

Pathway Modeling of *Shewanella denitrificans* OS217

Presented to

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Outline

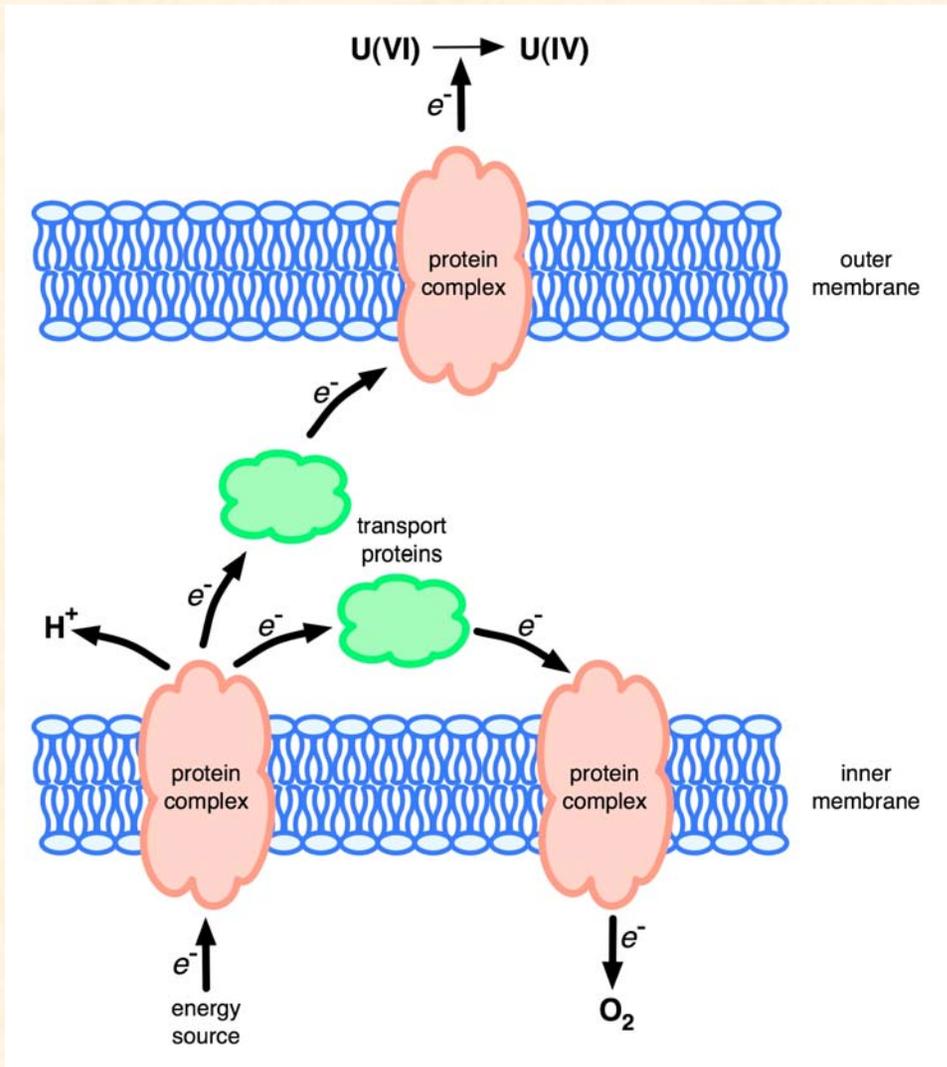
- **Goals for the Department of Energy (DOE)**
- **Energy Production in Microbes**
- **Solubility of Heavy Metals**
- **Why Shewanella?**
- **Pathways and Proteins**
- **Annotation**
- **Pathway Tools**
- **Importance of this Research**

Goals for Department of Energy (DOE)

- **Bioremediation of contaminated areas**
- **Use of metal reducing bacteria**
- **Expense to clean up contaminants like toxic uranium**
- **Use of microbes as alternative**



