

Preface

This book, *Viruses: From Understanding to Investigation*, was inspired by a long career of teaching and research. My students have included undergraduate, graduate, medical, and veterinary students.

As regards the book title, my intent is to lead students of virology from a basic understanding to an interest in the investigations that have provided the information contained herein. The focus of this textbook is on animal and human viruses, only because these have been the focus of my research and teaching for many years. The viruses of plants, fungi, bacteria, and single-celled organisms are certainly no less interesting.

There is a huge amount of information about viruses available online, in journals, books, websites, and blogs. So why the need for another virology textbook? My intent was to organize and present a thoughtful, understandable, and up-to-date summary of the volumes of information available for consumption elsewhere. While every textbook, including this one, contains many facts, I have tried to emphasize general concepts.

With 38 chapters, this book contains more than enough material for a semester long course in introductory virology. The book is geared toward students with some background in cell biology, microbiology, immunology, and/or biochemistry, and I hope that it will be useful for both undergraduate and beginning graduate students. I also hope that no instructor will try to cover all of the material contained herein during a single semester. The book is organized into two parts, the first nine chapters cover topics including an introduction to viruses (containing information on replication cycle, diversity, taxonomy, and outcomes of virus infection), structure, interactions with the host cell, methods for studying viruses, immunity to viruses, and introductions to viral epidemiology, evolution, and pathogenesis. There are also chapters that serve as introductions to RNA and DNA viruses. I imagine that this will be more than enough information for many instructors and students.

The remaining chapters present viruses by family, with information about structure, genome organization, replication strategies, and disease. I have tried to be up-to-date and include virus families that are relatively new (hence these chapters are short). While each

chapter includes basic information about a particular virus family, I am fond of narratives that tie the molecular basis of virus replication to pathogenesis, and have provided examples from a variety of animals, including human animals. The inclusion of "animal diseases" specifically serves as a reminder that companion and food animals play integral roles in human health and well-being. (As do plant and bacterial viruses, but those are subjects for other authors to address.)

I encourage instructors to review the material on virus families and choose a handful of these chapters to use in their courses. Positive-strand RNA viruses are presented first followed by negative and dsRNA viruses. The DNA viruses are presented from the smallest to the largest. Last, but certainly not least, are chapters covering the reverse transcribing retroviruses and hepadnaviruses. I have included some taxonomic information in each chapter, sometimes more, sometimes less. I imagine this to be a reference resource and starting point for students who wish to know more. (And I ask my colleagues not to make these boxes a giant exercise in memorization.)

Throughout the book, I have included brief discussions of both a historical nature (for example, oncogenic retroviruses and an account of the discovery of hepatitis B virus) and current issues such as the recent initiative of the World Health Organization and the World Organization for Animal Health (OIE) to collaborate to reduce human deaths by rabies virus in underdeveloped countries. In the mix are also topics relevant to basic research such as use of vesicular stomatitis virus G protein for pseudotyping and lymphocytic choriomeningitis virus (LCMV) as a model for pathogenesis.

For instructors and colleagues, a final word. You will find the depth of coverage somewhat mixed throughout, and I may have neglected your favorite virus or disease. I am also quite sure that I have presented ideas with which you disagree. Share these with your students, start a conversation, and call me out if necessary. My research manuscripts have always been improved by thoughtful criticism, and if this book is to have a life beyond the first edition, I expect that the same will be true in this case.