

# Preface

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Molecular phylogenetics is important, and I wish to promote it.

Different people have different ways of promoting their ideas and beliefs. Many would use dramatic or witty titles such as “The Communist Manifesto” or “A pain in the torus.” Some would resort to incendiary, but typically audacious or even mendacious claims, such as “What is true in *E. coli* is also true in the elephant, only truer,” “Nothing in biology makes sense except in the light of evolution,” or “All science is either physics or stamp collecting.” Occasionally, some rare authors would adopt even more extreme but less acceptable ways of imposing their views on others, such as Ted Kaczynski the Unabomber.

But I am not capable of dramatizing, and English as my second language prevents me from being witty. Making incendiary or audacious claims seems repugnant to me and to those around me. In particular, I do not wish to impose my views on others just as I am not fond of having others imposing their views on me. So how am I going to promote molecular phylogenetics when all these options are unavailable?

Evangelical preachers often promote their religion by linking their belief to famous people of the past, with the implication that, if such great people have adopted their religion, then you should, too. This has resulted in the creation of fables such as Darwin repenting in his last days and Einstein being God-fearing and deeply religious. Phylogeneticists have often taken the same approach, by highlighting two historical observations. The first is a quote from Aristotle that “He who sees things from the very beginning has the most advantageous view of them,” and the second is that the single figure in the 1859 book by the old man in evolutionary biology represents a phylogenetic tree. If bright people such as Aristotle and Darwin were so fond of tracing natural history back to its beginning, then surely you should, too, shouldn’t you? Being an empiricist, I have tried this trick multiple times in multiple situations. Unfortunately, it did not work magic.

Some authors, confident in their eloquence and passionate about their beliefs, will simply issue a directive: “Please read the book.” This is indeed a simple sentence, but I found it hard and heavy to articulate when my passion is not buttressed by eloquence.

So I will just paraphrase what A. W. F. Edwards said in his lovely little book entitled *Likelihood*. Molecular phylogenetics has been a fertile land for me. I have toiled on it and reaped the harvest. Although I would not claim myself to be a great farmer, I did have the privilege of meeting many great and productive ones on the land who have helped me to settle down comfortably. Given my own positive experience, I have no hesitation to invite you to join me in growing your crops here. This book is the best fruit of my harvest, produced in collaboration with Sandra Sickels and Ashish Kumar of Apple Academic Press. I am presenting it to you, for you to enjoy and to be convinced that it is good fruit from good earth. The book contains many useful advices on how you can grow, and improve upon, the existing crops.

If you are a young mathematics-inclined student interested in phylogenetics, this book is exactly for you. It provides not only a mathematical conceptual framework for molecular phylogenetics, but also algorithmic details and programming tips. However, I wish to take this opportunity to warn you that molecular phylogenetics is not easy and would demand two prerequisites from you. First, you need to have faith in yourself that you can learn molecular phylogenetics well. Second, you should never underestimate the difficulty in gaining proficiency in molecular phylogenetics.

While I generally do not cite religious books in teaching molecular phylogenetics, there happen to be two excellent examples in the Bible to illustrate the paramount importance of the two prerequisites. In the first example, Moses led the Israelites to the edge of their promised land flowing with milk and honey. In order to gather information to facilitate an attack, Moses sent 12 spies to survey the enemy territory. While two spies (Joshua and Caleb) came back with a united voice in favor of an attack, the other 10 were terrified by the giants inhabiting the territory and lost their faith in winning the battle. Their fear quickly spread out of control and the Israelites fled without a fight. Many biology students came to the land of molecular phylogenetics, surveyed its fertile land flowing with milk and honey, but became terrified by just a few symbols and equations that loomed large like giants, and fled without making an effort to gain an entry. Failure is guaranteed when one loses faith in oneself. In the second example, the Israelites came to the edge of Ai, a Canaanite royal city. This time they had in themselves a great deal of faith built up over 40 years of overcoming trials and tribulations. However, they committed the sin of underestimating the difficulty of conquering the city—they sent only

about 3000 half-hearted soldiers into the battle against the well-prepared enemy and consequently got beaten and slaughtered. They did learn the lesson and eventually took the city by mobilizing more than 30,000 mighty warriors and careful deployment of their forces. The bottom line is that you should never underestimate the difficulty you are facing. Many students came to the land of molecular phylogenetics half-prepared, thinking that they could master the subject by just going to the class and listening to lectures. This is equivalent to sending 3000 half-hearted soldiers when 30,000 mighty warriors are required. So have faith in yourself and try your best to mobilize the 30,000 mighty warriors in you. Don't run away and wander for another 40 years before circling back.

This book aims to serve three purposes. First, it is a personal invitation to you from a phylogeneticist. I hope that it will spin an invisible link between you and me so that I can be your personal guide. Please contact me whenever you have issues with my presentation of phylogenetic algorithms and applications. Second, it serves as a self-contained textbook that paves the way to ease your entry into the terrain of phylogenetics. Third, it represents a token of appreciation for the logistic support from University of Ottawa, the research grant from the Natural Science and Engineering Research Council of Canada and, in particular, the love and care I received from my wife and my children. One of the most emotionally voiced phrases by Christians is "God of our fathers." I wish that my children and their generation would someday come to explore this rugged terrain of science, and speak softly and emotionally "This land of our parents."

None of these purposes would be well served without your holding the book in your hand. Thank you for reading.