Facilities

Laboratory: Dr. Sharpton manages a 1,200 sq. ft. temperature controlled research laboratory in Nash Hall on the Oregon State University campus in Corvallis, OR. This lab encompasses roughly 600 sq. ft. of "dry" (computational) lab space and 600 sq. ft. of "wet" (molecular and microbiological) lab space. The dry space includes 12 ergonomic computing bays, each of which is outfit with a desktop computer, monitor, external hard drive, keyboard, and mouse, as well as two 8'x4' whiteboards, a 5'x5' conference table, and a conferencing-capable phone system to facilitate collaborative discussions. The wet space is a BSL2 research environment, containing a biosafety cabinet and three molecular benches. The lab is outfit with a variety of equipment for molecular biology and microbiology research, including a 5C refrigerator, a -20C freezer, a -80C freezer, thermocyclers, bench-top centrifuges, water baths, and gel electrophoresis equipment.

Computing: The project benefits from the combined access to a variety of computing resources owned by Dr. Sharpton, the Department of Microbiology, and OSU's *Center for Genome Research and Biocomputing* (CGRB). All machines are connected through a campus-wide high-speed network.

The *Sharpton lab* manages a cutting-edge biocomputing facility. This includes the following components:

1) **A dedicated Dell R920 model computer**, which contains 120 core nodes, 1 Tb RAM, and 6 Tb of storage, and runs Linux OS. The Sharpton lab has complete authority over and dedicated access to this machine.
2) **HPC Mercury RM208 database server**, which contains 32 core nodes, 128 Gb RAM, 12 Tb of storage, and runs Linux OS. The Sharpton lab has complete authority over and dedicated access to this machine, which constitutes the lab's ftp server.
3) **A shared IBM POWER S822LC model computer,** which contains 220 core nodes, 2 NVIDIA NVLink P100 Pascal GPUs, 1 Tb of RAM, a 10G network card, and runs Linux OS. The Sharpton lab owns a 25% share of this machine.
4) **A NFS mounted file system,** which contains 48 Tb of dedicated storage. This is mounted to all machines over a 10G connection.
5) **A direct high-speed interface to the CGRB computing cluster.** The Sharpton lab facility can directly interface with the CGRB computing cluster through a 10G connection. This cluster provides access to >2500 nodes, which are interlinked through job scheduling software through a 10G connection.

A system administrator maintains and manages this facility. This infrastructure ensures that we can conduct the proposed analyses in a timely fashion.

The *Microbiology Department* manages two shared Linux OS servers containing 40 opteron cores and 512 Gb of memory. This server is NFS mounted to 48 Tb of shared disc space, is maintained by a system administrator, and is freely accessible to the Sharpton lab.

Offices: Dr. Sharpton's office is 200-square-feet and is equipped with a PC computer, 1000 mbps internet connectivity, teleconferencing equipment, a color scanner and printer, and an 8x6 whiteboard.

Software: The Sharpton lab has access to the software and data resources needed to complete the project's objectives. This includes sequence quality control software (e.g., fastqc, prinseq, deconseq, bmtagger), various read mapping algorithms (e.g., bowtie, bwa, etc.), and 16S rRNA gene sequence analysis tools including QIIME and its dependencies, mothur, and PICRUST. Additionally, it contains the software needed to conduct the proposed statistical analyses (e.g., R, matlab, DEseq, etc.). The database server maintains copies of several useful reference databases, including the following: NCBI's non-redundant sequence databases, the MetaCyc/BioCyc dabases, KEGG Orthology Groups and Pathways, Pfam, SiftingFamilies, GreenGenes, Ribosomal Database Project, and a Gbrowse database of bacterial and vertebrate genomes, including zebrafish.

Animal Facilities: Nash Hall contains an ABSL-2 approved zebrafish laboratory, which is overseen by Dr. Michael Kent (see letter of support). This resource is principally used to study fish pathogens. It contains a

unique flow system, 3 large zebrafish racks, and is designed to work with BSL-2 agents, such as *Mycobacterium spp*. There is a second fish room with the capacity for 30 medium size zebrafish tanks. A temperature-controlled isolation room (about 10 X 15 ft) is designated for zebrafish *in vivo* studies with *Toxoplasma*.

