

Educational Innovation & Technology at MIT

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MIT, Office of Educational Innovation and Technology



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Outline

- About..
 - OEIT at MIT
 - About You
- Projects and Resources
 - OpenCourseWare
 - Visualizing Cultures
 - STAR

About Us: OEIT at MIT

- MIT Office of Educational Innovation and Technology
 - Works with faculty with **innovative** ideas
 - **Scales up projects** from individual faculty to classes/departments/university
 - **Partners** with other campus entities to “run” innovations long-term

Office of Educational Innovation and Technology

Mission

1. Work with faculty, students, and staff in developing **innovative uses of technology for teaching and learning**, and its integration in the curriculum.
2. Support faculty efforts to demonstrate **global leadership in educational innovation** through the use of technology.
3. **Collaborate** with educational technology service providers at MIT and elsewhere to ensure that innovative technology applications for education are supported as **sustainable services**.

Office of Educational Innovation and Technology

Strategic Focus

Bridging Research and Learning

Innovative tools to bring the practice of research to the process of learning.

Linking Content to the Curriculum

Activities that address how digital content is integrated into teaching and learning.

Fostering Communities of Innovation and Practice

Communities centered around specific technology solutions, such as visualization, active learning, emerging pedagogies, etc.

About Us: Jeff and Brandon

- Both: Work has been higher education focused
- **Jeff**
 - Residential computing (dorms)
 - Stellar at MIT (similar to Moodle)
 - O.K.I. (technical interoperability)
- **Brandon**
 - Educational digital libraries (collections of learning resources)
 - STEM (science, technology, engineering and mathematics)
 - Open Content & OpenCourseWare (outside of MIT)

About You!

- Grade-level?
- Specific discipline focus?
- Published a course/materials in Moodle?

Why are we here?

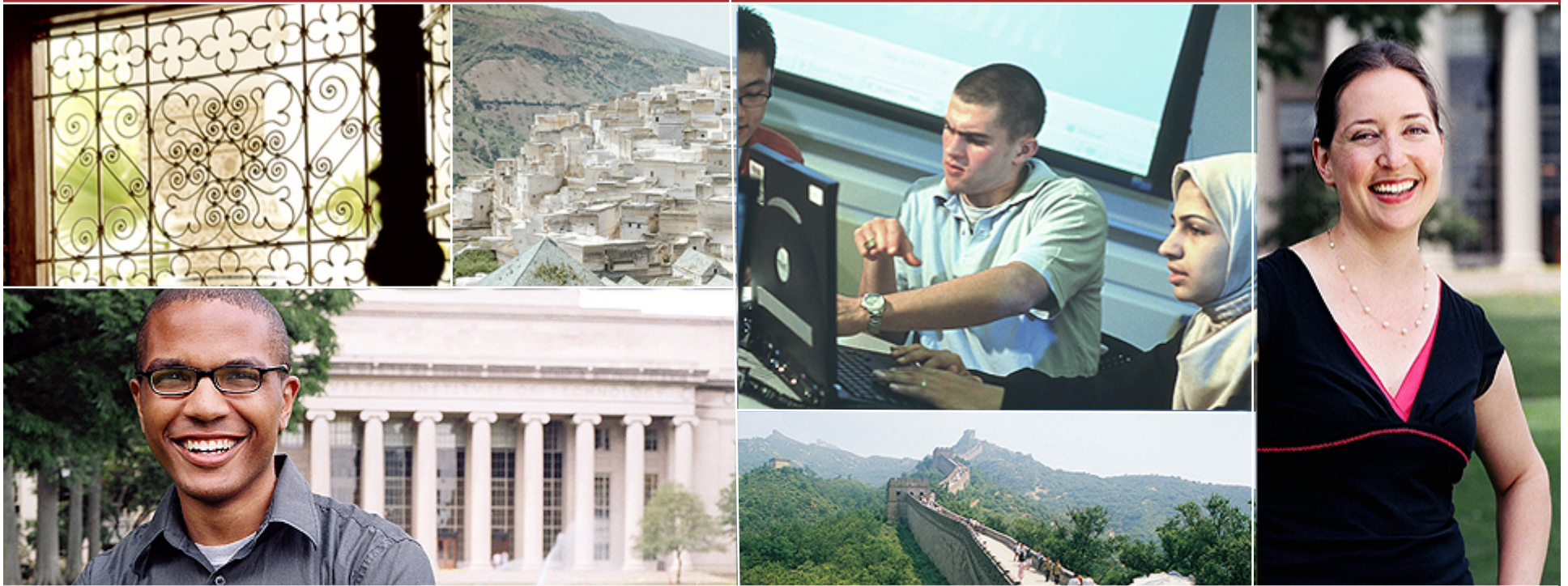
- To learn from you!
- To show you a little bit about what we're doing that might be useful.
- To learn from you!

