INTERNATL MICROBIOL (1998) 1:241–242

Geomicrobiology: Interactions between Microbes and Minerals

JILLIAN F. BANFIELD, KENNETH H. NEALSON (eds)
1997. Mineralogical Society of America, Washington, DC.
(Series: Reviews in Mineralogy, vol. 35)
448 pp. Paperback, $32.
ISBN 0-93995045-6

The recent controversy over nanofossils in a Martian meteorite and reports of bacteria growing in basalt have once again brought the study of geomicrobiology into the headlines. Thus, *Geomicrobiology: Interactions Between Microbes and Minerals*, comes at a very opportune time. The book, a byproduct of a short course of the same title hosted by the Mineralogical Society of America last fall, provides an in depth look at a fascinating subject. Containing 13 chapters it begins with a review for non-specialists on microorganisms and biogeochemical cycles and concludes with the evolution of the carbon cycle. Sandwiched in between are chapters covering such diverse subjects as prebiotic chemistry, processes at mineral surfaces, biogenic magnetites, and weathering as well as chapters which focus on specific processes (i.e., microbial manganese oxidation, calcite and silica deposition by algae, sulfide mineral oxidation). The first two chapters provide background on basic microbiology, microbial diversity, and biogeochemical cycling. Emphasis has been given to the use of molecular techniques such as 16S rRNA sequence analysis. It is refreshing, however, to see the admission that although molecular approaches can be a powerful tool for getting a more accurate measure of microbial diversity, the identity and function of these newly described organisms known only by their 16S rRNA sequence, remain a mystery. For those less familiar with geochemistry the following three chapters provide background on mineral structure and chemistry as well as biological interactions with mineral surfaces. The inclusion of some basic minerology in the Banfield and Hamers chapter should be most helpful to the non-geologists. The subsequent chapters go into specific examples in more detail. A great deal has been learned in the past few years about the genetics and biochemistry of manganese oxidation and is exquisitely covered in the Tebo et al. contribution. It was surprising to see little discussion of the microbial respiration of metals and metalloids other than iron, manganese, and sulfur, that can lead to mineral deposits (i.e., uranium, selenate, arsenic).

A major disappointment was the apparent lack of editing. Understandably, this volume was produced quite rapidly while one of the editors was on sabbatical. However, only a few chapters are devoid of typographical mistakes which in some case have resulted in factual errors. Nealson and Stahl state that freshwater environments typically contain 100 to 250 mM of sulfate while marine systems contain micromolar amounts (just the opposite is true). Bazylinski and Moskowitz have inadvertently created a new subgroup of Proteobacteria. The volume I received also included an insert correcting a figure in chapter 11, earlier versions did not. Suffice it to say reediting would greatly enhance the utility of this text. Despite its shortcomings, it is a good primer for the novice and an important volume for the seasoned veteran.

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Bacteria in oligotrophic environments: Starvation-survival lifestyle

RICHARD Y. MORITA
1997. Chapman & Hall, London.
529 pp. £69.
ISBN 0-412-10661-2

The way we understand the role that bacteria play in natural ecosystems changes suddenly each time a new methodological approach let us look at them from a different point of view. Epifluorescence counts, for example, brought a new appreciation of the importance of bacteria in planktonic food webs. Thus, at a time where discussions about the relative activity of each individual bacterium have acquired renewed impetus, a book that reviews the degree of activity of bacteria living in nutrient-limited ecosystems is warmly welcome.

Richard Morita has been at the core of some of the most important findings dealing with planktonic bacteria in the last decades: the discovery of barophiles (with C. ZoBell), the presence of large numbers of phage particles in natural seawater (with F. Torrella), or the work on starvation-survival processes. He was also one of the initiators of open-ocean microbiology. He has, thus, a good knowledge of the subject covered by the book, and this can be appreciated just by browsing through the ~ 2000 references the book contains. With such an amount of referenced studies, one would wonder to what level they are digested into the text; and I would have certainly liked some more effort in this sense. The book will be difficult for undergraduates and first-year graduate students, but it will be an

excellent reference to advanced graduate students and researchers. It is worthy the review of "old" literature (i.e. before 1980). We have come to a point where we too easily forget what had been done in the past and, repeatedly, in writing our papers we reiterate arguments that were posted many years before. I truly recommend the reading of these pages to anyone starting to work in open ocean planktonic bacteria. I myself learned a lot.

