

Facilities - Bigelow Laboratory for Ocean Sciences

Bigelow Laboratory for Ocean Sciences, founded in 1974, is an independent, non-profit organization with a primary focus on basic research of microbial processes affecting the productivity of the world's oceans, coastal seas, and estuaries. In 2012, the Laboratory relocated to its new, state-of-the-art Ocean Science and Education Campus facilities, with over 60,000 square feet of LEED® Platinum certified laboratory and office space.

Bigelow Laboratory Single Cell Genomics Center (SCGC) was established in 2009 as the first of its kind shared-user facility (scgc.bigelow.org). The SCGC offers multiple services on per-fee basis, including single cell isolation, whole genome amplification, PCR-based screening, genomic sequencing, and bioinformatics. For single cell isolation, the SCGC utilizes services of the J. J. MacIsaac Facility for Aquatic Cytometry (below). For whole genome amplification, the SCGC is equipped with a Bravo (Agilent Technologies) robotic liquid handler and a high-throughput plate reader (BMG). Cell sorting and single cell whole genome amplification are performed in a HEPA-filtered cleanroom. For PCR setup, SCGC uses a Freedom EVO (Tecan) robotic liquid handler. Thermal cycling is performed with an LC480 (Roche) real-time PCR cycler. Genomic sequencing libraries are prepared using M220 focused ultrasonicator (Covaris), Blue Pippin DNA Size Selection System (Sage Science), 2200 TapeStation Nucleic Acid System (Agilent Technologies) and Freedom EVO robotic liquid handler (Tecan). DNA is sequenced with SCGC's MiSeq and NextSeq 500 (Illumina). A Geneus-based (Genologics), enterprise-level laboratory information management system (LIMS) is used to record all SCGC's laboratory and computational activities, to store and process the obtained data and associated metadata. The obtained results are shared with SCGC customers via SFTP. The LIMS and single cell genomics-related bioinformatics analytical pipelines are hosted on Laboratory's compute cluster, which performs daily backups.

J. J. MacIsaac Facility for Aquatic Cytometry provides state-of-the art flow cytometry and cell imaging services. This facility is equipped with a Dako-Cytomation MoFlo cell sorter; Cytopeia inFlux cell sorter; BD FACScan cell counter; FlowCAM imaging cytometer, bright-field and epifluorescence microscopes. The MoFlo and inFlux are high-speed, jet-in-air research sorters. Both sorters are equipped for sorting into tubes and multi-well plates. The MoFlo is equipped with an air-cooled 488nm laser (Melles-Griot), and 7 PMT fluorescence detectors. The inFlux is equipped with 3 solid-state lasers (488, 354, and 643 nm) and 6 PMT detectors. The Facility also houses a FlowCAM® imaging-in-flow analyzer, an instrument invented at Bigelow Laboratory and manufactured by Fluid Imaging Technologies in Yarmouth, Maine.

High Performance Computer Cluster consists of a shared memory super computer system that has 160 processor cores, a 2,688-core GPU card and 1.3TB of RAM at its disposal and is scalable to a maximum of 4,096 cores and 64TB of RAM. The data warehouse component of the cluster consists of over 200TB of high performance, highly available storage being served up via a multitude of open protocols, allowing for a great deal of flexibility in the environment to support all operating systems seamlessly. The networking component of the cluster consists of the NUMALink 6 interconnect to connect all compute nodes at speeds of 56Gbps, while client side networking is served via 10GbE. Bigelow currently has a 100Mbps connection to the Internet to facilitate fast transfers of large datasets, with the ability to scale to 1Gbps on both the normal Internet as well as Internet2.

Other major facilities at Bigelow Laboratory for Ocean Sciences: Provasoli-Guillard National Center for Culture of Marine Phytoplankton (NCMA); Bigelow Analytical Services (BAS); Seawater Facility