Setting the Stage

- Future partnerships?
 - We want to **understand** your **needs**
 - Explore **opportunities** for collaboration
 - MIT Faculty that we work with are interested in **collaborating** with **K-12** teachers and students

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MIT OpenCourseWare & Highlights for High School



MITOPENCOURSEWARE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Thanks to Steve Carson, Dan Carchidi, & Rana Bannerjee, MIT OpenCourseWare



MIT OpenCourseWare Overview

- OpenCourseWare started in 2002
- “**Publication**” of MIT providing access to course materials
- Key Aspects
 - Does not grant degrees
 - Does not provide access to faculty
 - Course materials
 - **Licensed “openly”** (aka “open content”), using a Creative Commons Attribution-NonCommercial-ShareAlike license



OpenCourseWare Demonstration

- **1,900** Courses published
- Access to **video/audio lectures**
- Some courses translated in **Spanish**, Traditional & Simplified **Chinese**, Portuguese, Thai, Persian

The screenshot shows the MIT OpenCourseWare website. The header includes the MIT logo and the text "MITOPENCOURSEWARE MASSACHUSETTS INSTITUTE OF TECHNOLOGY". Navigation links include Home, Courses, Donate, About OCW, Help, and Contact Us. A search bar is present with the text "Enter search keyword" and a "GO" button. A sidebar on the left lists categories like "Get Started with OCW", "Find Courses" (with subcategories like Architecture and Planning, Engineering, etc.), "Highlights for High School", and "Other Resources". The main content area features a large banner with the text "Unlocking Knowledge, Empowering Minds." and a photo of Larry Birenbaum. Below this is a "FEATURED RESOURCE" section titled "Project Whirlwind comes home" with a description of its historical significance. At the bottom, there is a "NEWSLETTER" sign-up section and a footer with copyright information and links to RSS feeds, privacy policy, and site map.

<http://ocw.mit.edu/>

- **OCW is more than MIT**
- **Collaboration of 200 universities and organizations**
- **Shared vision, commitment to act**
- **9,000 courses published**

