Building an Open Textbook for Cell Biology: Lessons Learned (so far!)

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Introduction

In recent years, many 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 it is difficult to find any widely available open textbooks that cover this material. BIOL200 at UBC has a long history of offering students options when in comes to textbooks, in the form of online notes, housed in the course shells, that students could access for free.

It is our goal to take this online content, created for BIOL200, and convert it into an open textbook that would be publicly accessible, so that it could be adopted more broadly at institutions across North America.

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. **Additional resources for instructors to build their course, including high quality images and review material that can be incorporated into current teaching resources.**

Planned Content

The intention is to take 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 will include 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 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 Signalling
- **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 samples of the drafts of images that have been created for this textbook.

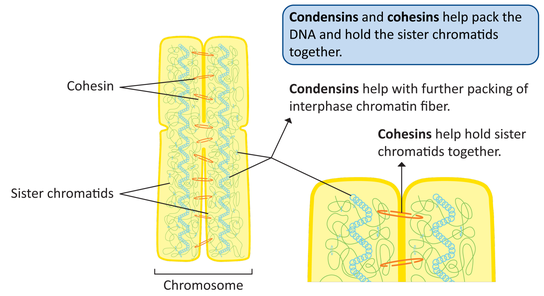

Figure 1: Draft image showing the location of cohesins and condensins in the mitotic chromosome

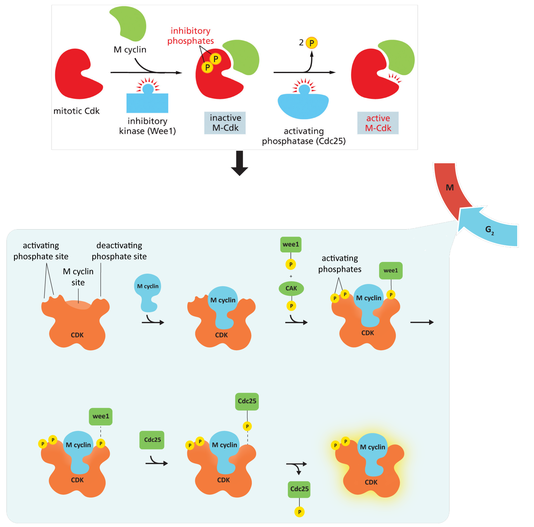

Figure 2: Comparison between original ECB image (Figure 18-10, Reference 1) and our new image.

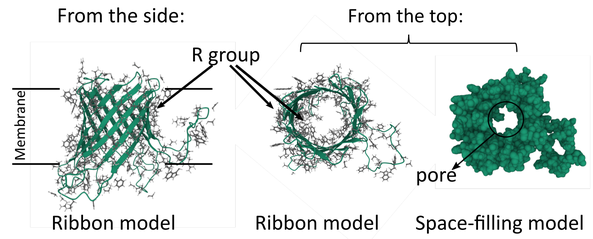

Figure 3: Image created from open source data, to show the location of R-groups on a transmembrane beta-barrel (from Chapter 2).

Lesson Learned (so far!)

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.

Reference

1. Alberts et. Al (2019). Essential Cell Biology (5th ed.) W.W. Norton & Company. New York.

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