MICROBIOLOGY

Handbook of Algal Science, Technology and Medicine.

Edited by Ozcan Konur. Academic Press. Amsterdam (The Netherlands) and New York: Elsevier. $161.50 (paper). xxix + 705 p.; ill.; index. ISBN: 978-0-12-818305-2. 2020.

Microalgae serve as the primary food and nutrient source in aquatic ecosystems, and they absorb carbon dioxide and generate oxygen by photosynthesis. Microalgae can efficiently produce valuable biomass for various applications such as food, feed, and energy, making them promising candidates to meet the challenges and concerns for sustainable bioenergy and medicine products. Edited by Ozcan Konur and authored by leading researchers in algal research, *Handbook of Algal Science, Technology and Medicine* introduces the science, technology, and medical applications of algae. The volume reviews the major algal research streams in the last four decades. It offers a critical introduction and handbook for the stakeholders, including researchers, students, policymakers, and industry leaders engaged in algal research and applications.

This volume is structured into the following parts: Introduction, an overview of the book (Part I); Algal Structures, providing the information on the structure and properties of algal species such as *Euglena gracilis*, Northwest Atlantic seaweeds, and fucoid algae (Part II); Algal Genomics, including metabolic engineering of cyanobacteria for biomaterials, macroalgal genomics on *Euglena*, and essence of stress phenomena of diatoms and haptophytes by omics approaches (Part III); Algal Photosystems and Photosynthesis, introducing the photosynthesis research on diatoms and cyanobacteria (Part IV); Algal Ecology, presenting studies on coastal management in the Mediterranean Sea with macroalgae, roles of phytoplankton for aquatic ecosystem functioning, and CO_2 biomitigation by microalgae culture technology(Part V); Algal Bioenergy and Biofuels, discussing the applications of microalgae to produce feedstocks for biodiesel and hydrogen products, bioelectricity with algal microbial fuel cells, and bioethanol production with green macroalgae (Part VI); Algal Biomedicine, reviewing the research and applications of algal bioactive compounds in medicine, cyanobacterial products for drug discovery and other biomedical uses, bioactive seaweed substances for health benefits, and alginates for wound care and treatment (Part VII); Algal Foods, using algal biomass for both food and feed products (Part VIII); Algal Toxicology, discussing the toxic effects of harmful algal blooms for aquaculture, cyanobacterial toxins and their impacts on human and animal health, origin of crab toxin and food poisoning by poisonous crabs, and microcystins and their effects on environment and human heath (Part IX); and Algal Bioremediation, reporting the applications of algae for bioremediation, including cyanobacteria for biosorption, bioaccumulation, and detoxification of persistent organic pollutants, microalgae for wastewater treatment, algal bioremediation of heavy metals and dyes, and biosorption of toxic chemicals by *Sargassum* macroalgae (Part X).

In summary, this handbook is a valuable tool for booming algal research and its various applications.

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Ecology of Protozoa: The Biology of Free-living Phagotrophic Protists. *Second Edition.*

By Genoveva F. Esteban and Tom M. Fenchel. Cham (Switzerland) and New York: Springer. $159.99. x + 186 p.; ill.; index. ISBN: 978-3-030-59978-2 (hc); 978-3-030-59979-9 (eb). 2020.

ECOLOGY

Fuzz: When Nature Breaks the Law.

By Mary Roach. New York: W. W. Norton & Company. $26.95. xi + 308 p.; ill.; no index. ISBN: 9781324001935 (hc); 9781324001843 (eb). 2021.

The author is on my short list of people I would love to have at a dinner party. Her previous best-selling books on the science of death, the alimentary canal, and sex (to name a few) were both factually correct and peppered with her acute sense of irony and humor. I laughed out loud when reading them and eagerly shared bits with whomever was within earshot. Thus, I eagerly awaited the arrival of her most recent book, *Fuzz*, where she takes aim at the history and practice of managing human-wildlife interactions and conflicts.

I was particularly interested in this topic because I work in this field and have thought deeply about the challenges (scientific and ethical) and irony (most newly developed deterrents do not work for long) of wildlife deterrence. Roach clearly recognizes that all human-wildlife conflicts ultimately are about humans and our perceptions of wildlife.

