**EQUIPMENT**

**Cornell University**

***Yu Laboratory:*** Major equipment items essential for the proposed studies available in the Yu laboratory include a speed-vac, incubators, shakers, four PCR machines (Bio-Rad C1000/S1000 with 96-well fast reaction modules), spectrophotometer, sonicator, electrophoresis equipment, centrifuges, refrigerators/freezers, pH meters, -80°C freezers, chemical hoods, CO2 incubator, Biosafety cabinet, N2 tank, etc. To facilitate high-throughput experiments, the Yu laboratory is equipped with a Molecular Devices QPix-HT colony picker and a Tecan Freedom Evo 200 (the largest) bio-robot platform with an 8-Channel Liquid Handling Arm, a 96 Multi-Channel Arm, and a Robotic Arm. It has 1x16-position, 4x4-position, 2x3-position plate carriers and an integrated Te-Vacs vacuum module for automated high-throughput DNA minipreps in 96/384-well-plate formats. It is also equipped with an extension deck that allows the Freedom Evo to be integrated with a Tecan Infinite M1000 plate reader, which includes absorbance, fluorescence, emission, excitation, and luminescence modules. Other equipment include three Multidrop Combi plate dispensers, four desktop microtiter-plate centrifuge, and two microtiter-plate shakers. Computational analyses are performed on a Dell PowerEdge T710 server with features including: 2x Intel Xeon X5570 processors, 6x 16G memory (144G total), and 6x 450G hard drive (2.7T total), and a Dell PowerEdge R930 server with 4x Intel Xeon E7-8870 v3 (144 threads), 16x 16G memory (256G total), and 6x 2TB 7.2K RPM SAS drives (12TB total). The Yu group also has access to many pieces of shared equipment within the Institute, including a spinning disk confocal microscope, a Bio-Rad Gel-Doc imaging system, ultracentrifuges, a real time PCR system, a Molecular Devices ImageXpress Micro XLS Imaging System, and an X-ray film processor.

***Shared Facilities at Cornell University:***The **Biotechnology Resource Center (BRC)** within Cornell’s Institute of Biotechnology provides an array of shared research resources and services for collaborative research, technology testing and development, and educational components. BRC core laboratories provide services for studies involving imaging (confocal and multiphoton imaging, flow cytometery, micro and nano-CT, and ultrasound), genomics (RNA-Seq, DNA sequencing, genotyping, and microarrays), epigenomics, proteomics and mass spectrometry, bio-IT, bioinformatics and computational biology and bioinformatics Other campus core facilities include NMR, electron microscopy and X-ray crystallography. The **BRC** is equipped with two **Illumina HiSeq 2500 instruments** can run two 8-channel flowcells in high output mode or run two 2-channel flowcells in "rapid run mode.", two **Illumina MiSeq** that can rapidly run a single sample or pool of samples, and two **Illumina NextSeq500** instruments that can rapidly run a single sample or pool of samples with up 800 M reads per flowcell. The sequencing facility is well managed, and the turnaround time for the NextSeq500 is often 5 days or less. Cornell core facilities also provide DNA Sanger sequencing and microarray analysis. The project team also has access to a Cornell core facility with expertise in bioinformatics (the Bioinformatics Facility, formerly the Computational Biology Services Unit [CBSU]) also within a 5-minute walk from either laboratory. This facility currently has a 60 node 240 core Windows cluster (DELL PowerEdge 1855 nodes with two x64 Pentium 4 Xeon 3 with 4 GHz, 4GB RAM and 144GB HD) and a 425 node 850 core hybrid Linux/Windows cluster (SUN V10Z nodes with two AMD Opteron 248 with 2.2 GHz, 2GB RAM and 300GB HD). Three 24 GB RAM Linux interactive workstations, one 16GB RAM Windows interactive workstation, and 31 Linux 16GB RAM remote workstations are also available for the proposed project.