and characterization of core-like and virus-like particles have been profusely employed to study rotavirus assembly and are also covered in this manual. Because of the segmented nature of rotaviruses genomes, these viruses have the capacity to evolve rapidly, which is of great relevance for their epidemiology. Hence, methods for the study of genetic reassortant rotaviruses by R. F. Ramig are deservedly found in *Rotaviruses, Methods and Protocols*. The high levels of diversity shown by human and animal cocirculating rotavirus strains require the use of serological and, increasingly, molecular techniques for virus typing and procedures for phylogenetic grouping of isolates; D. Brown among others provide the information required to cover these important issues.

All methodologies in *Rotaviruses, Methods and Protocols* are accurately described and may be reproduced by the reader without major problems. In a few occasions the reader is referred to other publications for detailed information. This is the only flaw I found in this book: the need to look for additional literature to get to the end of the story. In conclusion, *Rotaviruses, Methods and Protocols* can be strongly recommended to basic and clinical virologists who look for state-of-the-art methodologies to apply in their rotavirus studies.

Albert Bosch

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Bacterial Toxins, Methods and Protocols

OTTO HOLST (ed)

2000. Humana Press, Totowa,
New Jersey (Series: Methods in
Molecular Biology, vol. 145)

379 pp, 23.5 × 15.5 cm
Price: US\$ 89.50

ISBN: 0-896-03604-9

This volume in the "Methods in Molecular Biology" series offers a detailed published collection of techniques and procedures needed by researchers operating across the field of bacterial toxins. The concept that pathogenic bacteria might elaborate substances harmful to the infected host emerged shortly after the discovery of these microorganisms as etiological agents of human diseases. Bacterial toxins are macromolecular substances, which following to natural or experimental infection of the host, result either in the impairment of physiological functions or in overt damage to tissues. These

unfavorable effects may lead to disease and even to death.

Bacterial Toxins: Methods and Protocols consists of two differentiated sections based on the classification of bacterial toxins: protein toxins (15 chapters) and endotoxins (5 chapters). Each section is introduced by an overview article (Chapters 1 and 16). Although the 20 different chapters have been written by different authors, they are equally structured and each includes a brief informative introduction, a list of material, and a detailed description of methods, followed by special notes that clarify some aspects of the methodology described, gained through the experience of the authors in their own laboratory. Finally, a full list of recent references is also included.

The first part of the book comprises a collection of representative state-of-the-art techniques that provide a basis for understanding bacterial diseases induced by toxins. Chapters 2–4 describe molecular strategies for purifying and isolating *Clostridium botulinum* type A neurotoxin, Shiga toxins and cyanobacterial toxins (microcystins and nodularins). The possibility of constructing genes coding for bacterial toxins allows to design structure-function studies, as can be seen in Chapter 5. Chapters 6 and 10 describe the planar lipid bilayer methodology using the pore forming toxin as a model. Major biophysical properties of channel-forming bacterial toxins can be derived from electrophysiological data. The proteins of interest are reconstituted in an artificial phospholipid environment, and their ion-transport properties are measured under various conditions. This provides information at the single-channel level on conductance (the capability to pass a given amount of charged particles per unit of time), selectivity (discrimination between different ion types), voltage dependence (the fact that the channel conductance may depend on applied voltage), and kinetic behavior (the mean open and closed times of the channel and its gating properties). Chapter 7 describes the use of Fourier transformed infrared spectroscopy (FTIR) to determine the secondary structure composition of proteins, as well as its applications to determine the secondary structure of staphylococcal pore-forming toxins. Chapter 8 explains the use of fluorescence resonance energy transfer to detect conformational changes in protein toxins, such as the B-subunit of cholera toxin, that has been used as a probe for investigating the interaction of this protein with its ganglioside GM1 receptor. Chapter 9 describes the site direct spin labeling (SDSL) of proteins applied to diptheria toxin. This methodology has become a powerful approach to study structure and dynamics of proteins that are not readily amenable to X-ray crystallography or nuclear magnetic resonance spectroscopy. Chapter 11 deals with the use of surface plasmon resonance for studying macromolecular interactions between proteins, proteins and DNA, or proteins and lipids. Chapter 12 makes the reader acquainted with the synthesis of peptides via a C-terminal "anchor" on cellulose membranes ("The spot synthesis"). Chapter 14 reports de use of T-cell cytotoxicity assays for studying functional interactions between superantigen staphylococcal enterotoxin A and T-cell receptors. Chapter 15 illustrates the study of the blocking action of clostridial neurotoxins by means of different biological models. The content of Chapter 13 differs from the others in that it does not study the relationship between protein structure and mechanism of action, but the use of phage libraries for the generation of antitoxin antibodies.

