The Virtual Institute of Microbial Stress and Survival

Project Management: Rapid Deduction of Stress Response Pathways in Metal/Radionuclide Reducing Bacteria

Nancy A. Slater

Lawrence Berkeley National Laboratory

Managing the Genomics:GTL Project at LBNL

Project Management Overview

The effective management of the Genomics:GTL systems biology project at Lawrence Berkeley National Laboratory (LBNL) is essential to the success of the project. The comprehensive management plan for the project includes milestone planning and project integration, a plan for communicating and collaborating with the project stakeholders, financial management and website updates. In addition, the management plan incorporates reviews by committees, including a monthly Executive Committee review comprised of LBNL leadership, an annual Scientific Advisory Committee review, a biannual Technical Advisory Panel review to ensure that the project's technical development is aligned with related DOE efforts, and a monthly Steering Committee conference call where the project leaders discuss the project's progress and status.

At LBNL the role of the project manager is to organize intellectual cooperations—establishing meetings for the design and implementation plans for experiments, tracking their progress, ensuring that the scientific goals are aligned with the overall project goals, and ensuring that the lines of communication are open. The organization of special events, such as the upcoming JGI Annotation Jamboree, requires tracking many administrative, financial, and scientific resource requirements simultaneously, thereby allowing the scientists to focus on the areas of the effort in which they are expert.

A key responsibility in the project management process is troubleshooting problems related to the project resources and financial management of the project. There is a delicate balance between having adequate resources to achieve the scientific project objectives of the project and working within the funding levels of the project. If an area is falling behind on achieving their scientific milestones, the project manager must work closely with the researchers to resolve problems as efficiently and effectively as possible.

Communication and Collaboration

The Genomics:GTL project at LBNL is a collaborative effort between seven institutions, thirteen researchers and their associated laboratories. The project's communications tools consist of a variety of media, including a project website, monthly group meetings, conference calls, an annual retreat, workshops at conferences, and monthly progress reports.

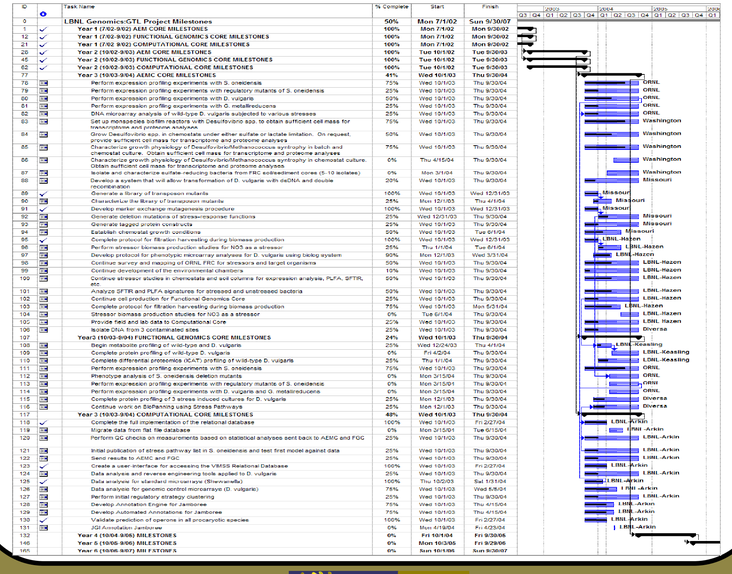
The monthly group meetings include a presentation from one of the Core Research groups, and it is attended by the local, northern California GTL project team members. There are a several conference calls that are held on a regular basis, including a monthly Steering Committee meeting in which all of the researchers participate, a monthly BioFiles conference call in which a representative from each laboratory discusses data generation, uploads and handling, and a quarterly conference call with DOE. The LBNL project has an annual retreat in which the researchers present data and findings related to their area of focus and other laboratory team members (Computer Science Engineers, Microbiologists, Database Managers, Graduate Students, Post Docs, etc.) present posters in a poster forum. The annual retreat has proven to be very successful in building working relationships among the dispersed group. The LBNL Genomics:GTL project will be participating in several workshops at international conferences in 2004, including:

Society for Industrial Microbiology (SIM) Annual Meeting
Workshop: Stress in Metal-Reducing Bacteria: Ecology, Functional Genomics, Bioinformatics
July 25-29 in Anaheim, CA http://www.simhq.org/html/meetings.html

10th International Symposium on Microbial Ecology (ISME-10)
ISME-10 Roundtable: Rapid Deduction of Stress Response Pathways in Metal-Reducing Bacteria: Ecology, Functional Genomics, Bioinformatics
August 22-27 in Cancun, Mexico http://www.kenes.com/isme/index.html

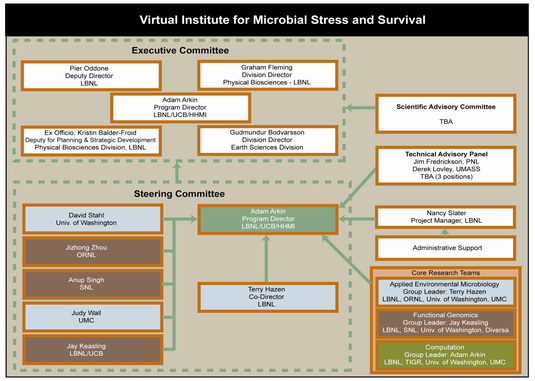
Milestone Planning and Project Integration

A detailed list of project deliverables and milestones is updated by the PIs at the beginning of each fiscal year. The process of updating and reviewing milestones ensures that the goals of each PI are aligned with the overall goals of the project. These milestones are the basis for an integrated project schedule, which is currently managed using Microsoft® Project. The project schedule is updated monthly, and progress is reported through progress reports and teleconferences with the PIs. The updated project schedule is posted to the project website, so that all of the collaborators have access to the most recent status of the project. The project is divided into three separate Core groups, and the integration plan for the project assures that the Core groups work together toward the objectives of the project. The Core Research group leaders are responsible for ensuring smooth operation of their section of the project as well as cooperation with the other groups. For example, the Applied Environmental Microbiology leader is responsible for ensuring that cell culture protocols are acceptable to the Functional Genomics Core, who will ultimately use the cell cultures for experiments. The Functional Genomics Core leader is responsible for ensuring quality control for data production and timely data uploads into the database. The Computational Core leader is responsible for ensuring that data entry, querying, and curation interfaces serve the needs of the other groups, and that the models are useable to biologists outside of the modeling group. The success of each group is interdependent on a well-integrated project team.