The central part of the book is concerned with the availability of energy to microbes and the responses of bacteria to the normal state of most environments: oligotrophy, lack of enough nutrients for sustained growth. Thus, the author's sentence "starvation-survival is the normal physiological state of most bacteria". After an introductory concepts chapter, where words like "dormancy, copiotrophs, eutrophs, saprophytes, zymogenous, oligocarbophiles..." are discussed, Morita deals with survival of bacteria, and the availability of organic matter for growth with a strong focus on discussing methods. At this point Morita believes that most of the bacterial activity and production measurements in oceanic waters are too high due to filtration, bottle and priming effects. An overview of bacterial size and degree of activity is followed by a group by group analysis of literature concerning starvation which will be of particular interest to researchers working on pathogen survival and dynamics in alien media. This part is followed by the, to me quite more interesting, discussion of physiology of starvation and survival and the molecular genetics of starvation and survival (a chapter authored by Paul Blum from the University of Nebraska) and the description of the processes making the starved cell more resistant to stress.

Two final chapters are particularly interesting for what they mean in ecological and evolutionary terms. Schrader et al. (also from the University of Nebraska) discuss phage dynamics as related to bacterial starvation. If this is the common bacterial physiological state in many environments, bacteriophages should have become adapted to such situation and the authors discuss in that framework the lysogeny/lytic growth choice, and the possibility of phages adapted to many hosts. In the final chapter, Morita asks whether bacteria in nature require energy for maintenance, a central problem for understanding the survival of bacteria in energy-devoid environments. The author differentiates this maintenance energy to the endogenous metabolism that prepares the cell for starvation but lets the question still open. Summing it up, Morita's book will become mandatory for libraries serving microbiologists and for bookshelves of microbial ecologists worried with the role of bacteria in nature.

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Mycoplasma Protocols

ROGER MILES, ROBIN NICHOLAS (eds)
1998. Humana Press, Totowa, New Jersey.
330 pp. Precio $79.50.
ISBN: 0-89603-525-5

Durante la última década los micoplasmas han ido adquiriendo cada vez mayor protagonismo. Sin duda, ha contribuido a ello la determinación de su papel en diversas enfermedades, tanto en humanos como en animales. Las afecciones que producen son principalmente respiratorias, crónicas o urogenitales. En el sector ganadero son responsables de importantes pérdidas económicas. Aunque todavía no se conoce la verdadera naturaleza de los micoplasmas, ya que son microorganismos de muy difícil manipulación, los avances en las técnicas de laboratorio han contribuido a una mayor comprensión de su biología.

La colección Methods in Molecular Biology, a la cual pertenece este volumen, comprende una amplia serie de títulos que, desde hace algunos años, trata de recoger y actualizar las aportaciones más recientes en técnicas y métodos moleculares en los diferentes campos de la biología, la medicina, etc. Tal como se deduce de los títulos de los diferentes volúmenes —*Plant Gene Transfer and Expresion Protocols, PCR Sequencing Protocols, Antibacterial Peptide Protocols, In vitro Mutagenesis Protocols*—, son esencialmente pautas para el trabajo de laboratorio en cada uno de los temas.

Mycoplasma Protocols ofrece una colección de técnicas útiles para la detección, aislamiento, identificación y caracterización de estos microorganismos, con especial énfasis en los que presentan mayor importancia en clínica y veterinaria. El contenido del libro se distribuye en 33 capítulos, en forma de contribuciones de diferentes expertos en cada materia. Desde la introducción general se trata de ofrecer la definición y la explicación de una entidad como el micoplasma y su significación en clínica humana y veterinaria. El resto de capítulos da una explicación detallada de las diferentes técnicas moleculares que se pueden emplear, análisis enzimáticos, de extracción de DNA, caracterización de los micoplasmas por PCR, entre otras. La bibliografía al final de cada capítulo es realmente exhaustiva, con todo lo cual se obtiene una perspectiva amplia y general de los métodos de manipulación genética de micoplasmas con fines tanto básicos como aplicados.

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Microbes interact with metals and minerals in natural and synthetic environments, altering their physical and chem-ical state, with metals and minerals also able to affect microbial growth, activity and survival.Â Geomicrobiology can simply be defined as the roles of microbes in geological processes (Banfield & Nealson, 1997; Banfield et al., 2005; Konhauser, 2007; Ehrlich & Newman, 2009). Metalâ€“ mineralâ€“microbe interactions are of key importance within the framework of geomicrobiology and also fundamental to microbial biomineralization processes. The term biomi-. 037143 G 2010 SGM Printed in Great Britain.Â The overall scheme is also affected by reciprocal interactions between biotic and abiotic This preview shows page 8 - 15 out of 50 pages. â€¢ Geomicrobiology : the interaction between microbes and geologic materials. Subscribe to view the full document.Â Geology â€“ Main Themes â€¢ Earth is a complicated system with interconnections, both gross and subtle, between living organisms, ocean, atmosphere, and solid rock. Life depends on but also shapes these interactions. â€¢ Our planet is profoundly old, especially compared to human time scales. â€¢ The Earth has changed greatly during its existence and continues to do so. â€¢ Every rock, stream, and landscape has a story; reading these stories increases our understanding and appreciation of nature. â€¢ Most geological processes can be understood in the context of plate tectonics theory. â€¢