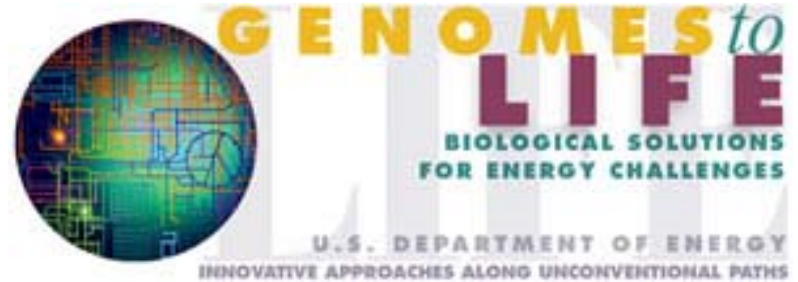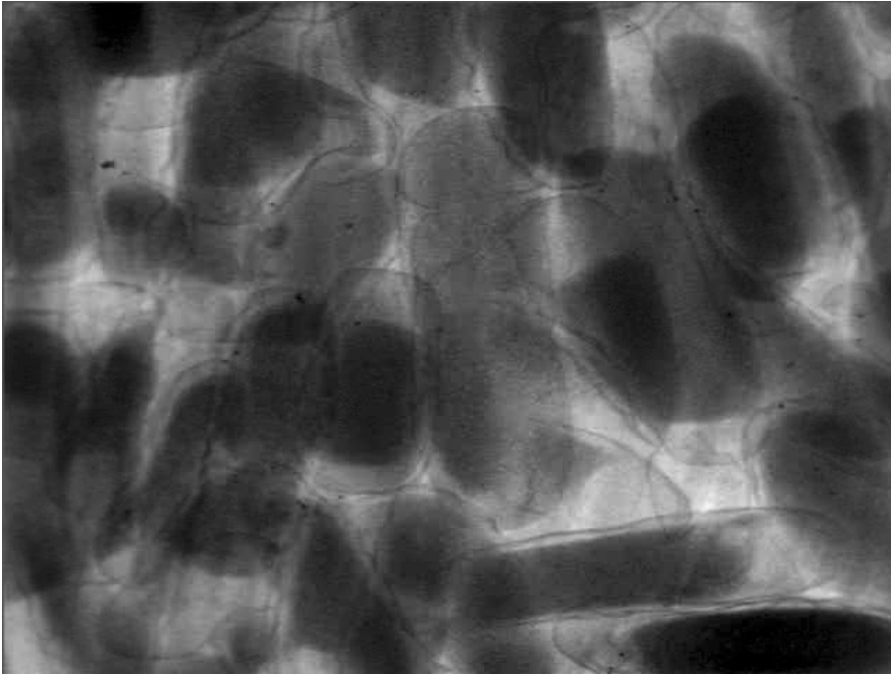# The *Shewanella* Federation

(http://www.shewanella.org/home.sjsp)

…….the Federation consists of teams of scientists from academia, national laboratories, and private industry working in a collaborative mode to achieve a comprehensive understanding of the components and functions of the prokaryotic cell that give it life…..

Core Projects

Argonne NL (Giometti et al.)
- Proteomics: 2-D PAGE + MS id

BIATECH (Kolker et al.)
- Sequence and data analysis
- Statistical models
- Quality assessments for HT analyses

Michigan State University (Tiedje et al.)
- "Informatics", Federation web site
- LIMS
- N transformations, denitrification

Oak Ridge NL (Zhou et al.)
- Genome microarrays
- Mutant construction, phage display

Pacific Northwest NL (Fredrickson et al.)
- Proteomics (AMTs)
- Chemostat cultivation/physiology
- Imaging/protein interactions

University of Southern California (Nealson et al.)
- Physiology, biochemistry, metal reduction
- Chemostat cultivation
- Imaging

Woods Hole (Riley et al.)
- Functional annotation (superfamilies)
- Metabolic pathways

Why *Shewanella*?

- Facultatively aerobic Gram-negative, γ-Proteobacteria
- *S. oneidensis* MR-1 genome has been sequenced, ~5.0 MB
- Genetic systems developed
- Respiratory versatile organism
  - 8 decaheme *c*-type cytochromes, 3 are OM lipoproteins
- Effectively reduces metals & radionuclides
- Widely distributed in the environment
  - Soil, sediment, water column, clinical
- A "gradient" organism, adaptive to changing environment
  - 88 predicted two-component regulatory proteins