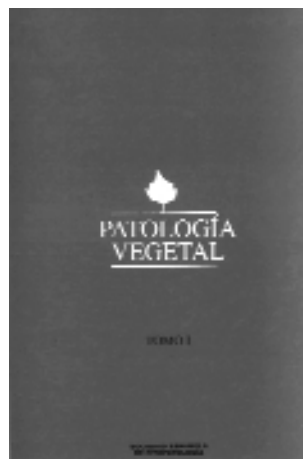
Chapters 16–20 are devoted to the study of the molecular structure of endotoxins by using different methodologies, such as application

of matrix-assisted laser desorption time of flight-mass spectrometry (Chapter 17), or applications of combined capillary electrophoresis-electrospray mass spectrometry in the characterization of short chain lipopolysaccharides (Chapter 18). Chapter 19 describes a method that allows the complete deacylation of lipopolysaccharides (LPS) and the isolation of oligosaccharide phosphates. The last chapter (20) focuses on the description of electrophysiological measurements of a reconstituted lipid matrix of the Gram-negative bacteria outer membrane to characterize various interactions and protein functions.

Bacterial Toxins: Methods and Protocols is mainly a practical book, which brings to light modern methods to study both protein toxins and other proteins and to modify them according to one's own circumstances.

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Patología Vegetal

G. LLÁCER, M. M. LÓPEZ,
A. TRAPERO AND A. BELLO (eds)

1996. Sociedad Española de
Fitopatología and PHYTOMA,
Valencia

1165 pp, 2 volumes, 17.5 × 25 cm
Price: 9500 PTA

ISBN: 84-921910-0-7

This two-volume textbook is the result of the collective work of sixty members of the Sociedad Española de Fitopatología (Spanish Society of Plant Pathology), experts in different branches of plant pathology. The text, in Spanish, offers an overview on this field, emphasizing those pathogens considered to cause the highest impact in Spain. An introductory chapter describes the main topics of plant pathology, whereas the rest make up a rather free review on different topics, including development, current status and strategies of disease control. Besides its contents, the book comprises also several colour plates showing disease symptoms, figures which help to better understand the text, and an extensive bibliography. The text is subdivided into two volumes. The first one comprises an introductory chapter, followed by three sections dealing with virology (twelve chapters), micoplasmology (one chapter) and bacteriology (six chapters). The second book is divided into mycology (thirteen chapters), parasitic plants (one chapter) and nematology (six chapters).

The virology section shows the state-of-the-art of this discipline, and includes, of course, viroids. The first chapters devote special attention to the viral genome, to satellite and defective RNAs properties, as well as to pathogenetic mechanisms. Also discussed are

techniques of transmission, diagnosis and control, including a series of viral diseases which have been described in the literature and identified in Spain. The chapter on epidemiology was written by late Prof. Agustin Alfaro, to whose memory the book has been dedicated. The virology section reflects the dramatic progress made on plant virus knowledge by using molecular biology techniques. The sequencing of the viral genome has allowed a better understanding of some viral mechanisms of interaction with vectors and hosts. Although the book's aim is not to be a report of research carried out by the authors, it does reflect the high level of interest reached in Spain with regards to plant virology research.

The chapter devoted to phytopathogenic mollicutes describes the progress made on the knowledge of the main diseases either caused by spiroplasms or associated to phytoplasmas, and on identification techniques and control measures; it describes also the increasing research on this group's phylogeny. The section devoted to phytopathogenic bacteria discusses taxonomical changes induced by molecular biology studies. The main types of bacterial diseases are described, illustrating the interactions between phytopathogenic bacteria and hosts. Among bacterial diseases described in the literature, those identified in various crops in Spain are pointed out.

