

## Cladistics: A Practical Primer on CD-ROM

Reviewed by R.P. Guralnick

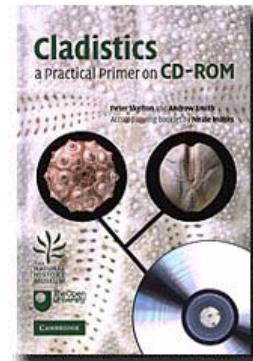
by Peter Skelton, Andrew Smith, and Neale Monks  
Cambridge University Press, Cambridge, 2002, xii + 80 pp.  
0-521-52341-9: \$55.00 (cloth)

Teaching students the core principles of phylogenetic reconstruction is no simple task because it requires students to model change through time both from past to present and from present to past. First, students need to understand that evolution has occurred due to speciation and splitting events from ancestors to descendants (past to present). Then they need to understand that inferring those events requires examining characters in descendant species and reconstructing past hypothetical ancestors (present to past). As Peter Skelton points out in the preface to *Cladistics: A Practical Primer on CD-ROM*, students often "have difficulties getting to grips with the strict logic of the method". From my perspective, learning tree-building is so hard for students because it requires clear mental images (or better yet mental animations) of how diversification occurs and the methods and vocabulary to link with those images. Where simpler methods such as textbooks might fail to provide compelling visualizations and interactivity to let students develop their knowledge about phylogeny reconstruction, *Cladistics: A Practical Primer on CD-ROM* mostly succeeds.

Multimedia production is a challenging business—I know because I spent a portion of graduate school and of my professional life as an educational multimedia designer and project manager. Users tend to expect more from multimedia presentations than from books. In books, long stretches of text are expected. In multimedia, the

user expects to be entertained and attention spans are more limited. Users can be easily bored or annoyed if things don't work the way they expect them to. Finally, multimedia doesn't age as well as books usually do. Having said that, I cannot imagine a better topic for multimedia treatment than cladistics and the authors of this product have overall done a good job finding a balance between content, animation, interactivity, question-asking and challenging "games".

I should explain that this "book review" is really a review of a supplemental book and the CD-ROM itself. It took me a little while to orient to the product here which is a CD-ROM that is the main piece of work and a book that serves as kind of a supplement to the CD. Both book and CD-ROM are organized into five major sections: First Principles; Characters and Homology; Cladograms and Trees; Fit and Robustness, and a "practical" section where the users apply the knowledge they have accrued through taking the course. The order of presentation is generally very good, especially given that it is hard to present a linear order to a discipline that is based, in my opinion, on reciprocal illumination. My only quibble is that the authors



don't spend quite enough time on some of the core concepts like: all organisms have a common ancestor; there is one history of life that we can reconstruct; and that the order of diversification of can be represented as a bifurcating trees. Instead, the authors quickly jump into tree-inference and characters.

Although in the preface, the authors claim that the booklet that houses the CD-ROM can be a stand-alone teaching aid, it is a bit of a stretch. The booklet is organized based on sections and screens shown in the CD-ROM, and many passages of the book refer directly to content on the CD-ROM. Headings in the book (e.g. "Section 11/21 to 14/21") don't make sense without the CD-ROM and its well labeled sections and screens. I found it strange to have a content-rich book referring to a content-rich CD-ROM. There is a tremendous amount of information presented on the CD-ROM and it can be overwhelming just dealing with the CD-ROM alone. It is hard to picture someone going from this dense book back to the dense CD-ROM screens with text, images, animations and interactivity. It doesn't work for me. Either you read the book and wonder about what you are missing on the CD-ROM (or how the book's black and white pictures are in color and move around on the CD-ROM)—or you just deal with the CD-ROM. The book also suffers from omissions. For example, I can't understand why the CD-ROM has a useful glossary of terms that doesn't show up in the book at all. It would seem that glossaries in particular are something that would be useful in a book like this—instead of popping up a new window on my computer screen to read a glossary item, I would have actually preferred to refer to the book.

Although I think the material on the *Cladistics* CD-ROM is top-notch in terms of pedagogy and the careful explanation of many important concepts, it doesn't always have the technical savvy to complement the content. The interactivity is somewhat limited, and feels a bit clunky by today's standards. It usually revolves around entering data or highlighting sections of an image. The multimedia producers could have utilized standard interactive techniques like "object dragging and dropping" to

much better illustrate certain points. For example, users could select morphological characters and move them to different spots on a phylogeny to understand transformation series. Some screens present massive amounts of relatively small font-sized text so much so that I decided to skim those sections instead of giving them my full attention. I understand this application is probably supposed to be used by college-aged students and doesn't have to be a video-game, but the lack of sophistication is still noticeable. The product risks losing people who might otherwise really get involved and interested due to that lack of sophistication.\

On the plus side, I had no difficulties getting the application up and running; there is basically no installation, just click on the application icon when you load the CD. The general layout and design is solid, and navigation proves straightforward. The use of sound is very effective, and the narrator does a good job of leading the user through the screens. I also found some of the interactives compelling. I particularly liked being able to slide one sequence against another as a way of representing alignment of gene sequence data. I also liked the many screens that explain how to choose among alternative trees given a set of characters that vary in their states; users work slowly from simple to more complex examples, which allows them to use knowledge accumulated in one step to progress towards the next.

Overall, I consider this product a qualified success. I would predict that most students will more quickly and effectively learn core tenets of phylogeny reconstruction using *Cladistics: A Practical Primer on CD-ROM* (an approximately ten hour course) than if learning on their own or from a textbook. In courses, the CD-ROM would be extremely useful for reinforcing concepts or as a general introduction to cladistics. However, I also think that there is room to improve upon the product and to continue to better leverage multimedia technology to represent the core principles of evolutionary history and its reconstruction. *Cladistics: A Practical Primer on CD-ROM* is an important, major step in the right direction.