ID		Task Name	% Complete	Start	Finish
0		**LBNL Genomics:GTL Project Milestones**	**50%**	**Mon 7/1/02**	**Sun 9/30/07**
1	✓	**Year 1 (7/02-9/02) AEM CORE MILESTONES**	**100%**	**Mon 7/1/02**	**Mon 9/30/02**
12	✓	**Year 1 (7/02-9/02) FUNCTIONAL GENOMICS CORE MILESTONES**	**100%**	**Mon 7/1/02**	**Mon 9/30/02**
21	✓	**Year 1 (7/02-9/02) COMPUTATIONAL CORE MILESTONES**	**100%**	**Mon 7/1/02**	**Mon 9/30/02**
28	✓	**Year 2 (10/02-9/03) AEM CORE MILESTONES**	**100%**	**Tue 10/1/02**	**Tue 9/30/03**
45	✓	**Year 2 (10/02-9/03) FUNCTIONAL GENOMICS CORE MILESTONES**	**100%**	**Tue 10/1/02**	**Tue 9/30/03**
62	✓	**Year 2 (10/02-9/03) COMPUTATIONAL CORE MILESTONES**	**100%**	**Tue 10/1/02**	**Tue 9/30/03**
77		**Year 3 (10/03-9/04) AEMC CORE MILESTONES**	**41%**	**Wed 10/1/03**	**Thu 9/30/04**
78		Perform expression profiling experiments with S. oneidensis	75%	Wed 10/1/03	Thu 9/30/04
79		Perform expression profiling experiments with regulatory mutants of S. oneidensis	25%	Wed 10/1/03	Thu 9/30/04
80		Perform expression profiling experiments with D. vulgaris	50%	Wed 10/1/03	Thu 9/30/04
81		Perform expression profiling experiments with G. metallireducens	25%	Wed 10/1/03	Thu 9/30/04
82		DNA microarray analysis of wild-type D. vulgaris subjected to various stresses	25%	Wed 10/1/03	Thu 9/30/04
83		Set up monoseeded batch readers with Desulfovibrio spp. to obtain sufficient cell mass for transcriptome and proteome analyses	75%	Wed 10/1/03	Thu 9/30/04
84		Grow Desulfovibrio spp. in chemostats under either sulfate or lactate limitation. On request, provide sufficient cell mass for transcriptome and proteome analyses	50%	Wed 10/1/03	Thu 9/30/04
85		Characterize growth physiology of Desulfovibrio/Methanococcus symbiotic in batch and chemostat culture. Obtain sufficient cell mass for transcriptome and proteome analyses	75%	Wed 10/1/03	Thu 9/30/04
86		Characterize growth physiology of Desulfovibrio/Methanococcus symbiotic in chemostat culture. Obtain sufficient cell mass for transcriptome and proteome analyses	0%	Thu 4/15/04	Thu 9/30/04
87		Isolate and characterize sulfate-reducing bacteria from FRC sediment cores (5-10 isolates)	0%	Mon 3/1/04	Thu 9/30/04
88		Develop a system that will allow transformation of D. vulgaris with dsDNA and double recombination	20%	Wed 10/1/03	Thu 9/30/04
89	✓	Generate a library of transposon mutants	100%	Wed 10/1/03	Wed 12/31/03
90		Characterize the library of transposon mutants	25%	Mon 12/1/03	Thu 4/1/04
91	✓	Develop marker exchange mutagenesis procedure	100%	Wed 10/1/03	Wed 12/31/03
92		Generate deletion mutations of stress-responsor functions	25%	Wed 12/31/03	Thu 9/30/04
93		Generate tagged protein constructs	25%	Wed 10/1/03	Thu 9/30/04
94		Establish chemostat growth conditions	50%	Wed 10/1/03	Tue 6/1/04
95	✓	Complete protocol for filtration harvesting during biomass production	100%	Wed 10/1/03	Wed 12/31/03
96		Perform stressor biomass production studies for NO3 as a stressor	25%	Thu 1/1/04	Tue 6/1/04
97		Develop protocol for phenotypic microarray analyses for D. vulgaris using biolog system	90%	Mon 12/1/03	Wed 3/31/04
98		Continue survey and mapping of ORNL FRC for stressors and target organisms	50%	Wed 10/1/03	Thu 9/30/04
99		Continue development of the environmental chambers	10%	Wed 10/1/03	Thu 9/30/04
100		Continue stressor studies in chemostats and soil columns for expression analysis, PLFA, SFTR, etc.	50%	Wed 10/1/03	Thu 9/30/04
101		Analyze SFTR and PLFA signatures for stressed and unstressed bacteria	50%	Wed 10/1/03	Thu 9/30/04
102		Continue cell production for Functional Genomics Core	25%	Wed 10/1/03	Thu 9/30/04
103		Complete protocol for filtration harvesting during biomass production	75%	Wed 10/1/03	Mon 5/31/04
104		Stressor biomass production studies for NO3 as a stressor	0%	Tue 6/1/04	Thu 9/30/04
105		Provide field and lab data to Computational Core	25%	Wed 10/1/03	Thu 9/30/04
106		Isolate DNA from 3 contaminated sites	25%	Wed 10/1/03	Thu 9/30/04
107		**Year 3 (10/03-9/04) FUNCTIONAL GENOMICS CORE MILESTONES**	**24%**	**Wed 10/1/03**	**Thu 9/30/04**