The people and stories she features are rich in human detail and many are amusing. In 15 chapters she dives into our fitful relationships with carnivores (tigers, leopards, mountain lions, bears), elephants, monkeys, rodents, gulls, geese, vultures, starlings, blackbirds, and many other species that may scare us, sometimes kill us, may eat our crops, kill our pets and livestock, break into our homes, crash into our cars and planes, and may generally harass us.

The author clearly articulates that perspective matters. In India she shares that despite a frightening number of annual fatal encounters with elephants, tigers, and leopards, and despite some people being terrorized by monkeys, the ultimate goal is to figure out how to coexist with wildlife rather than simply shoot or poison problem animals—the all-too-often solution in other countries. Coexistence is a Sisyphean task because animals rapidly habituate to many nonlethal deterrents and these deterrents may be no match against a highly preferred human resource that tips the cost-benefit calculus against avoidance. Thus, Roach, through interviews, and her own calculations, shows that in some cases the damage caused by wildlife is modest compared to other sources of damage, which calls into question the need to aggressively persecute "problem" animals.

The author is an acute observer and although I normally find footnotes bothersome, I learned (and laughed) a lot while reading them and the many anecdotes that peppered the text. I did know that birds do not explode after eating thrown rice at weddings (but people do slip on the rice), I did not know that people could feel that they might explode if they grind up white beans, toast them for a bit, and use it as a rice condiment as a Japanese TV show suggested.

I expect Roach would find it amusing, as I did, that the hardcover book, *sans* the dust jacket, loudly proclaims "ROACH FUZZ" on the spine—something clearly in need of further investigation. *Fuzz* adds the humanity, and perhaps humility, to the study of human-wildlife conflict and as such is not only a very enjoyable read, but an important one for anyone interested in our continued coexistence with wildlife.

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Naturalist: A Graphic Adaptation.
   By Edward O. Wilson; adapted by Jim Ottaviani; art by C. M. Butzer; coloring by Hilary Sycamore. Washington (DC): Island Press. $28.00. vi + 232 p.; ill.; no index. ISBN: 9781610919586. 2020.

Joint Species Distribution Modelling: With Applications in R. *Ecology, Biodiversity and Conservation.*
   By Otso Ovaskainen and Nerea Abrego. Cambridge and New York: Cambridge University Press. $115.00 (hardcover); $49.99 (paper). xvi + 372 p. + 8 pl.; ill.; index. ISBN: 978-1-108-49246-1 (hc); 978-1-108-71678-9 (pb). 2020.

The authors provide a perfect blend of ecological and statistical insight into joint species distribution modeling. This book is an excellent resource for any quantitative ecologist or ecological statistician interested in conducting science-driven analyses with statistical rigor to address pressing questions in community ecology.

Ovaskainen and Abrego begin with a comprehensive overview of community ecology. They highlight the foundational theory and provide context for the type of data, statistical methods, and analyses that can be used to inform our understanding of community assembly processes. Recent and popular species distribution models for individual and multiple species are discussed, as well as the important distinction between correlative and process-based models. Their primary focus is hierarchical modeling of species communities, which falls within the general framework of joint species distribution models. An important advantage of this modeling framework is that it naturally accommodates multiple axes of variation in the data, including multiple species, data types (e.g., binary, count, continuous, zero-inflated), and study designs (hierarchical, spatial, temporal).

In building the foundation of hierarchical modeling, the authors begin with single-species distributions, incorporating variations of linear and generalized linear models. Then they extend these statistical approaches using random effects to enable multiple species modeling, which capture possible shared responses to environmental conditions. Using real-world ecological data, they illustrate the benefits of the hierarchical modeling framework—that it can be used for estimating biotic interactions in species distribution models, modeling species co-occurrence, and capturing dependence in the observation data due to the study design, biotic relationships between species, or dependence in time and across space. Importantly, it can also incorporate species traits and phylogenetic relationships. Inference from these models can be used to address important issues in community ecology, including the identification of regions with similar environmental characteristics or prioritization regions for conservation efforts. Through simulations and examples, the authors provide contextual analyses with well-commented R code using the Hmsc R package for all aspects of model fitting, inference, and prediction.