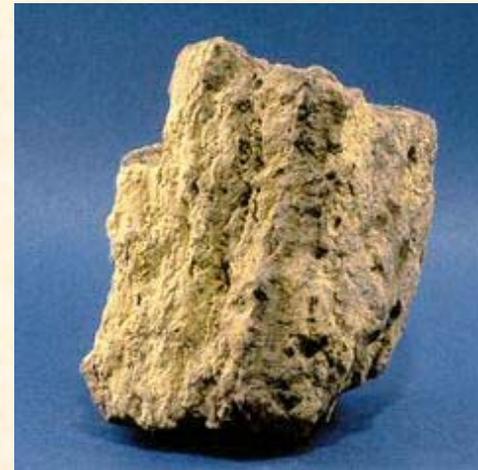
Energy Production in Microbes



- Respiration
- Energy Production
- Aerobic
 - Oxygen as terminal electron acceptor
- Anaerobic (bacteria)
 - Heavy metal as terminal electron acceptor

Solubility of Heavy Metals

- **Nuclear plant wastes (i.e. Uranium)**
 - Soluble, dissolved
 - Insoluble, precipitate
- **Difficult to clean-up**

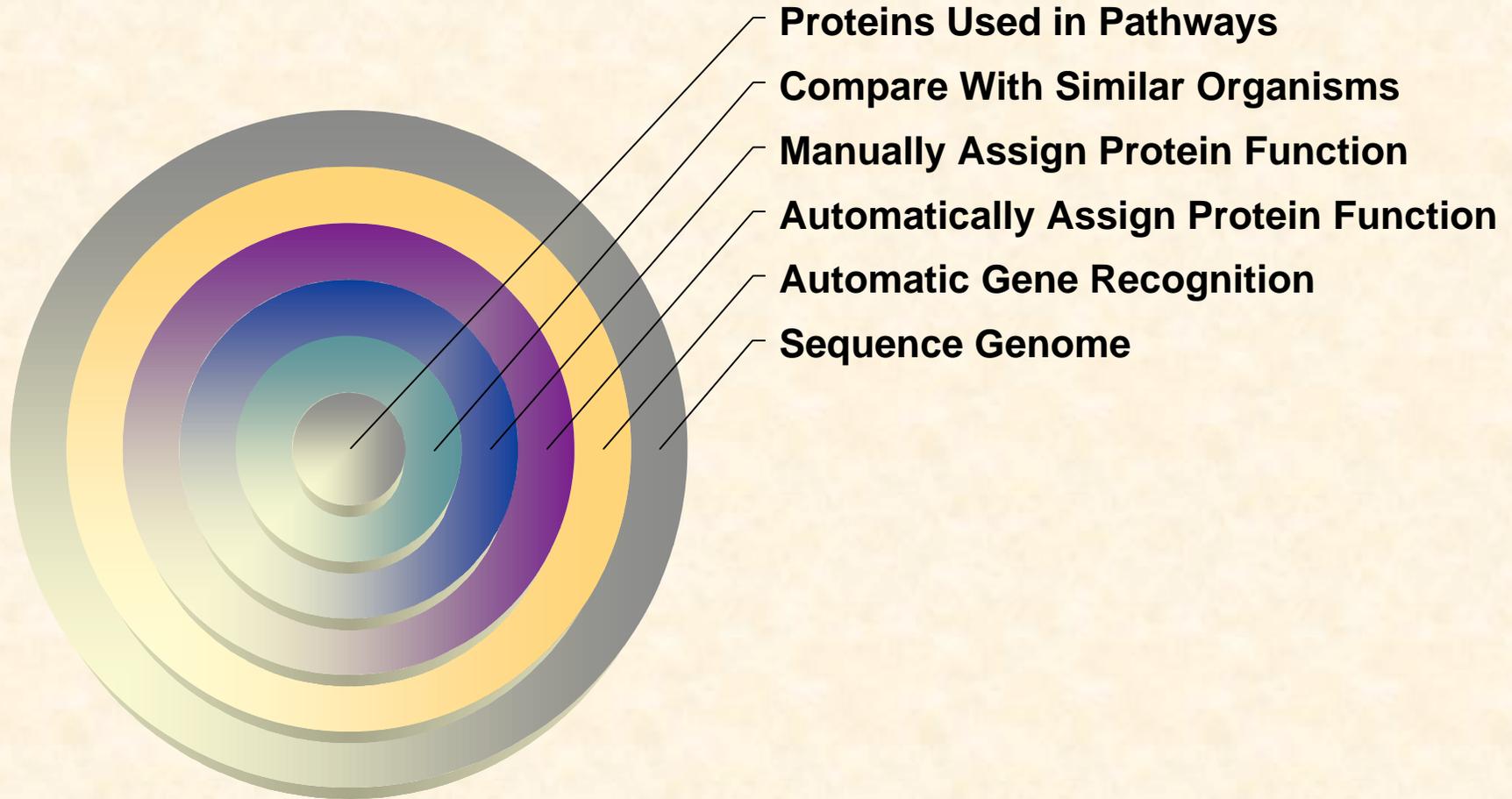


Why *Shewanella*?

