

shortcomings. Yet, after reading the part on agroecological farming initiatives in postconflict Colombia, I was left wondering to what degree such practices, although beneficial in terms of ecosystem service provisioning, are effective in lifting smallholder farmers out of poverty.

The final part of the book then focuses on how governance can integrate diverse stakeholders' perspectives to facilitate FLR implementation and includes a must-read chapter dealing with the complex yet underappreciated issue of land tenure and property rights. By highlighting the complexity surrounding the FLR process, this volume makes a compelling case for a more multidisciplinary approach to large scale landscape reforestation. Therefore, it is highly recommended reading for foresters, ecologists, and conservation biologists. Acknowledging and dealing with these complexities may perhaps slow down the FLR process in the short term, but may enhance successful forest restoration in the longer term. This is of utmost importance if we want to counter global warming.

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THE BIOLOGY OF MEDITERRANEAN-TYPE ECOSYSTEMS. *The Biology of Habitats Series.*

By Karen J. Esler, Anna L. Jacobsen, and R. Brandon Pratt. Oxford and New York: Oxford University Press. \$105.00 (hardcover); \$55.00 (paper). xvi + 336 p. + 18 pl.; ill.; index. ISBN: 978-0-19-873913-5 (hc); 978-0-19-873914-2 (pb). 2018.

Outside tropical latitudes, ecosystems with a Mediterranean-type climate stand out for harboring high levels of plant diversity. As in any other rich-species ecosystem, how this diversity has been originated and maintained is the subject of current research. However, the particular emphasis in Mediterranean-type ecosystems (MTE) has been traditionally put in understanding how they have been originated in five independent regions of the world, and why Mediterranean-type flora is remarkably similar across these regions in their form and function. This book nicely presents that answering these questions is not an easy task, and requires expertise from different scientific disciplines.

By threshing several drivers that operate over contrasting spatial and temporal scales, we can deduce from reading this book that MTE and the plant diversity they harbor are the outcome of large periods of climatic and geological stability over millions of years combined with drivers varying often in unpredictable ways at smaller temporal and spatial scales such as rainfall, temperature, fire, and cold. Although stability has reduced rates of species extinction through evolutionary time, variability in several environmen-

tal drivers has opened new opportunities for species to evolve and clades to radiate. Nonetheless, the study of MTE is not new, and great research efforts have been conducted during the last 50 years. The authors take advantage of the rich literature available to provide several examples supporting the fact that despite these five MTE regions sharing similar features, they simultaneously vary in many particularities due to differences, for instance, in biogeographic isolation, evolutionary histories, soil characteristics, species' functional profiles, and their degree of past and present human impacts. Indeed, many of these differences between MTE regions are not fully understood and the book clearly illustrates that the study of their underlying mechanisms is now a frontier of knowledge. The most likely is that the bulk of progress will continue to be made by researchers based on MTE countries. But perhaps this volume helps to overcome the proximity factor. Observed differences in MTE across the globe make them as ideal candidates to study fundamental questions in biology. The book will, therefore, be fantastic reading for two different sets of audiences. For those not familiar with this topic, this volume is a very nice introduction to the origin, main characteristics, and functioning of MTE, which can further serve as a useful tool for helping teach undergraduate courses. Yet, the authors have done a great job in combining well-established concepts with recent novel research in topics associated with ecology (ecosystem, community, and functional ecology) and evolutionary biology. This combination provides a highly interesting review for those more experienced researchers who focus on exploring in depth the processes driving the similarities and differences of these unique ecosystems. For myself, this book makes me ponder new questions while traveling by train through Mediterranean mixed-oak forests in south Spain.

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HIERARCHY: PERSPECTIVES FOR ECOLOGICAL COMPLEXITY. *Second Edition.*

By T. F. H. Allen and Thomas B. Starr. Chicago (Illinois): University of Chicago Press. \$125.00 (hardcover); \$47.50 (paper). vi + 417 p.; ill.; author and subject indexes. ISBN: 978-0-226-48954-4 (hc); 978-0-226-48968-1 (pb); 978-0-226-48971-1 (eb). 2017.

Hierarchy brackets my career. The first edition appeared the year I began graduate school; the second as I approach retirement. Like my colleague Bruce Milne, whom Allen and Starr profile in the new edition's first paragraph, I did not "get" the book when I first read it in 1982. More than three decades on, I now understand and use many of its

concepts, theories, and ideas (I have yet to use their neologism “holon” in any of my own writing), but the volume itself remains difficult, meandering, and oft-times inscrutable.

