PROGRESS REPORT – Year 4

COMPUTATIONAL AND GENOME BIOLOGY INITIATIVE

August 1, 2008

1. What was accomplished in 2007-2008? Several goals were articulated in the previous report.

A. New Graduate Students in MCB Program

We continued to attract and elevate the profile of graduate students in computational and genome biology in the MCB Graduate Program. Seven new Ph.D. students and two Ph.D. transfer students entered the MCB Graduate Program. Four new students, Erin Bredeweg, Jason Cumbie, Kathleen Eide, and Michael Raboin were provided CGBI-funded GRA positions in recognition of their qualifications and interests in computational and genome-based biological research. Three of these students have chosen CGBI faculty to be their major professor: Erin Bredeweg’s major professor is Michael Freitag in Biochemistry and Biophysics; Jason Cumbie’s major professor is Jeff Chang in Botany & Plant Pathology; and, Michael Raboin’s major professor is Dee Denver in Zoology. Kathleen Eide’s major professor is Ling Jin in Biomedical Sciences.

B. Continue Renovation of MCB Curriculum

Substantial progress on continued MCB Graduate curriculum renovation, formation of new courses, and final instructional plans for the new faculty to teach in the MCB Graduate Program was made.

a. MCB Curriculum Renovation Implementation. The MCB curriculum, including the changes that were implemented, is as follows:

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<th>Summer 2007</th>
<th>Fall 2007</th>
<th>Winter 2008</th>
<th>Spring 2008</th>
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<tr>
<td>*MCB511</td>
<td>*MCB555</td>
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<tr>
<td>Research Perspectives (3)</td>
<td>Genome Expression (4)</td>
<td>Cell &amp; Developmental Biology (4)</td>
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<td>*MCB525</td>
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<td>MCB599</td>
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<td>Techniques in Molecular &amp; Cellular Biology (3)</td>
<td>Microarray Data Analysis (1)</td>
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<td>*MCB554</td>
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<td>*MCB668</td>
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<tr>
<td>Genome Structure, Organization &amp; Maintenance (4)</td>
<td>Bioinformatics &amp; Programming (2+2)</td>
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<td>MCB605</td>
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<tr>
<td>Reading &amp; Conference (1) (Journal Club)</td>
<td>Reading &amp; Conference (1) (Journal Club)</td>
<td>Genome Evolution (3)</td>
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* = MCB Core Curriculum courses
b. Changes to the MCB curriculum and formation of new courses:
   i. Consolidation of 3-credit MCB553 (Structure and function of eukaryotic cells) and
      3-credit MCB556 (Cell signaling and development) into a single 4-credit course
      entitled Cell & Developmental Biology (MCB556), offered Spring Quarter.
   ii. Introduction of MCB668 (Bioinformatics & Programming) as a two 2-credit
       module, offered Winter Quarter.
   iii. Introduction of MCB599 Microarray Data Analysis as a 1-credit course, offered
       Winter Quarter.
   iv. Introduction of MCB669 Genome Evolution as a 3-credit course, offered Spring
       Quarter.
   v. Addition of MCB565 Mammalian Molecular Genetics as a 3 credits course, offered
       alternate years, Spring Quarter.
   vi. MCB 605 Reading and Conference is being used for the MCB Journal Club, a 1-credit
       course, normally offered Fall, Winter, and Spring (Winter MCB Journal Club
       was not offered due to the absence of an instructor).
   vii. PHL 547 Research Ethics (3) is currently being substituted for MCB 557 Scientific
       Skills and Ethics.

c. CGBI Faculty Teaching in the MCB Graduate Program:
   i. M. Freitag – Co-teaches MCB 554 (Genome Structure, Organization and Maintenance);
      Teaches and organizes MCB 511 (Research Perspectives)
   ii. E. Bakker – Co-teaches MCB669 (Genome Evolution); Co-teaches MB/MCB668
       (Bioinformatics and Programming)
   iii. T. Mockler - Co-teaches MCB555 (Genome Expression); Co-teaches MB/MCB668
       (Bioinformatics and Programming)
   iv. J. Chang – Co-teaches MCB554 (Genome Structure, Organization and Maintenance)
   v. D. Denver – Co-teaches MCB669 (Genome Evolution); Co-teaches MCB554 (Genome
      Structure, Organization and Maintenance)

C. Expansion of High-Throughput Sequencing (HTS) Facility and Computational Infrastructure
Two significant expansions to the CGRB HTS facility and computational infrastructure were
realized during 2007-08:
   a. Increased storage resources for Illumina data
      Due to the increased storage demands introduced by the HTS sequencing facility, dedicated
      storage space was purchased, installed and deployed within the existing CGRB computational
      infrastructure. Labs that have been the heaviest users of the Illumina sequencer contributed
      to the purchase of the storage hardware in exchange for dedicated disk space in proportion to
      their contribution. Policies were developed to manage and archive Illumina data to ensure
      long-term stability of the storage space.
   b. Paired-end upgrade to Illumina DNA sequencing machine
      The CGRB Illumina DNA sequencing machine was upgraded by the installation of a “paired-
      end module.” This upgrade increases the amount of sequence generated by the instrument
      and enables certain types of sequence manipulations and experimental procedures that were
      previously intractable. Funds for this upgrade originated from a May, 2007, OSU RERF
      award.