- γ -proteobacteria
- *Shewanella oneidensis* MR-1
- Potential for bioremediation of contaminated areas
 - *Shewanella* thrives on heavy metals in absence of oxygen
 - Not harmful to humans or other organisms
- A model organism for understanding metal reduction
 - Relation to *E.coli*
 - Tolerates oxygen
- *Shewanella denitrificans* OS217

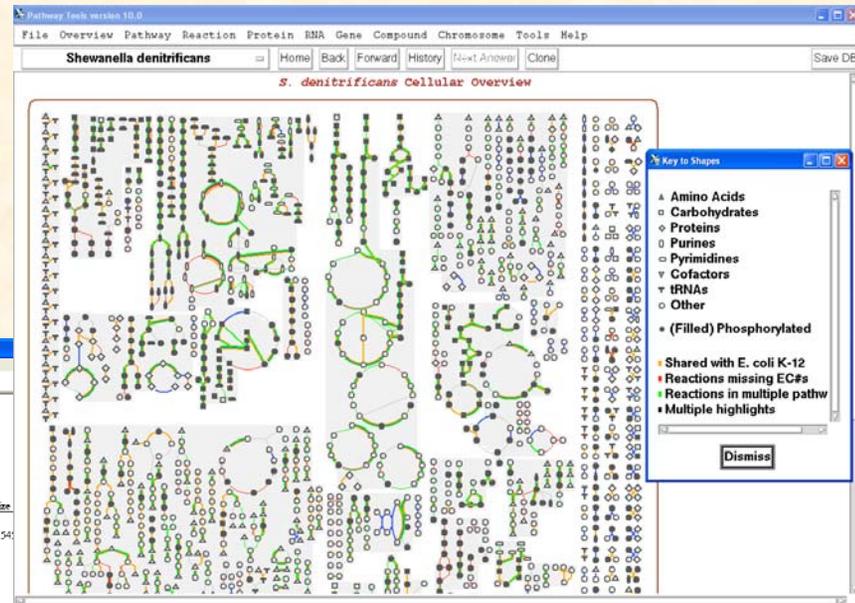
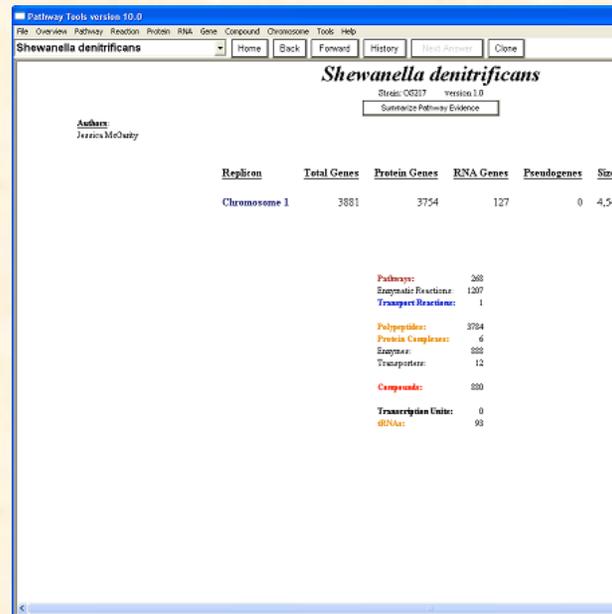