The authors also note in their introduction that Robert V. O’Neill suggested that *Hierarchy* should be read as poetry, not scientific discourse. O’Neill, author not only of many influential papers and books on hierarchy theory but also of *Tarot Symbolism* (1986. Lima (OH): Fairway Press), knows of what he speaks. *Hierarchy* is not poetry, however. Poetry strips prose to its essentials; a paragraph is held in a single word, an entire book in a stanza. In contrast, *Hierarchy* has grown over the decades from a relatively slim 310 pages (of which 30 were bibliography) to a super-sized 417 pages (to which the bibliography only added five, although there are also 11 pages of endnotes and 21 pages of glossary). The new material adds little and, like the old, still merits editing.

The main message has not changed in 35 years: “Hierarchy theory is significantly the study of the observer addressing a complex system” (p. 3). To paraphrase Hillel, the great Talmudic sage of the first century BCE, the remaining pages of *Hierarchy* are but commentary; go forth and study (Talmud; Shabbat 31a).

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EVOLUTION

FROM BACTERIA TO BACH AND BACK: THE EVOLUTION OF MINDS.

By Daniel C. Dennett. New York: W. W. Norton & Company. \$18.95 (paper). xviii + 477 p. + 2 pl.; ill.; index. ISBN: 978-0-393-35550-5. 2017.

This volume is Dennett’s latest account of the human mind, a mechanism characterized by its ability to comprehend, by means of mechanisms that achieve ends with competence, even when comprehension is lacking. The competence in question derives from processes of evolution by means of natural selection.

Given Descartes’s influential bifurcation of matter and mind, we find ourselves drawn to examine the relationship between the private, and intimately familiar phenomena of consciousness on one hand, and the scientifically tractable phenomena of matter and energy on the other. One might be led to think it just as strange, when drawn in by Descartes’ bifurcation, that reason came to be from what is mindless, as that a material object came to be ex nihilo (John

Locke was thus drawn in by Descartes and understood Mind as the First Cause).

But Darwin’s dangerous idea, according to Dennett, explains how there can be reasons in the absence of *reasoners*. Darwin, for example, cited reasons for the instincts of certain insects. But almost nobody thinks the insects, competent as they are, are privy to the reasons in question. Here we have, as Dennett puts it, *Darwin’s strange inversion of reasoning*, whereby organisms are designed from the bottom up.

Alan Turing likewise provides a strange inversion of reasoning and another example of competence without comprehension. Computers do not comprehend, for the moment at least, the processes by which they so competently deliver results (in many cases, neither do we). Turing’s *strange inversion*, similar to Darwin’s *strange inversion*, emphasizes competence over comprehension. Intelligence of this variety, if one may so call it, is artificial. So the design in question is design characterized as top-down.

No longer looking for comprehension behind competence, no longer held steadfastly within the grip of Descartes’s bifurcation, one may consider our animal brains to be designed from the bottom up, the product of mindless processes whereby organs are developed in relation to selection pressures. When rudimentary memes (i.e., words) very gradually appear in the environment, “selfishly” striving to be replicators, adaptations are provoked whereby human brains serve as the interactors. This transmission very gradually gives way to the evolution of language, culture, and intelligence. And, stored upon this great bandwidth, top-down meets bottom-up. According to Dennett, “There is not just coevolution between memes and genes; there is a codependence between our minds’ top-down reasoning abilities and the bottom-up uncomprehending talents of our animal brains” (p. 413).

As the author is well aware, there is no formalized science of memes heretofore. And, given the theoretical weight he places upon the role of memes, one might wonder if this is not a liability. Are words really analogous to genes? Perhaps it is sufficient that we can understand how words and other memes can descend with modification. Nevertheless, when one considers Dennett’s *tour de force* of scientifically informed philosophy, as he draws upon contemporary, rigorous science, in support of his premises, appeal to memes, given the current state of mimetics, seems an outlier.

Although *From Bacteria to Bach and Back* bears some resemblance to his earlier works, written in the engaging and accessible style to which we have become accustomed, Dennett’s book applies familiar ideas to new scientific developments. His thoughts on artificial intelligence, and the ethical considerations issued in by these technologies, are