108		Begin metabolite profiling of wild-types and D. vulgaris	25%	Wed 12/24/03	Thu 4/1/04
109		Complete protein profiling of wild-type D. vulgaris	0%	Fri 4/2/04	Thu 9/30/04
110		Complete differential proteomics (ICAT) profiling of wild-type D. vulgaris	25%	Thu 1/1/04	Thu 9/30/04
111		Perform expression profiling experiments with S. oneidensis	75%	Wed 10/1/03	Thu 9/30/04
112		Phenotype analysis of S. oneidensis deletion mutants	0%	Mon 3/15/04	Thu 9/30/04
113		Perform expression profiling experiments with regulatory mutants of S. oneidensis	0%	Mon 3/15/04	Thu 9/30/04
114		Perform expression profiling experiments with D. vulgaris and G. metalireducens	0%	Mon 3/15/04	Thu 9/30/04
115		Complete protein profiling of 3 stress induced cultures for D. vulgaris	25%	Mon 12/1/03	Thu 9/30/04
116		Continue work on Refinining using Stress Pathways	25%	Mon 12/1/03	Thu 9/30/04
117		**Year 3 (10/03-9/04) COMPUTATIONAL CORE MILESTONES**	**48%**	**Wed 10/1/03**	**Thu 9/30/04**
118	✓	Complete the full implementation of the relational database	100%	Wed 10/1/03	Fri 2/27/04
119		Migrate data from flat file database	0%	Mon 3/15/04	Tue 6/15/04
120		Perform GC checks on measurements based on statistical analyses sent back to AEMC and FGC	25%	Wed 10/1/03	Thu 9/30/04
121		Initial publication of stress pathway list in S. oneidensis and test first model against data	25%	Wed 10/1/03	Thu 9/30/04
122		Send results to AEMC and FGC	25%	Wed 10/1/03	Thu 9/30/04
123	✓	Create a user interface for accessing the VIMSS Relational Database	100%	Wed 10/1/03	Fri 2/27/04
124		Data analysis and reverse engineering tools applied to D. vulgaris	25%	Wed 10/1/03	Thu 9/30/04
125	✓	Data analysis for standard microarrays (Rhoarsella)	100%	Thu 10/2/03	Sat 1/31/04
126		Data analysis for genomic control microarrays (D. vulgaris)	75%	Wed 10/1/03	Wed 5/5/04
127		Perform initial regulatory strategy clustering	25%	Wed 10/1/03	Thu 9/30/04
128		Develop Annotation Engine for Jamboree	75%	Wed 10/1/03	Thu 4/15/04
129		Develop Automated Annotations for Jamboree	75%	Wed 10/1/03	Thu 4/15/04
130		Validate prediction of operons in all procaryotic species	100%	Wed 10/1/03	Fri 2/27/04
131		JGI Annotation Jamboree	0%	Mon 4/19/04	Fri 4/23/04
132		**Year 4 (10/04-9/05) MILESTONES**	**0%**	**Fri 10/1/04**	**Fri 9/29/05**
146		**Year 5 (10/05-9/06) MILESTONES**	**0%**	**Mon 10/3/05**	**Fri 9/29/06**
160		**Year 6 (10/06-9/07) MILESTONES**	**0%**	**Sun 10/1/06**	**Sun 9/30/07**

Project Organization



Financial Management

Each of the researchers provides input into the annual spend plan for the project. The finances of the project are tracked on a continuous basis, and the researchers receive monthly reports showing actual costs verses the spend plan. The finances of the project are maintained using software packages at LBNL as well as spreadsheets and charts. These tools allow the Project Manager to identify spending trends, so that appropriate can be taken to keep the project aligned with the annual spend plan. The Executive Committee reviews the project financial reports monthly.

LBNL Genomics:GTL Project Website

The Genomics:GTL project at LBNL is the inaugural project for the Virtual Institute of Microbial Stress and Survival (VIMSS), and details regarding the project are located on the world wide web at http://vimss.lbl.gov. This website serves as a tool for communicating the status of the project and access to important tools, including:

- An overview of the GTL project at Berkeley and links to the key personnel working on the project
- A link to Comparative Genomics Tools such as the Comparative Genome Database, the Genome Browser, and Operon and Regulon Prediction tools (http://escalante.lbl.gov/)
- Link to the BioFiles repository of project data
- Discussion board for project team members to interact and post protocols, questions and solutions
- Job board with available GTL-related positions
- Calendar of upcoming meetings and events

http://vimss.lbl.gov