

## Their Future in Your Hands: Inspiring Undergrads to Pursue Ph.D.s

You may find it surprising that liberal arts colleges are remarkably adept at training not just future Ph.D.s, but especially successful ones. If institutions are ranked according to the percentage of their graduates who go on to receive Ph.D.s, three of the top six are liberal arts colleges.<sup>1</sup> What are liberal arts colleges doing to put them on equal footing with top research universities such as Caltech and MIT? The advantage appears to be the close working relationship of students and their professors. The running joke is that the success of these colleges is due to the absence of graduate students. The truth within this witticism may be that all of us are examples that either inspire or discourage undergraduates from pursuing science. What can you do to better motivate undergraduates? We offer here some simple strategies, derived from our experiences at two liberal arts colleges, which can help all of us to guide undergraduates to become successful scientists.

### Model

Tell students what great jobs we have. Reflect on what we all take for granted—flexible hours, no boss, no dress code. As scientists and professors, we are free to pursue our intellectual interests and are paid to do so! Debunk the myth that we make no money. Not only are most of us well compensated, but the benefits (including college tuition reimbursements) are great. We also enjoy flexibility in scheduling—a perk not shared by industry scientists. Most in academia have stable jobs and are unlikely to be transferred or laid off, even in troubled economic times. Consider how you demonstrate your job satisfaction to students. Stressed-out, complaining professors do not make attractive role models.

### Inform

Inform young students about earning a doctorate in science. Most undergraduates and parents don't realize that a biomedical Ph.D. is often free and that graduate students may be paid to pursue their advanced degree. Staying in school also delays student loan payback, and medical

school may be free with an M.D./Ph.D. degree. Emphasize the leadership capacity that a Ph.D. student acquires in making decisions about the direction of research while also working at the bench. Early exposure to this information is crucial because it can spark students' interest and helps them improve performance in their coursework.

**Tell students what great jobs we have.**

### Interest

Introduce students to the excitement of exploration and discovery in the first year to encourage students to stay in science and allow for earlier entry into the research lab. Topics that

allow students to relate coursework to their own lives can grab their interest. Examples such as prions and mad-cow disease make the study of proteins more pertinent to teenagers. Draw attention to what is *not* known. Teach what is still to be discovered, understood, or applied so that students don't feel that everything interesting is already done. What is left for them to dream of solving?

### Engage

Engage students by undertaking research projects in laboratory courses. Even simple projects allow students to begin to think like scientists. If freshmen tackle simple experimental design and hypothesis formation they will be prepared to pursue more complex independent research in later years. The first year is not too early to begin to look at figures from journal articles. Incorporate these into your courses to allow students to see that class topics encompass a vibrant field of science. If we let students *be* scientists, they can discover their own passion for discovery.

When students become interested in research, we all know that the best place for them is in our own research labs. Students who have their own project engage in science in a unique way. Intensive research with a mentor, especially during a focused time such as a summer research program, can ignite a student's interest in science. An opportunity for students to share their results in poster sessions creates a special energy and excitement. Finally, bring your research students to meetings where they can



**Teach what is still to be discovered, understood, or applied so that students don't feel that everything interesting is already done.**

**An important component of inspiring students is to have high expectations of them.**

participate in science, meet graduate students, and be recruited by professors and programs.

### Inspire

Share your wonder of science in your class. Tell your students the great stories. Share your own “ah ha” moments, and relay the folklore of science discoveries that happened in the lab down the hall or across campus. Have students read some of the simple articles that appear in great journals (e.g., the brief communication published in *Nature* that described the use of the polymerase chain reaction to determine that certain types of fish are often mislabeled in the market<sup>2</sup>). Discuss the Nobel Prizes when they are announced: The website (<http://nobelprize.org>) is comprehensible for undergrads. Relay to students the scientific accomplishments of your alumni. These approaches help students to see a doctoral degree as accessible. An important component of inspiring students is to have high expectations of them. You will be surprised how often they will rise to your expectations.

### Advocate

Advocate for a curriculum that requires students to synthesize, solve, and evaluate rather than memorize. Encourage your institution to have a summer research program that includes a

poster session. Ask your professional association to sponsor undergraduate events, including a poster session, at annual meetings. Bring underrepresented minority students to meetings (like the ASCB Annual Meeting) where they can meet minority faculty and students. Lobby for undergraduate travel awards.