<http://ocwconsortium.org/>

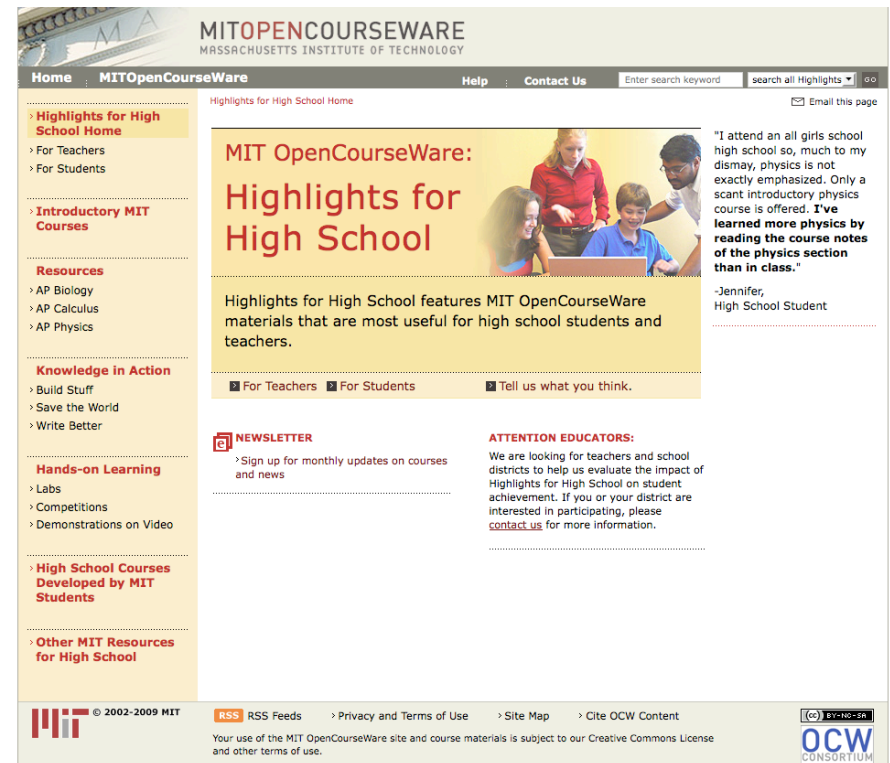
Extra Tools for OCW

- OCW Finder :: ocwfinder.org
 - Search and browse across OCWs
 - OCW Consortium also has a search at www.ocwconsortium.org/use/use-dynamic.html
- OER Recommender :: oerrecommender.org
 - “Related” resources from selected collections
 - Plug-in for Firefox

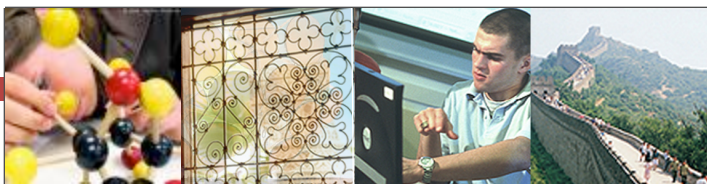


Highlights for High School First Steps...

- Highlights for High School is MIT's first step in realizing the OCW Secondary Education vision. Its goals are:
 - To **simplify access** to OCW materials relevant for **high school students and teachers**
 - To **publish high school courses developed at MIT** for students and teachers



<http://ocw.mit.edu/highschool>



Highlights for High School Guiding Assumptions

- Supplement, not replace current course materials
- May influence lecture vs. facilitation in the classroom
- Teacher professional development
- Inexperienced and experienced teachers will use differently
- Teachers don't have time to browse extensively, need to find relevant material immediately



Highlights for High School Design Principles

- First, focus on upper grades of high school (**11th and 12th grade**), closest to undergraduate level
- Use **existing materials** on OCW, but only those appropriate for a high school audience
- Use **high school students** and MIT freshman to decide what is appropriate and useful
- Publish MIT outreach program materials and student developed courses – advanced science and math topics, taught in a fun, more informal manner



Highlights for High School Site Contents

- Thousands of lecture notes, problem sets, exams and other resources from introductory MIT courses
- Multimedia content including captioned **video** clips, **audio** clips, and java **applets**
- AP[®] Sections
 - Over 500 **Calculus** resources
 - Over 600 **Biology** resources
 - Over 1,650 **Physics** resources
- **Sampling** of original and inspiring MIT **student-developed courses**



Highlights for High School Demo

The screenshot shows the MIT OpenCourseWare website's 'Highlights for High School' page. The header includes the MIT OpenCourseWare logo and navigation links like Home, MITOpenCourseWare, Help, and Contact Us. A search bar is also present. The main content area features a large banner with the title 'MIT OpenCourseWare: Highlights for High School' and a quote from a high school student. Below the banner, there are sections for 'Resources' (AP Biology, AP Calculus, AP Physics), 'Knowledge in Action' (Build Stuff, Save the World, Write Better), 'Hands-on Learning' (Labs, Competitions, Demonstrations on Video), 'High School Courses Developed by MIT Students', and 'Other MIT Resources for High School'. A sidebar on the left contains links to 'Highlights for High School Home', 'For Teachers', 'For Students', and 'Introductory MIT Courses'. At the bottom, there is a newsletter sign-up section and an 'ATTENTION EDUCATORS' section. The footer includes the MIT logo, copyright information (© 2002-2009 MIT), RSS feeds, privacy and terms of use links, site map, and cite OCW content link. The Creative Commons BY-NC-SA license is also displayed.