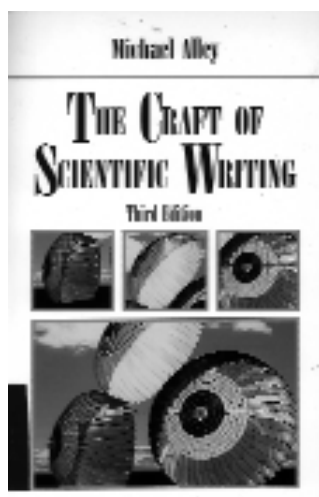
Regarding mycology, the first three chapters of that section analyse general aspects of classification, pathogen–host interactions, epidemiology and disease control; the other chapters are more specific and deal with the main fungal diseases attacking plants in Spain. The authors have decided to group diseases on the basis of global characteristics, and have subdivided them in groups such as vascular, foliar and root fungal diseases, mildews, rusts, smuts, cankers, fungal diseases of woods and of harvested products. This undoubtedly facilitates the task of popularizing plant pathology, one of the aims of the book. In some cases, however, it may lead to a certain degree of taxonomic confusion or impreciseness. A chapter is devoted to parasitic plants, especially to the genus *Orobanchae*. The last six chapters deal with agricultural nematology. They describe nematode species as phytoparasites or as virus vectors of major interest in Spain, in regard to epidemiology, interaction with other microorganisms and their control.

The book reflects the actual fragmentation of plant pathology, which is due to the multiplicity of pathogens, and to the interactions between plant pathology and different areas of biological and agricultural sciences. The book also reflects a rather wide independence in the organization and development of each area, yet it maintains a high degree of unity with regards to the contents of each item. As is the case in most reviews on hot-topics research, it is difficult for the text to keep pace with the latest advancements in the field. The book reflects indeed the time elapsed since it was written—the first chapters date back to 1994, and the latest to December 1995—until it was released. Nevertheless, contributors are authorities in their respective fields, and the book is a good source of information for those interested in plant disease, including advanced students, researchers, instructors and a wide range of professionals with agricultural interests. It appears as a very valuable tool in a field which, over the last decades, has more and more advanced, both from the scientific and the technical points of view. Most chapters include an extensive bibliography which

allows the reader to gain access to an exhaustive documentation to follow the development of different topics. Coordinating the contributions of so many specialists as have coauthored this book is a difficult task, and can lead to differences in the relevance given to some topics, such as some virosis arisen in Spain prior to the preparation of this work, whose vectors have never been developed.

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The Craft of Scientific Writing

MICHAEL ALLEY

1996. Springer-Verlag, New York (3rd ed.)

282 pp, 15.5 × 23.5 cm

Price: US\$ 27.00

ISBN: 0-387-94766-3



The Craft of Editing

MICHAEL ALLEY

2000. Springer-Verlag, New York

155 pp, 15.5 × 23.5 cm

Price: US\$ 10.06

ISBN: 0-387-98964-1

The Craft of Scientific Writing was first published in 1987, and has now reached its third edition. Its author, writer and applied physicist Michael Alley, has taught writing courses to scientists over the past fifteen years. Like Alley's courses, this book aims at helping scientists and engineers to communicate the results of their own work, and to obtain credit for it. Many scientists find it more difficult to put properly into words what they did than it was to carry out the work itself. As the author points out in the Foreword, "when you [the researcher] do not communicate well or are too slow to communicate, the credit often

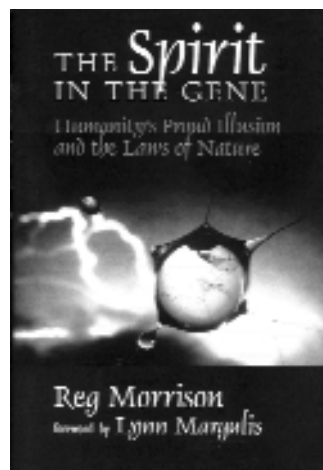
goes to someone else.” The problem is that scientists usually have misconceptions on what scientific writing is, and try to follow rules that they believe will help, and to use tools that they think will always work the same way, forgetting that writing is not a science, but a craft. Although the ultimate goal of writing science is communication, writing can have different purposes, each one needing different tools. Writing popular science for a newspaper or a weekly magazine is not the same as writing a grant proposal or a research paper for a professional journal.