Shewanella is a Gradient Organism

Gotland Deep, Central Baltic Sea

Shewanella baltica dominated recovered isolates (77%)
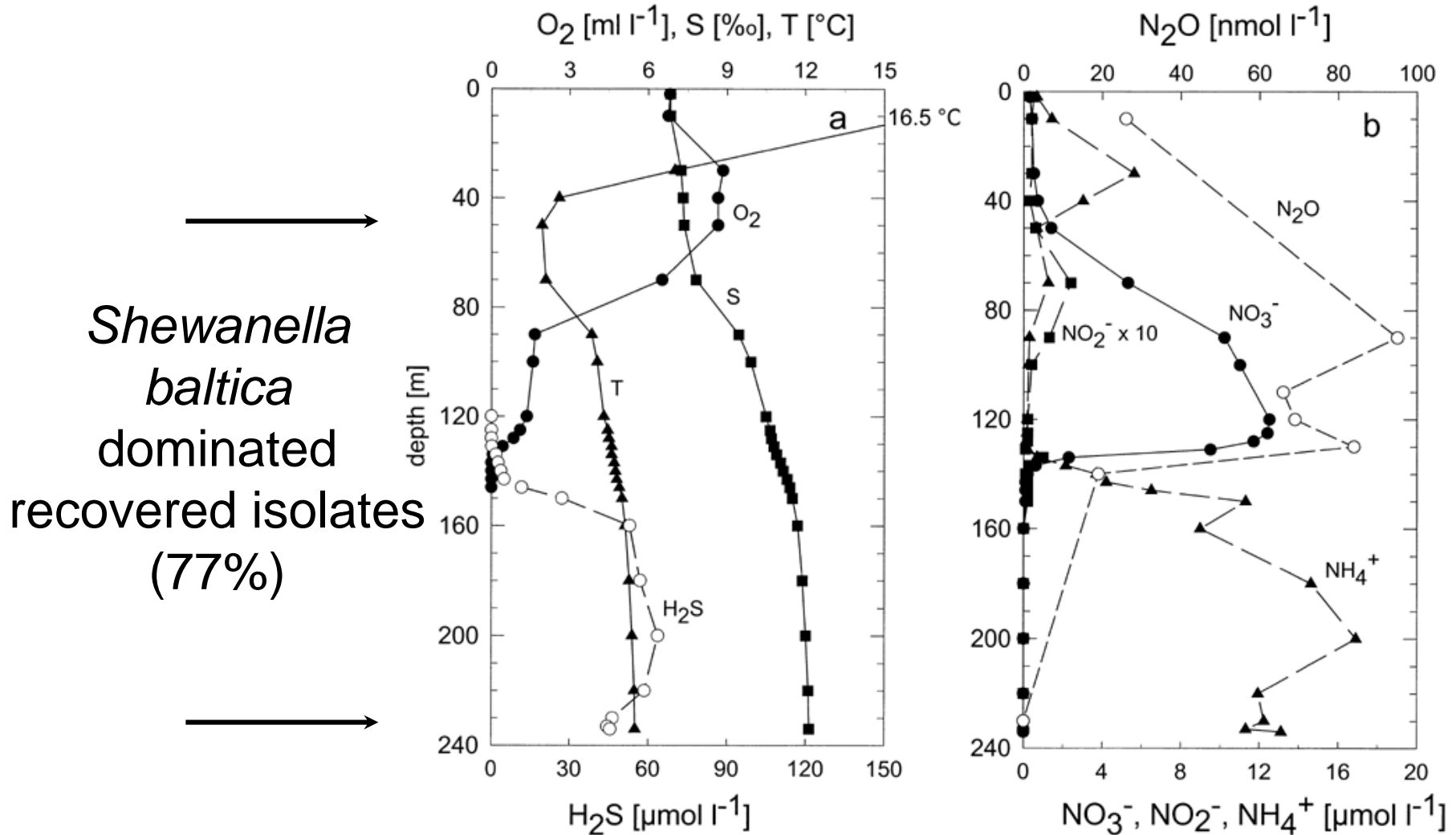
(From Brettar, Moore, Höefle, 2001 *Microbial Ecology*)

Science Focus

- Energy metabolism, growth, nutrient limitations
  - Electron transport, metal reduction, denitrification
- Response to environmental signals
  - Redox, chemotaxis, signaling molecules

Approach

- Alter/perturb system
  - Controlled cultivation (continuous, controlled batch)
  - Mutagenesis (targeted, genome-wide)
- "Global", high-throughput analyses
  - Transcriptional (microarrays)
  - Proteome (2-D gel, AMTs)
  - Reporter gene fusions (targeted)
- Physiology & metabolism
- Data analysis/integration/modeling/prediction
  - MAGPIE (Automated Genomics Project Investigation Environment)

Technology/Capability Development

- Photon Arrival time Interval Distribution (Weiss – UCLA)
- Combined AFM + 2-photon confocal (Lu - PNNL)
- Proteomics - FTICRMS & Hi-res LC (Smith – PNNL)
- Phage display (Palzkill – Baylor)
- Metabolites!!