<http://ocw.mit.edu/highschool>



Highlights for High School User Feedback

"I am an MIT alumna (class of 2001) and this is my first year teaching AP Biology. Thank you for so many wonderful resources for AP Bio! I am so proud of being MIT Alumni and for being able to count on MIT to help me in my work!" *MIT alumna*

"I just wanted to say thank you for the fantastic work you do. I can't help but think this is one of the greatest contributions to democratic education I know of." *Educator*



Highlights for High School Web Analytics

- Over 600,000 visits since launch on November 29, 2007
- ~1,300 visits per day
- ~65% of users are from the United States, ~35% international
- ~34% HS teachers, ~16% HS students
- Users from 190 different countries have visited the site

MIT Visualizing Cultures


MIT VISUALIZING CULTURES

Units Intro Events Press Bio Contact

Visualizing Japan

BLACK SHIPS & SAMURAI

COMMODORE PERRY AND THE OPENING OF JAPAN (1853-1854)



Black Ships & Samurai

Commodore Perry and the Opening of Japan (1853-1854)


On July 8, 1853, residents of feudal Japan beheld an astonishing sight; foreign warships entering their harbor under a cloud of black smoke. Commodore Matthew Perry had arrived to force the long-secluded country to open its doors. Essay by John W. Dower

[VC|TV]

[VC|Curriculum]

YOKOHAMA BOOMTOWN

Foreigners in Treaty-Port Japan (1859-1872)



Yokohama Boomtown

Foreigners in Treaty-Port Japan (1859-1872)


This window on the imagined life of foreigners in Japan at the dawn of the modern era is based on the catalogue of the 1990 exhibition at the Arthur M. Sackler Gallery, Smithsonian Institution, *Yokohama: Prints from Nineteenth-Century Japan*, by Ann Yonemura. Essay by John W. Dower.

[VC|TV]

[VC|Curriculum]

Felice Beato's Japan: Places

An Album by the Pioneer Foreign Photographer in Yokohama



Felice Beato's Japan: Places

An Album by the Pioneer Foreign Photographer in Yokohama


This 50-image album features scenes along the routes that foreign sightseers travelled in the opening years of the Meiji period. Album courtesy of the Hood Museum of Art, Dartmouth College. Essay by Allen Hockley

[VC|TV]

[VC|Curriculum]

YELLOW PROMISE / YELLOW PERIL

FOREIGN POSTCARDS OF THE RUSSO-JAPANESE WAR (1904-05)



Yellow Promise/Yellow Peril

Foreign Postcards of the Russo-Japanese War (1904-05)


The first war to be depicted internationally in postcards is captured here in these dramatic images. Produced in association with the Museum of Fine Arts, Boston. Essay by John W. Dower.

[VC|TV]

[VC|Curriculum]

Ground Zero 1945

Pictures by Atomic Bomb Survivors



Ground Zero 1945

Pictures by Atomic Bomb Survivors


These drawings and paintings by Japanese survivors of the atomic bomb were created more than a quarter century after the bombs fell on Hiroshima and Nagasaki in August 1945. They are provided by the Hiroshima Peace Memorial Museum. Essay by John W. Dower.