With simple adjustments to our own behavior, and simple modifications to our classroom teaching, laboratory practices, and institutional policies, we can better represent to undergraduates the requirements and rewards of a doctoral degree in science. You never know what will resonate. One student recently remarked that she was first inspired while washing glassware in the lab, intrigued while listening to ongoing discussions of research. This experience “sparked in me the idea that I could be part of a team that could uncover something no had ever found before.” ■

—Martha J. Gossel, *Connecticut College*, and Jennifer Roecklein-Canfield, *Simmons College*

### References

<sup>1</sup>Cech TR. (1999). Science at Liberal Arts Colleges: A Better Education? *Daedalus* 128, 195–216.

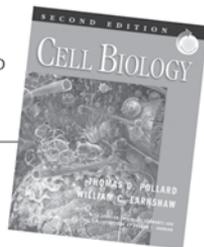
<sup>2</sup>Marko PB, Lee SC, Rice AM, Gramling JM, Fitzhenry TM, McAlister JS, Harper GR, Moran AL. (2004). Fisheries: Mislabelling of a depleted reef fish. *Nature* 430, 309–310.

## A concise yet comprehensive resource

### Cell Biology 2nd Edition

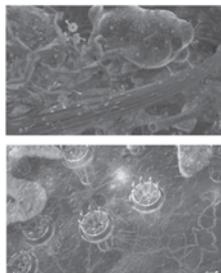


by Thomas D. Pollard, MD, William C. Earnshaw, PhD, FRSE with Jennifer Lippincott-Schwartz, PhD



#### What's New in the 2nd Edition of Cell Biology?

- The latest version of this masterful introduction to the field now includes:
- ▶ Spectacular new artwork by gifted artist Graham Johnson of the Scripps Research Institute, giving students realistic drawings that show the correct relative sizes and the shapes of all of the molecules for the first ‘life-like’ views of virtual cells at the molecular level.
  - ▶ New chapters and sections on the most dynamic areas of cell biology, including organelles and membrane traffic, RNA processing (including RNAi), and updates on stem cells and DNA Repair.
  - ▶ New easy access guide enables students to find figures featuring popular model organisms and specialized cells throughout the book.
  - ▶ New keystone chapter on the origin and evolution of life on earth.
  - ▶ Improved organization and an accessible new design increase the focus on understanding concepts and mechanisms with a ‘bottom-up’ approach, allowing students to learn and retain general principles.



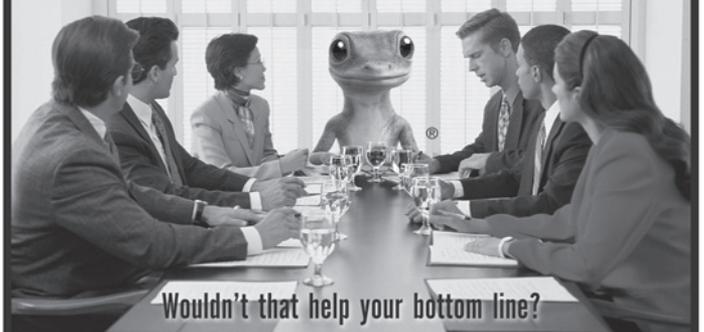
To request a desk copy: [www.elsevierhealth.com](http://www.elsevierhealth.com) or 1-800-222-9570

928 pages, 1,500 illustrations  
©2007, \$94.00, Hardcover,

With **FREE** Student Consult  
Online Access

A Saunders Title  
ISBN-13: 9781416022558

Get an exclusive member discount on GEICO car insurance.



Wouldn't that help your bottom line?

GEICO and ASCB have teamed up to offer a special discount on car insurance.

Special member discount



To find out how much you could save, visit [geico.com](http://geico.com) or call 1-800-368-2734 today.

Visit [geico.com](http://geico.com) for your FREE, no-obligation rate quote and be sure to select ASCB when asked for your affiliation. New customers save an average of \$500 when they switch.

GEICO offers you:

- Outstanding, round-the-clock service online or on the phone, even on holidays and weekends
- Fast, fair claim handling
- Money-saving discounts

**GEICO**  
[geico.com](http://geico.com)

Some discounts, coverages, payment plans, and features are not available in all states or in all GEICO companies. Discount amount varies in some states. Discount is not available in all states or in all GEICO companies. One group discount applicable per policy. In New York a premium reduction is available. ASCB is compensated for allowing GEICO to offer this auto insurance program to ASCB members. GEICO auto insurance is not available in Mass. Government Employees Insurance Co. • GEICO General Insurance Co. • GEICO Indemnity Co. • GEICO Casualty Co. These companies are subsidiaries of Berkshire Hathaway Inc. GEICO: Washington, DC 20076. GEICO Gecko image © 1999 – 2008. © 2008 GEICO