the book, while I found many references that were new to me. The extremely high number of citations and the detailed way in which many studies are referred to and discussed might, however, represent a major challenge for readers who do not already have a background knowledge on ant–plant interactions. Although a highly welcome contribution for those familiar with ant–plant interactions, the book appears less suitable when it comes to attracting students to the field. I can also imagine that the book would pose a difficult task for an interested nonscientist. In this context, a summarising introduction providing the nonspecialist reader with a synopsis of the (ecologically and/or quantitatively) most important ant–plant interactions and their general roles in the ecosystem would have been highly welcome. So if you want the answer to the question "What is going on in the interacting worlds of ants and plants?" the book can provide it – but only if you are willing to study it completely.

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Book review

Evolutionary dynamics of cancer

Dynamics of Cancer: Incidence, Inheritance, and Evolution by Steven A. Frank. Princeton University Press, 2007. £23.95, US $39.50 (400 pages) ISBN-10 0691133662, ISBN-13 978-0691133669

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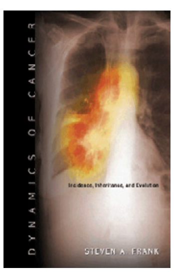

If I were again beginning my studies, I would follow the advice of Plato and start with mathematics. **Galileo Galilei (1564–1642)**

Cancer is one of the leading causes of mortality in many countries. Funding for cancer research has increased by leaps and bounds ever since the 'war on cancer' was declared 40 years ago. This funding together with advances in molecular biology, genetics and computer technology led to the development of animal models and highly automated gene-sequencing technologies that broadened our understanding of cancer tremendously. The current view is that cancer is due to misbehaving oncogenes, tumor suppressor genes or genes that lead to genomic instability. These changes occur because of replication errors, interactions with environmental mutagens, or epigenetic changes that alter the patterns of gene expression in a heritable fashion.

Interestingly, much before this wealth of molecular detail was available, scientists were measuring the rate at which tumors grow or the increased cellular output from the bone marrow in patients with hematopoietic tumors. Epidemiologists were charting the changes in incidence rates with the age structure of the population and comparing rates between different populations. In other words, the biology of old was very quantitative. Perhaps unfortunately, many biologists nowadays are more comfortable discussing genotypes and phenotypes in a descriptive fashion and lose sight of the importance of dynamics in the development and evolution of the tumor as a process in time. We believe that a proper description of the phenotype requires understanding the evolutionary dynamics of the mutant population. We therefore welcome Steve Frank's engaging book *Dynamics of Cancer*, which provides a comprehensive account of cancer dynamics from the perspective of a mathematical biologist.

Ultimately, the language of evolutionary dynamics is mathematics, and a more complete understanding of cancer requires that we look at the problem from a mathematical perspective. Unfortunately, there is a perception that biology is 'too complicated' and that mathematics can only deal with idealized systems far removed from relevant biological processes. As a corollary, the mathematics required for understanding biological processes is seen as either too difficult (daunting to many biologists) or so cumbersome that one ultimately loses sight of the original problem. This argumentation is faulty on several counts: first, what appears to be very complex behavior can often be described by simple equations. Second, the purpose of a mathematical model is not to explain every detail of a biological process, but its fundamental behavior. Only theory can make sense of quantitative data, generate hypotheses and suggest new hypotheses. As Einstein has said, only theory can suggest what to measure and how to interpret it. A full quantitative understanding of the somatic evolution that leads to cancer will be written in the language of mathematics.

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In clear steps, *Dynamics of Cancer* shows the wealth of biological information that can be gained by trying to understand cancer incidence patterns in populations. As Yogi Berra said, "You can observe a lot by watching," and this book is an excellent example of what can be gleaned by intelligent observation. Each chapter starts by Frank clearly defining what he wants to discuss, and then goes on to describe, step by step, the salient biology and mathematics needed to achieve that goal. He devotes two chapters to explain the mathematics necessary to understand the rest of the book, which should be accessible to most biologists with some college mathematics. Subsequent chapters tackle many important issues in cancer including somatic evolution and multistage progression, inherited and sporadic cancer, the impact of aging on cancer, the role of normal and malignant stem cells, carcinogens and tissue architecture. The relevant biology is supported by some of the best literature around and, as such, the bibliography is a gold mine of papers in cancer biology.

The book could not have come at a better time, as interdisciplinary research is increasingly coming to the fore. We believe that the book will serve as a melting pot, bringing together biologists, oncologists, mathematical biologists and computer scientists. It will enrich the work of all these specialists, broaden their perspective and advance the field of cancer research and therapy. All of us interested in cancer biology will benefit from reading this book.

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