[VC|TV]

[VC|Curriculum]

Ground Zero 1945

A Schoolboy's Story



Ground Zero 1945

A Schoolboy's Story

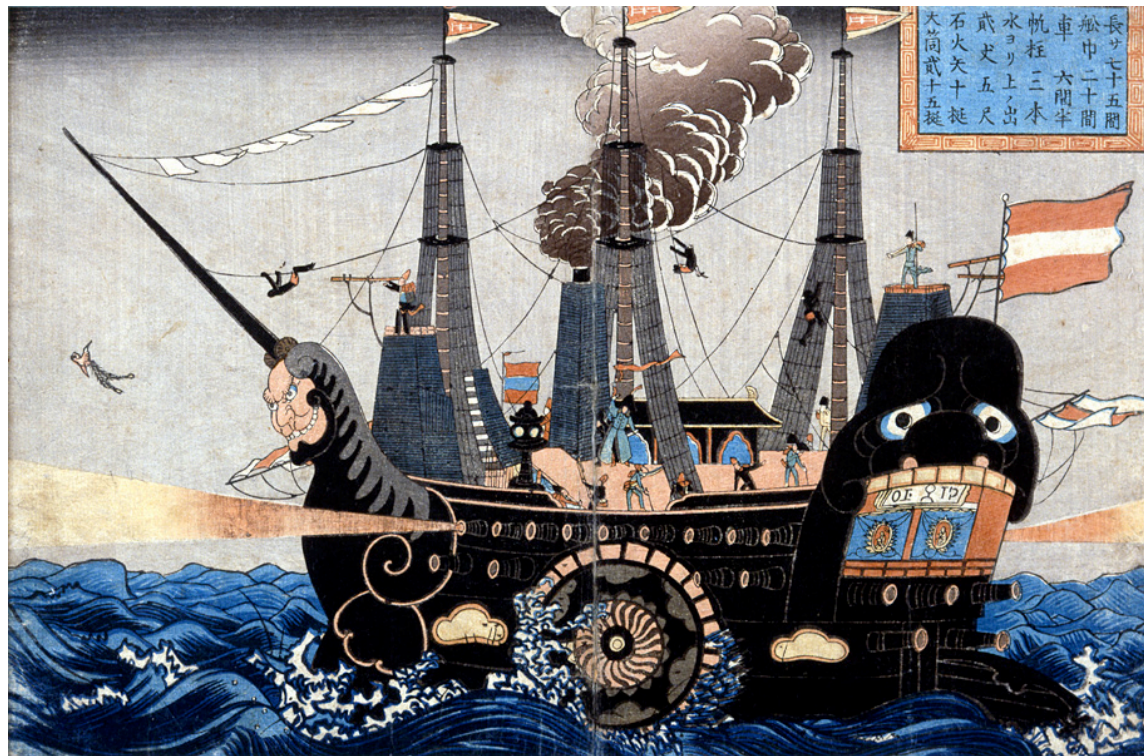
This unit presents the illustrated testimony of Akihiro Takahashi, who survived the atomic bombing of Hiroshima on August 6, 1945. Illustrations by Goro Shikoku, with English translation by Yuki Tanaka. Courtesy of Hiroshima Peace Institute.

[VC|TV]

[VC|Curriculum]

