



## One Cell, Three Genomes

**Intracellular protein trafficking brings subunits of proteins into a common space before they function**

Complete a short study of the following organisms using the internet and describe the organism in the space provided.

*Porphyra*

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*Heterosigma*

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*Synechocystis*

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*Thiobacillus denitrificans*

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*Prochlorothrix*

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*Sinorhizobium meliloti*

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Complete a short study of the protein Rubisco. Describe it here.

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***Review the West Nile Virus and HIV Bioinformatics worksheet materials below to remember your SDSC password and your entry into the Microbes Count! textbook site.***

***Data and Background Material provided by***

***Microbes Count! Problem Posing, Problem Solving, and Peer Persuasion in Microbiology***

***John R. Jungck, Marion Field Fass, and Ethel D. Stanley, Editors***

***BioQUEST Curriculum Consortium***

***Enter into the site:***

***<http://workbench.sdsc.edu/>***

***Sign in or register***

***Save your password here: \_\_\_\_\_***

***Read through the SDSC tutorial and informational pages provided.***

Read through the *One Cell, Three Genomes* section by John Jungck, Sam Donovan, and John Greenier on pages 207-216 of the Microbes Count! text.

Open the Microbes Count! site and locate the Chapter 6.4 Section. Open the “Rubisco Files” to view the sequences used in this exercise. You will be using (rbcL) and (rbcS) sequences.

Now you are ready to import the sequences (rbcL provided by the text) and analyze the sequences using the tools provided by the San Diego Super Computer site.

Session Tools

Click Start New Session → Run → Type in the name of your session. Click Start New Session.

Protein Tools

Add New Protein Sequences → Run

Travel to the rbcL site of Chapter 6.4

Rubisco Files (First choose rbcL)

Select all

Copy all

Paste all of the Rubisco L files (rbcL) which contain the Ribulose biphosphate carboxylase large chain precursors into the sequence portion of the SDSC site

Scan the entire page to see that a number of sequences are uploaded.

Save (found at bottom of page)

Protein Tools

Using the file (rbcL) with the ribulose biphosphate carboxylase large chain protein, choose three organisms from this list:

Garden pea

Maize

Common tobacco

Wheat

Soybean

Fern

Along with a (a)Photosynthetic algae (b) Cyanobacterium (c) Chemolithotrophic facultative anaerobe (d) Nitrogen Fixing bacterium from your definitions above.

Select those 7 sequences using a ✓ on the SDSC site.

Run

Protein Tools

- Clustal W Multiple Sequence Alignment (be sure all 7 sequences are selected) →
- Run → Submit
- Check that the sequences are aligned in an unrooted tree.
- The results of the analysis can be copied onto a word document.
- Copy the first page and the dendrogram page of the CLUSTALW analysis.

What conclusions can you draw regarding the similarities and differences of this common protein on earth?

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**FOR THE REALLY BRAVE AND BRILLIANT STUDENTS!!!!**

Complete all of the steps above using the RubiscoS files (rbcS) which contain the Ribulose biphosphate carboxylase small chain files. Describe if your conclusions are similar using the small chain sequences as the large chain sequences.

*Porphyra*: photosynthetic algae  
*Heterosigma*: microscopic algae with 2 flagella  
*Synechocystis*: cyanobacteria  
*Thiobacillus denitrificans*: Chemolithotropic, sulfur-oxidizing bacteria; facultative anaerobe  
*Prochlorothrix*: Cyanobacteria  
*Sinorhizobium meliloti*: Nitrogen fixing bacteria in roots  
*Anabaena*: Filamentous nitrogen fixing cyanobacteria