Breakout Session I

Biological Diversity

Wednesday, October 21, 2009

What fundamental energy inputs are utilized with high efficiency (i.e. energy in to biomass out) for primary metabolism by organisms that do not use either light or the assimilation of other high energy species (e.g. carbohydrates, lipids, etc) as energy inputs?

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KEY ORGANISMS:
-Halophiles
-Extrem. Bacteria
-pH extremes
-Algae
-Key : to do synthetic biology in halophiles (organism as a chassis)

Which (if any) of these energy input paradigms can be exported to other organisms?

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-Thermophiles – have adapted unique protein folding properties that resist extreme temps – incredibly stable

- unique CO2 concentrating systems? Thermo/Halo/Acidophiles

-Transfer of metal reduction systems

-New Question: Which scalability paradigms can be exported to other organisms?

Which (if any) organisms that use novel energy inputs are genetically tractable?

-**Directed** exploration of biodiversity is key to progress (traits that are useful in scalable systems) (driven by systems biology)

-high-temp organisms (Thermophiles) are well described

SYSTEMS BIOLOGY (TOOLS OF OMICS & MODELING) IS KEY
-sequencing itself not the only answer (annotation an issue)
-Can we ID new genes by annotating operons/regulons with known genes?
-Can also get hints about protein function through structure prediction or interaction maps

-Genetics tools for photosynthetic microbes are less developed and are needed

-Looking at existing systems for new insights – some need for basic research

-Metagenomics may be used to predict organism interactions

What are key metabolic convergence points; i.e. what are the key high energy intermediates in primary metabolism that might serve as junction points for the insertion of novel biosynthetic pathways.

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-not always predictable – need to focus on biodiversity; metabolic diversity
-need to seek novel paths to CO2 fixation

METALS
-directed discovery needed

-Form biofilms on nanowires? Transduce electrons along ‘wire’ (Brute force electron transfer?)