MIT Visualizing Cultures

www.visualizingcultures.com



STAR: Software Tools for Academics & Researchers

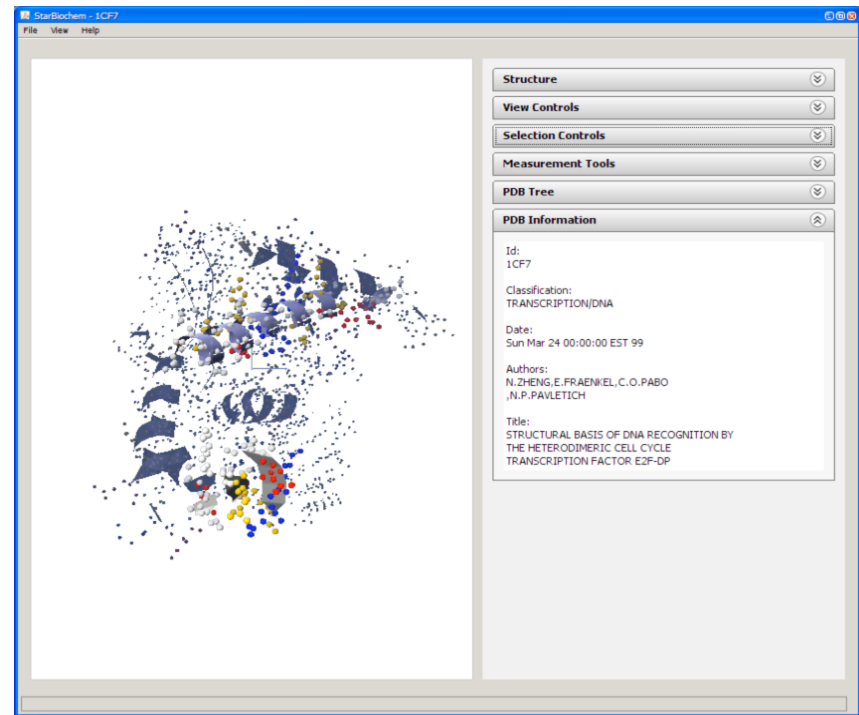
<http://web.mit.edu/star>

- The STAR program seeks to **bridge the divide between** scientific research and the **classroom**.
- Created **custom interfaces** to research software to **focus** on use for **learning/teaching**

Thanks to Ivica Ceraj, Justin Riley, Lourdes Aleman, Sara Bonner, Rocklyn Clark, Chuck Schubert

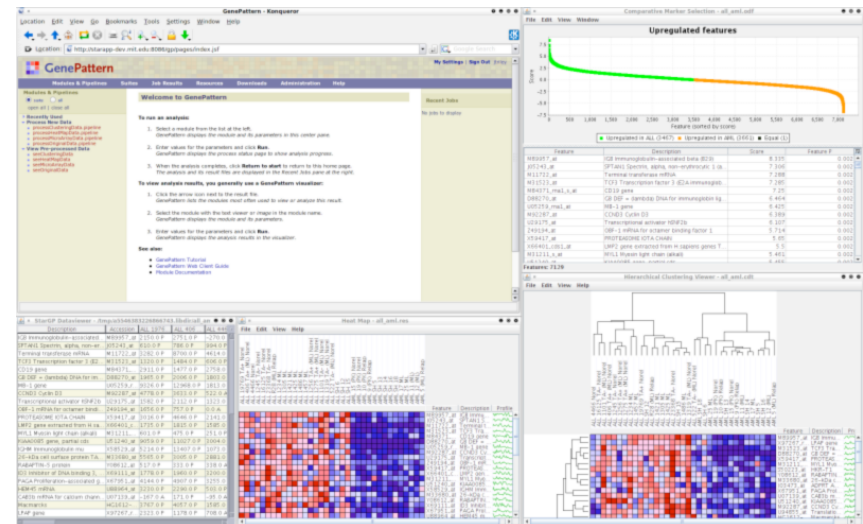
Star:Biochem

- **3D protein viewer** that allows students to learn key concepts in structural biology in an interactive manner.
- This software allows for the visualization and manipulation of many of the PDB (Protein Data Bank) molecules in a 3D environment.