Core Services and Support:
Dr. Sharpton is a member of the interdepartmental Center for Genome Research and Biocomputing and have access to the services, equipment, and support made available through this center (http://corelabs.cgrb.oregonstate.edu/). Because the CGRB is connected to Nash Hall by a sky-bridge, these resources are conveniently accessible to Dr. Sharpton's lab.

Genomics. The genomics core offers several services relevant to the generation and analysis of high-throughput sequence data. If necessary, this core can support the library preparation and transcriptomic sequencing components of the proposed work. The CGRB Genomics core is equipped with the expertise and equipment to conduct: DNA library preparation and sequencing (Illumina HiSeq2000; Illumina MiSeq; Roche 454 Jr.); Sanger DNA sequencing (ABI 3730 DNA Analyzer); Genotyping (ABI3730 DNA Analyzer); Confocal microscopy (Zeiss LSM 510 META); Laser Capture Microdissection (Zeiss PALM MicroBeam IV); Bioanalyzer quantification (Agilent Bioanalyzer 2100); and RT-PCR (ABI PRISM® 7500 FAST Sequence Detection System).

Biocomputing. The CGRB Biocomputing core offers research support and consultation using a fee-for-service model. The expertise of the support staff includes hardware and infrastructure design and maintenance, data management and analysis, and software design and development. The core has extensive experience analyzing high-throughput DNA sequence data. OSU investigators can hire core personnel to solve specific programming and analytical challenges. The core also offers training workshops and connects researchers with expertise in different fields to solve transdisciplinary problems.

Additional Shared Facilities. The CGRB provides access to various equipment, including: Kodak X-OMAT Processor, an Invitrogen Qubit Fluorometer, a Promega QuantiFluor Fluorometer, a NanoDrop ND-1000 UV-Vis spectrophotometer, a Molecular Devices Spectra MAX 190 Microplate Spectrophotometer, a Qiagen Rapidplate, a GE Storm 820 PhosphorImager, and Genetix Qpix2 Colony Picker.

Environment:
Thomas Sharpton's laboratory and office is located in Nash Hall on the Oregon State University campus in Corvallis, OR. Oregon State University is one of two universities to have Land, Sea, Space, and Sun Grant designations. The university encompasses a network of over 12 colleges, 15 Agricultural Experiment Stations, 35 county Extension offices, the Hatfield Marine Science Center in Newport, OR, and the OSU-Cascades campus in Bend, OR. The 400-acre main campus in Corvallis is also the research epicenter of the university.

Nash Hall is a 5-story building that principally houses the Department of Microbiology and contains over 15 research laboratories, along with supporting offices and facilities, 2 teaching laboratories, 3 lecture rooms, offices and preparation rooms for instructors, an undergraduate computer lab, and Teaching Assistant and Student meeting rooms. OSU's *High Throughput Cultivation Laboratory* is also located in Nash Hall. Shared research facilities in the building include fluorescent and light microscopes and cameras, 25C and 37C constant temperature rooms, combination walk-in cooler and freezers, large and small autoclaves, chemical fume hoods, crushed ice machines, regular and ultra-centrifuges, floor and table-top shakers and incubators, CO2 incubators, gel electrophoresis imaging equipment, a NanoDrop spectrophotometer, and a flow cytometer. Additionally, there are two dedicated PCR rooms, a shared BSL2 laboratory, a building-wide reverse osmosis water system, and a general dishwashing room in the building.

We have established collaborations across the OSU campus (e.g., E. Ho, N. Hord, F. Steven, J. Beckman, A. Gombart, D. Denver, J. Chang, S. Giovannoi, A. Morgun, N. Schulzhenko, and M. Kent) and are also collaborating with extramural groups around the country (e.g., UCSF, UC Davis, CU Boulder, Harvard, Stoneybrook, Stanford). The Sharpton lab is involved in two interdisciplinary, collaborative microbiome-related projects: the iSEEM Project and the Human Microbiome Project. These collaborations provide opportunities for mentoring, scientific discussion, and exchange of technologies and data, which will enrich the proposed project.