a rigorous, evolutionary classification of genomic function. The conclusions of this chapter should not be a surprise to anyone familiar with Graur's recent publications and public comments. Indeed, the author has been a vocal opponent (both in the scientific literature and on Twitter) of the type of big data research exemplified by the ENCODE project's conclusion that at least 80% of the human genome is functional. This chapter also details the new evolutionary classification of genomic elements suggested by Graur (Literal, Indifferent, Junk, and Garbage DNA), one of the author's most recent contributions to the field.

The many different concepts covered by this book are illustrated by fascinating examples from the literature, from the role of retrogenes in shaping the length of dogs' legs to the "cool" tale of internal gene duplications leading to the evolution of antifreeze resistance in fish living in the Arctic and Antarctic Oceans. The volume concludes with two additional chapters about the evolution of gene regulation and experimental molecular evolution contributed by Amy K. Stater and Tim F. Cooper, respectively. These chapters comprehensively cover two fast-evolving topics, from the precursor work of Monod and Jacob to the recent genomics of laboratory-evolved microbe experiments.

This book is a must read for anyone lacking the molecular evolution background necessary to make sense of the current deluge of molecular data and, more generally, for anyone trying to keep up to date with the fast moving field of molecular and genome evolution.

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MOLECULAR BIOLOGY: STRUCTURE AND DYNAMICS OF GENOMES AND PROTEOMES.

*By Jordanka Zlatanova and Kensal E. van Holde. New York: Garland Science (Taylor & Francis Group).* $190.00 (paper). xix + 624 p.; ill.; index. ISBN: 978-0-8153-4504-6. 2016.

CELL BIOLOGY BY THE NUMBERS.

*By Ron Milo and Rob Phillips; illustrated by Nigel Orme. New York: Garland Science (Taylor & Francis Group).* $49.95 (paper). xlii + 356 p.; ill.; index. ISBN: 978-0-8153-4537-4. 2016.

This unique book is all about numerical thinking in (cell) biology. In about 100 vignettes, each a few pages long, the authors address all kinds of questions from a quantitative perspective. For instance, if you have always wondered how big the average protein is, or how many photons it takes to make a cyanobacterium, this volume has the (order of magnitude) answers. Each vignette can be read on its own, and Milo and Phillips focus on simple approximations to get close to the numerical estimate they are after. They do a great job of showing readers how one can use simple mathematics to arrive at often fairly accurate estimates, while working with the constraints of the still often surprisingly sparse quantitative information available for biological systems. This lack of quantitative data in biology is an issue the authors point out multiple times, and that they have helped to remedy through their development and curation of BioNumbers, a very useful, free online database that tries to collect a comprehensive set of numerical estimates for all types of biological quantities (disclaimer: I have been a contributor to BioNumbers in the past). Although I am not a cell biologist, I nevertheless enjoyed browsing through those vignettes and picking up some interesting new bits of insight. For instance, I had never wondered if the size difference between mice and whales is mainly due to larger cell sizes in the latter animal, or similar cell sizes but larger numbers. Milo and Phillips take readers through a bit of numerical reasoning to explain that the latter is the dominating component.

Although it is unlikely that someone will read the whole volume from beginning to end, a biologist working on a specific topic covered in the book might start reading the vignettes related to this topic, and then branch out to related topics. I suspect any reader will gain some new biological insights, and along the way will hopefully appreciate the usefulness and power of numerical thinking. If I were to work on any topic covered in this volume, I would ask my students to read several vignettes and then come up with a research question triggered by the vignettes. I suspect there are many good and publishable projects "sitting" in the pages of this work, ready to be addressed and thus continue to make biology more quantitative. A good recent example I can think of is the reestimation of the number of bacterial cells in the human body, which was published in *PLOS Biology* (R. Sender et al. 2016. *PLOS Biology* 14:e1002533; with maybe not surprisingly Milo as senior author) and showed that the often quoted ratio of 10:1 is an overestimate and the number is likely closer to a 1:1 ratio. By publishing this paper, Milo disproved his own speculation in the book that the real ratio is closer to 100:1—which, to me, is the hallmark of great science.

Overall, this is an interesting and highly useful volume, which should sit on the shelf of anyone working in cell biology and related fields, as well as anyone who is just curious about (cell) biology from a quantitative perspective.

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