Building an Open Textbook for Cell Biology – 2023 Update

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Introduction

In recent years, colleges and universities have expressed a commitment to increasing the use of Open Educational Resources (OER) in their courses, including UBC and OSU. Cell Biology is a core course in every biology program in North America, and yet no widely available open textbook exists.

To this end, we have created an open virtual e-Book, which will be hosted by OSU, and freely available to all who wish to use it. It is expected to be available in time for the fall of 2023.

Anticipated Project Impacts

1. **The primary impact for students is a significant savings in textbook costs.**
   - Oregon State University anticipates a savings of 50 400$USD (63 200$CDN) for it's 700 cell biology students.
   - If all of BIOL200 (both campuses) were to adopt this textbook, the overall savings to our 1900 students per year would be roughly 190 000$CDN, based on our current textbook cost (~100$ CDN).
2. **Roughly 200 new, CC-licensed images were created by Heather Ng-Cornish, which has greatly increased access to high quality cell biology figures available to all faculty.**
3. Each chapter includes a variety of end-of-chapter review questions, to help support student and faculty with incorporating the book. We have also created two new videos (on CDK activation and co-translational insertion) with the help of the OSU media team.

Textbook Content

We have taken a problem-solving, based approach to the material, as has always been the case in BIOL200. This means that each chapter will include a combination of cell biology content, as well as techniques that are commonly used and relevant to the chapter. We have included real data (where possible, as copyright allows), and review questions that help students to think more deeply about course material.

Included Chapters

- **Chapter 0:** First Year Review and Background information
- **Chapter 1:** Visualizing Cells Through Microscopy
- **Chapter 2:** Biological Membranes
- **Chapter 3:** DNA, Chromosomes and the Interphase Nucleus
- **Chapter 4:** The Endomembrane System
- **Chapter 5:** Mitochondria & Chloroplasts: Structure-Function Relationships
- **Chapter 6:** The Cytoskeleton
- **Chapter 7:** Cell Signaling
- **Chapter 8:** The Cell Cycle and Mitosis.

Future Plans

This would require additional time and resources to do. Potential chapters include:

- Extracellular matrix in plants and animals
- Cell-to-Cell Adhesion
- Programmed Cell Death

Additional Problem-Solving Resources

- Development of vetted problem-solving and data analysis questions would greatly improve the resources included in this textbook.

Sample Figures

Below we see a few representative samples of images that have been created for this textbook.

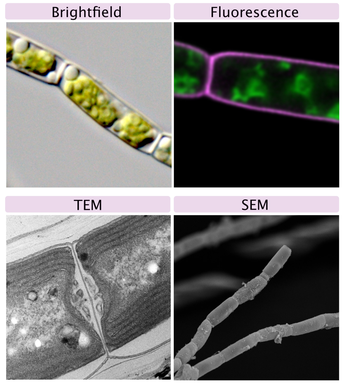

Figure 1: Figure from Chapter 1, comparing types of microscopy. Thanks to Davis Iritani and Yoichiro Watanabe at the Agriculture & Agri-Foods Canada Station in Summerland, BC.

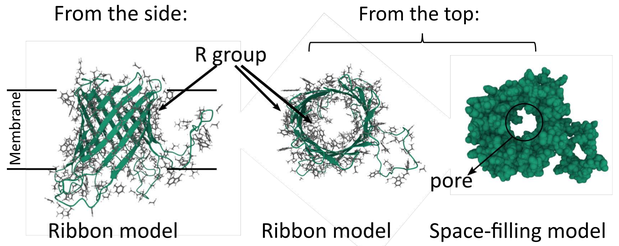

Figure 2: Image created from open source data, to show the location of R-groups on a transmembrane beta-barrel (from Chapter 2).

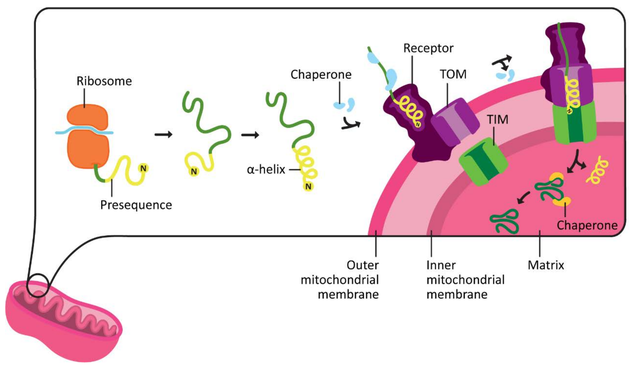

Figure 3: Protein targeting and import into the mitochondria (from Chapter 5). Image created by Heather Ng-Cornish.

Lesson We Learned

1. **This work is time-consuming!**
   - It will take longer than you think – so find collaborators to help!
   - Collaborators from other institutions may give you access to additional funding.
   - UBC has excellent resources on both campuses: https://open.ubc.ca.
2. **Figures are a limiting factor**
   - Hiring someone to help with building figures is an excellent use of funding resources.
3. **'Real' data can be challenging to use in an open-source format.**
   - Most published data is under traditional copyright, which can be difficult to use.
   - There are a more and more open databases, which is making things better.
   - Using your networks to source 'real' data that is not subject to copyright can help.
4. **Get as much funding as you can!**
   - Grants are available from several sources – apply to all of them!
   - Different funding often comes with different kinds of additional support, which helps.

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