Annotation

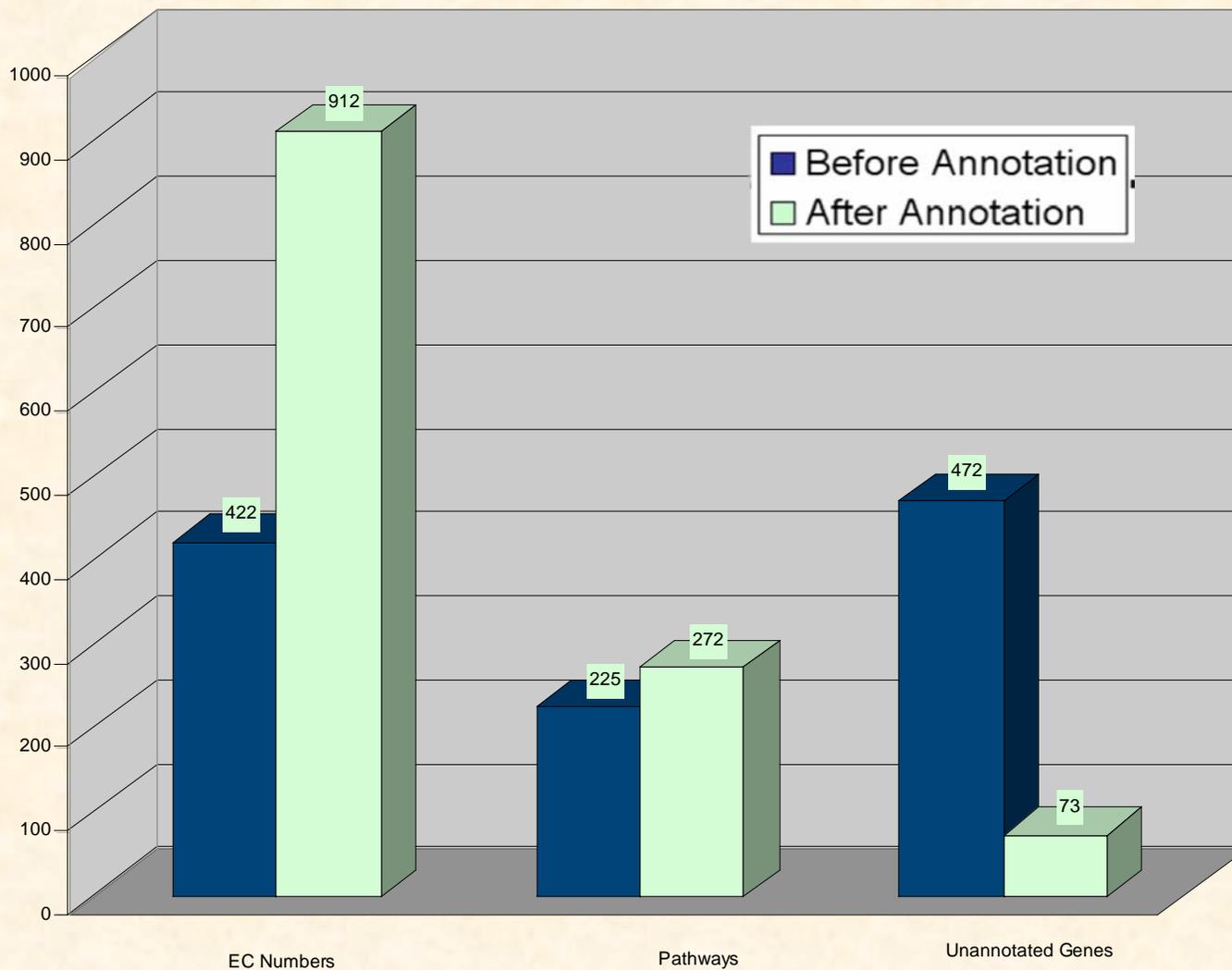


Pathway Tools©

- Before Pathway Tools
- What does Pathway Tools do?
- How does it work?



Results



Summary

- **Importance of this Research**
- **Other strains of *Shewanella sp.***
- **Future of research**

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References

1. http://bioinformatics.oxfordjournals.org/cgi/reprint/18/suppl_1/S225.pdf
2. <http://news-service.stanford.edu/news/2006/may24/criddle-052406.html>
3. <http://genamics.com/cgi-bin/genamics/genomes/genomeseach.cgi?field=ID&query=1606>
4. <http://dwb.unl.edu/Teacher/NSF/C11/C11Links/www.bact.wisc.edu/microtextbook/metabolism/RespAnaer.html>
5. http://www.chem.ed.ac.uk/chapman/oth_cyt.html
6. http://img.jgi.doe.gov/cgi-bin/pub/main.cgi?page=taxonDetail&taxon_oid=635600000
7. http://www.genome.jp/dbget-bin/get_pathway?org_name=sdn&mapno=00910
8. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=genome&cmd=Retrieve&dopt=Overview&list_uids=261
9. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=genome&cmd=Retrieve&dopt=Overview&list_uids=19373
10. <http://www.shewanella.org/home.sjsp>

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