

The role of textbooks in communicating developmental biology

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ABSTRACT Writing a textbook that synthesized the field from the perspectives of embryology, genetics, cell biology and molecular biology was a challenge. Because this field evolves so rapidly, a textbook can only lay the basic foundation for understanding new information and provide the framework that helps scholars place new information into context throughout their career. In this essay, I propose that an international college of specialists be established to provide authoritative online updates on developmental biology topics as a service to students and the professional developmental biology community.

KEY WORDS: *textbook, communication, online update, RNAi, internet*

Background Information

Scholarly Interests of the Author

My research is focused on the study of embryonic development of *Xenopus laevis*, the South African clawed frog. This organism has long served as a paradigm for vertebrate development and has played a major role in most of the significant discoveries in developmental biology for the last two decades. Current research involves the use of the technique of transgenesis to study the roles of Bcl-xL and ING1 in development.

I have often been asked why I decided in the mid-1970s to write a textbook on developmental biology. The main reason was that it had not yet been done. Why did I think I could do this? The answer is simple: I was naïve. I had no idea how this project would consume my life and define my existence for so many years. However, I will never regret having made that decision, because I believe I was able to synthesize the field in a way that benefited students. Back when I first contemplated writing the book, the only existing textbook that served as a model for such a project was a book written by my Ph.D. supervisor, Nelson Spratt. Spratt's book was written in the late 1960s/early 1970s, well before the grand union of embryology, genetics, cell biology, and molecular biology had made a significant impact on the study of embryonic development. While writing the first edition of my textbook, I made an effort to describe development from the perspectives of these disciplines. The textbook appeared as three editions in 1980, 1984, and 1991, with the third edition including Bill Jeffery and Carol Erickson as co-authors.

A textbook has a key role to play in education: It provides the foundation of knowledge in the field and provides the framework that helps scholars place new information into context throughout their career. This enables them to continue to make sense out of random bits of information and allows them to gain wisdom.

So, there we have the *raison d'être* for textbooks: to serve as a foundation of wisdom. Thus, the onus on the textbook author is tremendous.

Representative Publications

- BROWDER, L.W. (1997). Gene expression, cell determination and differentiation. In *Textbook of Tissue Engineering* (Eds. Lanza, R., Langer, R. and Chick, W.) R.G. Landes, Austin, Texas, pp. 79-86.
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Lessons Learned

What did I learn during my journey as an author that would be of value to other presumptive authors?

- Writing a textbook will take longer than you ever imagined.
- Writing requires blocks of uninterrupted time.
- You don't find time to take on a task like this; you **make** time to do it
- Seek advice you trust from as many colleagues as you possibly can and accept it as being constructive. (If you have a thin skin, this isn't a job for you.)
- Remember your target audience; you are writing for students, not to impress your colleagues. Test your material on your students and value their feedback.
- Keep reminding yourself why you are writing this book: You are introducing them to one of the most incredible processes in Nature.
- Embryonic development is visually exciting, and modern imaging technology conveys development dramatically; exploit this!
- Simple graphic artwork is invaluable for illustrating complex concepts. A good graphic artist is an invaluable colleague.

New Challenges Facing Textbook Authors, Instructors and Students

With each edition of *Developmental Biology*, it became more challenging to cover the spectrum of development as the field became more complex. The complexity of developmental biology places a tremendous communication burden on author(s) and instructors alike. The advances in our understanding of development in the last decade have been spectacular. Furthermore, the societal implications of basic research in developmental biology have become so much more acute. We are on the cusp of achieving sufficient understanding of directing the genomes of cells to make it possible to repair or replace body parts. Consequently, public interest in our discipline and the demand for knowledge of developmental biology will increase accordingly.

No single textbook can cover the entire field of development and respond effectively to the rapid progress of research. Is there, then, still a need for textbooks as a developmental biology learning platform? Absolutely! However, no textbook in this field can stand alone; it must serve to provide the foundation for understanding new information. The traditional textbook lacks the flexibility to keep abreast of progress in such a dynamic field as developmental biology. New technologies and research results can sweep through the developmental biology community rapidly and completely change our perceptions. An example is RNAi, which was first described as a means for conducting loss-of-function experiments in worms in 1998 (Fire *et al.*, 1998). It took the *C. elegans* community by storm and became standard methodology within a matter of months.

Because developmental biology is such a rapidly evolving field, students must have access to current information and guidance for placing that information into the proper context. That is beyond the function of a textbook. Another limitation of developmental biology

textbooks is that the entire breadth of this diverse field cannot be covered in sufficient depth in a textbook. By necessity, a textbook author selects material that s/he thinks is appropriate for inclusion for the majority of students. This will never suffice for all courses. This provides an opportunity for others within the developmental biology community to contribute to the dialogue.

Modern electronic communication technologies make it possible to overcome the limitations of textbooks. Students today are comfortable using these tools to access information. Electronic search engines will reveal a myriad of information about developmental biology, but the authenticity of that information is often in doubt. The old adage—"A little knowledge is a dangerous thing"—is quite relevant. What students, investigators and laypeople alike require is authentication of information.

The role of textbook authors, publishers, and scholarly organizations as gatekeepers is key here. They have the credibility to serve as authoritative sources of online information to supplement textbook material. We have come to rely upon publishers to evaluate material published under their auspices as being authoritative. Likewise, scholarly organizations have credibility as protectors and proponents of their discipline and can call upon the expertise of their members.

A Communal Effort

I propose the establishment of an international college of specialists who can provide authoritative online informational updates as a service to both students and the professional developmental biology community. This college should do more than merely review the current literature; it must also evaluate the literature for its significance and relevance. Without context, information can never be converted into wisdom. The establishment of such a college would be recognition that developmental biology is a dynamic discipline that is undergoing constant development itself and that requires ongoing assimilation of new information into the body of knowledge. Our understanding of this field must undergo constant revitalization, and the college would be an invaluable tool for helping us deal with the information overload that affects all of us. It is my fervent hope that our scholarly organizations and publishers of both textbooks and journals will play essential roles in establishing this organization.

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