D. New Grant Funding
An OSU Building Use Credit (BUC) was awarded in October, 2007, to renovate facilities and
install a high-capacity uninterruptible power supply (UPS) to support the CGRB central services lab
and computational infrastructure. Several CGBI or CGBI-associated faculty received new NIH,
NSF or DOE grants. Several grant proposals are pending, including NIH, NSF, HHMI and OSU Venture Fund. Also, specific CGBI faculty were instrumental in OSU being selected as one of twelve universities to participate in the HHMI National Genome Research Initiative that will support a special BI21x lab section to sequence and analyze a phage genome. HHMI will provide funding to cover the cost for all reagents, supplies and sequencing charges for the class.

E. MCB Faculty Forum
This occurred November 13, 2007, in 4001 ALS, with a reception that followed in 3006 ALS. The primary objective of the workshop was to finalize the changes to the curriculum. All MCB faculty and the MCB Advisory Board were invited.

F. New MCB Director
Dr. Barbara J. Taylor was chosen as the new MCB Director in January 2008, replacing Interim Director Dr. James C. Carrington.

G. Implemented a new track in 2007
A new track, Genome Biology, was offered in 2007 for specialized training within the MCB Graduate Program.

H. Elevated Profile of CGBI Faculty in Computational Biology
Several CGBI or CGBI-associated faculty published manuscripts that incorporated computational methods in their data analysis. Journals include: Biology Direct, PLoS One, PLoS Biology, PLoS Genetics, The Plant Cell, Nucleic Acids Research and BMC Bioinformatics. It is expected that these publications will elevate the profile of these faculty and attract graduate students and post-docs interested in computational biology.

2. Goals for 2008-09

A. New Graduate Students in MCB Program
We will continue to attract and elevate the profile of graduate students in computational and genome biology in the MCB Graduate Program.

B. Select Additional New MCB Students to receive CGRBI GRA stipends
Two incoming graduate students have been offered CGBI support: Sanjuro Jogdeo and Henry Priest.

C. Continue Renovation of MCB Curriculum/New Courses
We will continue to implement the changes in the MCB Curriculum suggested by the MCB faculty during the 2006 MCB Graduate Program Workshop.

D. Expansion of High-Throughput Sequencing Facility and Computational Infrastructure
We intend to upgrade several components within the CGRB computational infrastructure, including adding new cluster nodes and high-performance storage space that are dedicated for use by new faculty programs.

E. New Grant Funding
Besides grants to individual CGBI faculty, we seek to obtain additional group grants for training graduate students and for development of shared use research facilities.
3. **Where you want to be when your initiative is fully developed/matured?**
   - Major strength in Computational and Genome Biology at OSU. Strong impact on existing departments and programs through infusion of new faculty, new graduate students and new or revised core facilities. We envision OSU being recognized as a major force in these areas of science, which will serve to attract students, faculty, post-doctorals and stature to OSU.
   - Recognition as an excellent destination for graduate students in computational and genome-based biology. They will be accommodated through formulation of a new track – Computational and Genome Biology – within the MCB Graduate Program.
   - Major new community resources and core facilities, primarily through the CGRB, enabling high-throughput and computation-intensive bioscience. This will serve to attract new grant money broadly across OSU.
   - Recognition as a center of high-impact discovery, attracting donors and gift-givers to OSU.

4. **A few simplified metrics that will be easy for others to understand**
   - Leveraged approximately $3.1 million from CGRB, Research Office and Colleges to combine with Provost’s Initiative funds.
   - Funds originally proposed for THREE new faculty were leveraged to provide support for FIVE new faculty in four departments.
   - Within five years, each faculty is projected to generate $450,000/yr in external grant funding.
   - Both salary and start-up packages offered are recognized as peer-competitive by our external advisors (Brian Staskawicz of UC Berkeley, and Steve Kay of The Scripps Research Institute).
   - Five new or revised courses to be offered by MCB Graduate Program within two years.

5. **Other helpful information (examples include student credit hours that will be/could be generated; new dollars that will be generated from the dollars invested; a summary of what OSU gets for this investment)**
   - In addition to research funding to new faculty, the Initiative and new CGRB investment will continue to fuel high-value, grant-generating activities from existing programs. Examples of early payoffs from these investments include funding for projects like the Ocean Microbial Genome project ($3.3 million, Moore Foundation; PI: Giovannoni, CGBI co-coordinator), Arabidopsis Small RNA project (Total $2.9 million over 6 years, NSF; PI: Carrington, CGBI co-coordinator), and new grants for CGBI faculty (see above)

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