The book devotes two chapters to the structure of the documents; the first chapter deals with organization (beginnings, middles and endings), and the second with the details (transitions between them, depth and emphasis). Language is the topic which has received the most attention: six chapters which deal with precision (choosing the right word; choosing the right level of detail), clarity (avoiding needless complexity; avoiding ambiguity), forthrightness (controlling tone; choosing strong nouns and verbs), familiarity (avoiding unfamiliar terms; defining unfamiliar terms; incorporating examples and analogies); conciseness (eliminating redundancies; eliminating writing zeroes; reducing sentences to simplest forms; eliminating bureaucratic waste), and fluidity (varying sentence rhythms: eliminating discontinuities). Two chapters deal with illustrations, and describe the advantages and disadvantages of each type (tables and figures, including graphs, photographs and diagrams). Four chapters discuss the different kinds of documents (correspondence, proposals, instructions and presentations), and another the format (typography and layout of documents). The last chapter consists of personal advice on the actual writing; it includes tips on fighting the blank-page syndrome, starting the work, and proceeding until the document is finished. Two appendixes help to avoid grammar, punctuation and language pitfalls.

Some of the principles of *The Craft of Scientific Writing* are also found in *The Craft of Editing. A Guide for Managers, Scientists, and Engineers*. Editing is a complex process of scientific publication whose final goal is to improve the text. According to Alley, the three perspectives of editing are content, style and form, each one comprising several subissues which depend on factors such as the audience, the purpose and the occasion. According to its subtitle, the book is “a guide for managers, scientists, and engineers” who deal with scientific and technical writing in business, engineering firms, government labs or universities, either in their own texts or in someone else’s work. A most useful 48-page appendix —“One Hundred Problems of Style”—deals with structure, language and illustration, including aspects on format, grammar, punctuation, and usage (redundancies, pretentious words, misspellings, verb tenses, use of numerals, units, fonts and symbols). A “Glossary of Editing Terms” defines terms which are of use to people who deal with authors and printers. This book is a complement to *The Craft of Scientific Writing*, which, besides helping scientists and engineers to write their own work effectively, provides a first introduction to editing.

Mercè Piqueras

INTERNATIONAL MICROBIOLOGY



286 pp, 23.5 × 15.8 cm
ISBN: 0-80143-651-6

The Spirit in the Gene: Humanity's Proud Illusion and the Laws of Nature

REG MORRISON (foreword by
LYNN MARGULIS)

1999. Cornell University Press,
Ithaca, New York

Two observations about global societies seem obvious to me. First, there are too many humans on this planet. Second, very few humans want to talk, let alone think seriously, about this condition and its implications for the future of our species. These two observations lead to the question “why is it that we humans have already soiled our nest beyond repair, know this to be so, and seem to be doing all we can to avoid confronting the issue?” Reg Morrison, offers us a fascinating, articulate, and ultimately chilling, viewpoint on this critical subject.

Morrison’s thesis is that humanity is enslaved by ideologies and illogical beliefs that keep us distracted from the awful truth, that we are about to suffer an immense population collapse. The culprit is the latest wiring on our evolved brain, a clever coalition of neurons that has allowed us to dominate the environment with our language and technology. But this added brain-power is also keeping us in denial of what we are actually doing to ourselves and the planet. Morrison’s argument leads to the idea that this distraction serves a larger evolutionary purpose. While congratulate ourselves on our superior tool-making abilities and our indulge in our complex rationalizations that go along with it, we are oblivious to the fact that it is our genes, not our minds, that are in the driver’s seat.

The argument is compelling because it appears to cover all the facts. He begins with a list of twelve indicators of global warming and a discussion of the havoc that humanity is wreaking on the planet. According to Morrison, human-generated pollution may be only a trigger, the real problem will come when the permafrost all over the world begins to melt. This melting will release enormous quantities of methane into the atmosphere, a time-bomb that is actually the waste product of archaeobacteria. As the book progresses he shifts to human evolution and, ultimately, to the power of the genetic material within us to direct our destiny as a species, whether we know it or not.

