

## Preface: Building on a History of Dual Careers in the Sciences

Aquatic microbial ecology and the processes of biogeochemistry are coupled and synergistic. The aim of this book is to highlight some perspectives, insights, and data in the coupled fields of aquatic microbial ecology and biogeochemistry when viewed through the lens of collaborative duos—dual career couples. Their synergy and collaborative interactions have contributed substantially to our contemporary understanding of pattern, process, and dynamics. This is thus a book *by* dual career couples, not *about* them.

A great deal has been written about dual career couples—the challenges they face in job searches, spousal hiring negotiations as well as the daily challenges and rewards of working in like-minded professions, often in shared offices or work environments (e.g., Ferber and Loeb 1997). Little has been written to highlight the important contributions many dual career couples have made to contemporary aquatic sciences. This book aims to do just that.

Science has long attracted bright minds, and bright minds often think alike. Most notable are the spousal collaborations of the Curies and the Einsteins, but, in fact, there is a long history of creative couples working together—especially in fields such as ecology and plant sciences. As noted by Slack (1996), “Collaborative marriages were common in botany even in the first half of the nineteenth century in England. However, many of these partnerships were highly imbalanced, as was the case, for example, of the collaborative marriage of Elizabeth G. Knight and Nathaniel Lord Britton. He, a professor of Botany at Columbia by 1891, and she a Hunter College graduate. Their collaboration was one in which he had the sole paid position, and she conducted her research unpaid. Nevertheless, she went on to publish over 300 articles and reviews, edited several journals and even supervised at least one graduate student” (Slack 1996). Theirs was a “personal and botanical partnership.” While their partnership was scientifically fulfilling, it highlights the frustrations of antinepotism regulations, sexism, and bias that have pervaded academia for decades. The Comstocks of Cornell, Anna Botsford Comstock and John Henry Comstock, had a similar professional and personal partnership, with Anna only embarking on a teaching career late in life, having been the “power behind the

throne” for decades. Because Cornell, where she had been an instructor of nature-study, did not permit full professorships for women except in the Department of Home Economics (Henson 1996), only 2 years before her retirement, in 1922, was she finally advanced to full professor.

These vignettes are interesting reading, and the collection of essays edited by Pycior et al. (1996) describes many more, but many of the experiences are not so dissimilar from experiences today, where many dual career couples have to make do in order to advance their collective personal and professional careers. Fortunately, pathways for dual career couples are improving, with many institutions recognizing that spousal collaborative teams often bring a unique and special strength to a collaboration. Whether they work closely on a daily basis, or whether they share only a similar passion for their work but maintain distinct disciplines, couples share “in the joys and the sorrows of their life-companions, but they also have a part in their thoughts, their studies, their labors, their achievements” (Mozens 1913, cited in Pycior et al. 1996). This book hopes to celebrate those thoughts, studies, labors, and achievements.

In the field of aquatic microbial ecology, as is most likely the case in all sciences, dual career couples are more and more common. As recently reported in an article in *Nature* highlighting dual career couples, and based on a National Science Foundation survey, over 25 % of “married people with doctorates had a spouse working in science or engineering” (Smith 2014). The goal of this book was to assemble a series of chapters written by dual career couples—and only by them. The couples selected were invited because we aimed to represent established scientists as well as up-and-coming scientists, those working in both marine and freshwater, across a spectrum of topics, and who represented a diverse geographic area. The end result is the nearly two dozen papers herein, representing contributions from across the globe, from USA to Australia and Europe (France, Germany), and the UK (Wales). More than that, several of the couples originally hail from outside the USA, including Africa, India and Israel. In fact, based on the couples we knew and came to know during this process, we could have filled three volumes rather than just one.

The chapters presented here represent a wide-ranging collection of topics. This is not a structured book, wherein a set suite of topics was outlined and authors chosen to each write their piece of the assignment. Rather, this collection of chapters flowed organically. The first set of chapters begins to unravel microbial diversity, from a discussion of the history of ideas of the microbial web (Sherr and Sherr) to an overview of the drivers of biodiversity (Rynereson and Menden-Deuer) and selective pressures of phytoplankton shape (Karp Boss and Boss), followed by a phylogenetic analysis of bacteria across the freshwater–saltwater continuum (Bižić-Ionescu and Ionescu), and an analysis of the challenges linking biogeochemical models with ‘omics data (Coles and Hood). These chapters are followed by two chapters that address the history of ideas related to stoichiometry (Kilham and Kilham) and their implications related to plankton predation (Mitra and Flynn). Understanding the mysteries of light and nitrogen and their regulation is the topic of the next set of chapters. This part begins with a perspective on the dynamics of saturation responses (Kana and Glibert) and moves to the metabolism of nitrogen in terms of nitrate

reductase (Young and Berges), and ammonium as a paradoxical nutrient (Wilkerson and Dugdale), and the mysteries of nitrogen fixation (Marino and Howarth), and an analysis of the global distribution of subsurface chlorophyll maximum layers (Silsbe and Malkin). The chapters then transition to a series of analyses in which the dynamics of changing ecosystems is the focus, generally using longer-term records or observations, including the Arabian Sea (Goes and Gomes), the Arctic Ocean (Grebmeier and Cooper), the coastal North Sea (Wiltshire and Boersma), and Pensacola Bay (Caffrey and Murrell), to the even fresher waters of the Seine River (Garnier and Billen) and Maine's Mount Desert Island lakes (Roesler and Culbertson). Finally, the last suite of chapters highlights unique systems, processes, and dynamics, from the Sargasso Sea (Pinckney and Richardson) to Australia's Gulf of Carpentaria (Rothlisberg and Burford), the Chesapeake Bay (Sellner and Sellner), and the freshwater hydrothermal vents of the Yellowstone National Park (Aguilar and Cuhel). In all, these chapters take us from the Arctic to Africa, from the Arabian Sea to Australia, from small lakes and Yellowstone hot vents to the Sargasso Sea, and in the process provide analyses that make us think about the structure and function of all of these systems in the aquatic realm.

While the chapters speak for themselves, each chapter is told with a little bit of backstory—a small snapshot into the lives of the couple, who they are, how they met, their children (they are couples, after all), or what else they may enjoy outside of science. It is something special to learn about friendships turned more serious on station, underwater marriage proposals, and at-sea weddings on oceanographic ships. Aquatic science is in the veins of the couples whose work is presented here. The more traditional bios of the authors can be found elsewhere; we are interested to peek into the human dimension of these great teams. This is a book about dual perspectives, and a snapshot into work–life balance helps to put it all in “perspective.”

Our hope is that this book is useful not only for the depth and breadth of knowledge that is conveyed in the chapters, but that this book also serves to be useful for future dual career couples faced with the challenges only dual career couples face. Great teams do make great science. Of the couples highlighted here, 78 % have positions at the same institution. Another interesting statistic here is that 75 % of the chapters herein were first-authored by the distaff side; this just shows who really does the work in these collaborations! This book should give new meaning to the concept of coupled biogeochemical cycles.

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