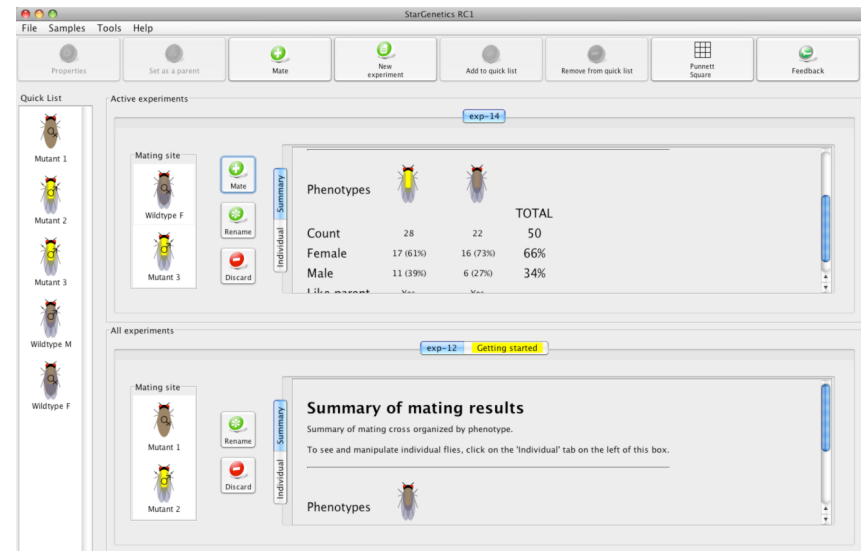
Star:Biogene

- A set of visual and analytic software tools for the **analysis of genomic gene expression data generated through microarray analysis.**
- This software allows students to compare the **expression of multiple genes** across a range of biological samples (cell lines, tumors, etc).



Star:Genetics

- A set of **tools for analyzing genetic traits**.
- This software simulates **mating experiments** between organisms that are genetically different across a range of traits and provides data that students can use to analyze the nature of the genetic traits in question.



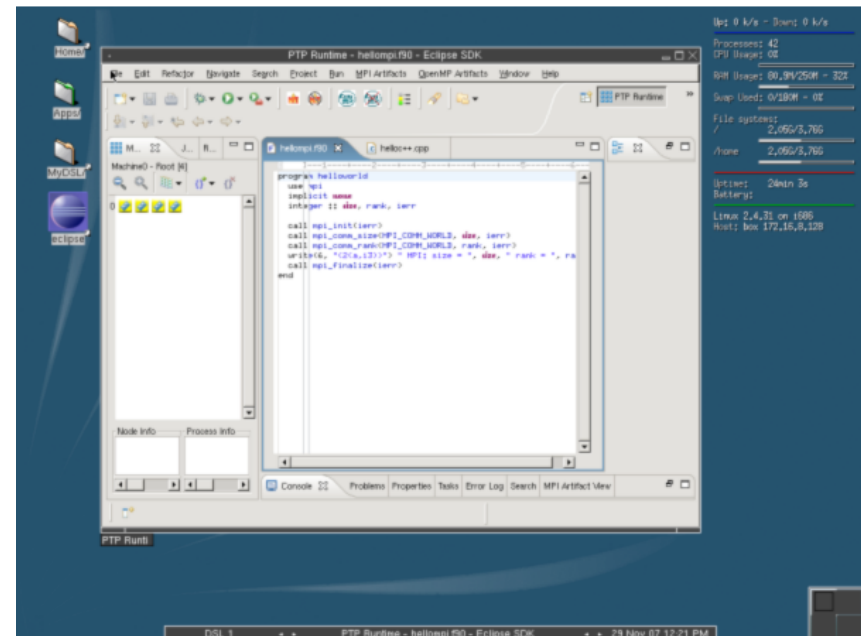
Star:ORF

- Facilitates the identification of the protein(s) encoded within a DNA sequence. ORF stands for **Open Reading Frame** and is defined as a stretch of DNA sequence that likely encodes for a protein.
- Using StarORF, the DNA sequence is first transcribed into RNA and then translated into all the potential protein chains encoded within each of the six translation frames (3 in the forward direction and 3 in the reverse direction).
- This allows students to **identify the translation frame** that results in the **longest protein coding sequence**.