The framework of Morrison’s argument is built on the logical extension of the “interpretive net” that began with Darwin and has evolved into “sociobiology” and “evolutionary psychology.” Sociobiology offers us a way of organizing insights into the behaviors of a social species such as ours. In many respects, it is no different than Marxism or Islam. You take anything you see out there and

you will find an explanation for it within the system. But unlike most other belief systems, ethology, sociobiology, or evolutionary sociology, or whatever you call it, is based on mostly verifiable facts. In this regard, I think Darwin inadvertently created the closest thing to a religion that science has to offer us, a belief system that is testable scientifically. And the only charge for admission to this way of thinking is for us to lose our sense of self-importance, exactly the medicine we humans need right now.

Others working under the umbrella of sociobiology have made similar points before, but Morrison does it masterfully, exposing virtually all of humanity's pretensions. His sweeping vista and impressive detachment is like that of a photographer (he actually is one) stepping back and composing his subject. His references are entirely within the boundaries of current scientific respectability and he is a master at articulating the power of the biological realities within us.

One unique feature of Morrison's book is the frequent use of examples from his native Australia. In discussing extinctions, he draws attention to the gastric-brooding frog (*Rheobatrachus silus*) of that country. This strange frog, unfortunately a recent victim of the worldwide wave of amphibian extinctions, was only lately discovered to have raised young in the stomach of the mother. Other Australian examples, including microbial waste-dumps (stromatolites) and the geometric genius of the retarius spider, are used to illustrate the thread of his argument. Another feature of the book are Morrison's excellent Australian nature photographs (which should have been in color).

While Morrison constructs his thesis under the umbrella of sociobiology, it is the other umbrellas, i.e. religion and "mystical" beliefs, that he draws attention to. He argues that human allegiance to irrational beliefs serves not only to create tribal solidarity, but also to promote the insane population growth necessary for an inevitable population collapse. Both, however, serve a larger purpose, one that is genetically driven. Humans, Morrison is saying, are a youthful pioneer species that has invaded every part of the earth. Like other invading species, it keeps growing until it hits the wall, which he puts in the second half of the 21st century. And, in spite of all the obvious facts, humans continue to believe in things that keep them unconscious of the larger patterns.

While I found *The Spirit in the Gene* to be a fascinating read, two things bothered me about it. First, Morrison uses the term "mysticism" in a way that suggests to me he does not know what he is talking about. I would agree with him that most religions, including secular ones like "sustainable economic growth", have the ability to keep their believers "re-tied" (*re-ligio*) by their emotions and, consequently, be directed according to the larger genetic purposes of the species. What is missing here is an understanding that spirituality is not necessarily religion. (To her credit, Lynn Margulis points out in her introduction that the title of Morrison's book may not be entirely accurate, for the same reasons that I am raising. This book should not have been called *The Spirit in the Gene*. It should have been called *Habitat Holocaust*, a name that was proposed, but ultimately rejected.)

Throughout history, some "spiritual" people have consciously stepped out of the biological cycle to work on altering normal consciousness. The goals of the many sophisticated avenues of spiritual inquiry, ranging from Buddhism to Toltec shamanism, involve the deliberate rejection of emotion, sexuality, and consequently, ordinary society. Why have they done this and what have they found? Does their work qualify as a kind of science, or at least a legitimate, organized inquiry into the nature of things? Morrison probably has not a clue. Even if these people represent only a tiny percentage of the population, they have been working at by-passing DNA's operating system for millennia.

My second problem with *The Spirit in the Gene* is that Morrison, the photographer that he is, simply takes his shot and leaves. Having composed the picture and pushed the shutter button, he feels no responsibility to even offer the bare outlines of a plan to change things. He is completely resigned to the completion of what he calls the "plague cycle". There is no hope. We can, like Morrison, be detached from our destiny, but calling for solutions amounts to not much more than wishful thinking. This is a fatalism that makes ancient Roman astrology look tame. And here is another problem, does an acceptance of the scenario he sees take individuals and institutions off the hook about doing something now? Again, has not he heard of consciousness raising? Some spiritual people, not people mesmerized by religions, actually work at this, and it is not easy. Maybe some of them have something to offer us.