The screenshot displays the StarORF web application interface. At the top, the 'Input' section shows a DNA sequence: `GATAGGCTGTGTTTCCTGCTTTTTCACAACCTATCCAAATCCACAGGCCCTACTATTCTTACTA`. Below the sequence, statistics are provided: 'Sequence length is 2,495 bp', 'Percentage of GC is 39%', and 'Current minimal ORF length is 80bp'. There are buttons for 'Change ORF length' and 'Reverse complement'. The 'Six frame translation' section shows the translation of the DNA sequence into six frames. The first frame (forward) shows a long protein sequence starting with 'Leu Arg Glu Asn Thr Leu Asn Ala Cys Asp Arg Pro Leu Cys Asn Arg Ser Phe Cys' and ending with a 'STOP' codon. The second frame (reverse) shows a shorter protein sequence starting with 'Ala STOP Gly Lys His Thr STOP Cys Met Arg Ser Ala ile Met STOP STOP ile ile Leu Leu'. The third frame (reverse) shows a protein sequence starting with 'Lys Pro Phe Val Cys Lys ile Cys Ala ile Pro Trp STOP Thr ile Ser STOP Leu Gly Glu Ala' and ending with a 'STOP' codon. The fourth frame (reverse) shows a protein sequence starting with 'Ser Leu Ser Phe Val Ser Leu Ala His Ser Arg Gly Asn His Leu Leu Asp Tyr Asp Lys Gln' and ending with a 'STOP' codon. The fifth frame (reverse) shows a protein sequence starting with 'Cys Val Arg Met Val Ser Ala ile Cys Ser Phe Phe Val Phe Tyr Asn Arg Glu Arg His Phe Leu Arg Lys Gly Gly Thr Cys Arg Lys Met Glu Asn ile Leu Asp Leu' and ending with a 'STOP' codon. The sixth frame (reverse) shows a protein sequence starting with 'Trp Asn Gln Ala Leu Ala Gln ile Glu Lys Lys Leu Ser Lys Pro Ser Phe Glu Thr Trp Met Lys Ser Thr Lys Ala His Ser Leu Gln Glu Asp Tyr Leu Thr ile Thr Ala Pro' and ending with a 'STOP' codon. The 'Putative ORF protein sequence' section shows the longest protein sequence: 'Cys Val Arg Met Val Ser Ala ile Cys Ser Phe Phe Val Phe Tyr Asn Arg Glu Arg His Phe Leu Arg Lys Gly Gly Thr Cys Arg Lys Met Glu Asn ile Leu Asp Leu Trp Asn Gln Ala Leu Ala Gln ile Glu Lys Lys Leu Ser Lys Pro Ser Phe Glu Thr Trp Met Lys Ser Thr Lys Ala His Ser Leu Gln Glu Asp Tyr Leu Thr ile Thr Ala Pro'. The 'Putative protein is 477 amino acids long.' section shows the protein sequence in 3-letter code and a 'Copy to clipboard' button.

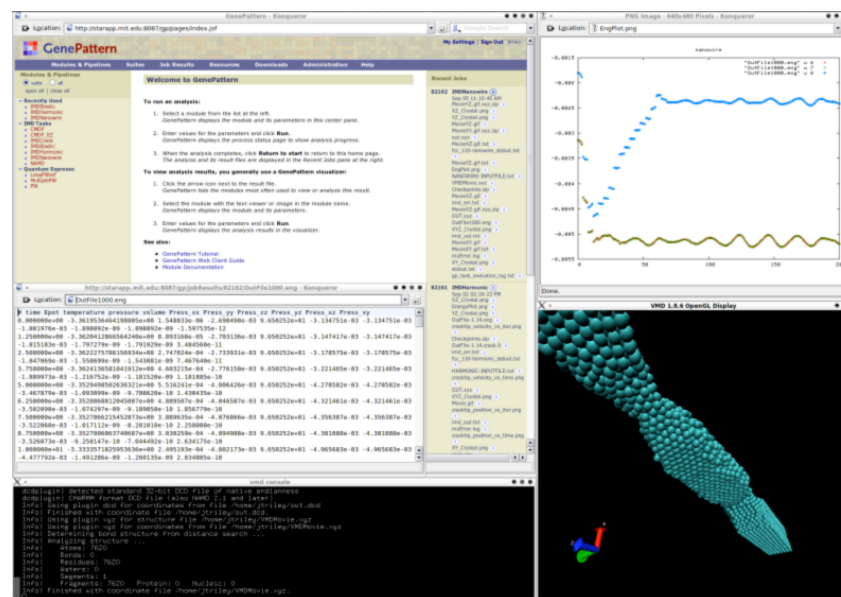
Star:HPC

- Provides an on demand computational cluster for **teaching parallel programming** using both OpenMP and OpenMPI technologies.



Star:MolSim

- A collection of molecular dynamics and atomistic materials modeling research software available via the web.



Thanks!

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