

FACILITIES and EQUIPMENT DESCRIPTION

The UCR Institute for Integrative Genome Biology:

The University of California, Riverside will complete construction of a dedicated new \$53.8 million, 64,000 ft² interdisciplinary, four-story Genomics Building in February 2009 to accommodate over 200 faculty members, graduate students, postdoctoral and staff researchers. The building brings together bioinformaticians and life scientists under one roof who use modern genetic tools, genomics and bioinformatics to help address basic and applied questions in the plant, insect, and fungal sciences. The labs and student/researcher office spaces are open plan in design to stimulate interactivity between members of different research groups, and the 100-seat auditorium will host symposiums and training sessions dedicated to chemical genomics research.

Genomics Core Facility. In close proximity to this new building is recently renovated 10,000 ft² instrumentation facility (Keen Hall) that offers advanced tools in bioinformatics, microscopy/imaging, proteomics and genomics. The Genomics Core Facility at the Institute for Integrative Genome Biology (IIGB) provides technical, instrument, and professional development. The Core has two suites of instrumentation. In the Genomics Suite, capabilities include automated extraction and purification of plasmids from bacterial cultures in deep-well plates (Beckman Mutimek robot), automated handling of liquids for DNA sequencing reactions (Multiprobe II robot, Perkin Elmer) and PCR (Dyad, Biorad, Eppendorf, and ABI thermocyclers). For routine sequencing, the facility utilizes a 96-capillary sequencer (ABI 3730x1), whereas for genotyping, amplified microsatellites can be detected using a 16-capillary instrument (ABI 3100) and appropriate computer software (ABI GeneMapper). In the Gene Expression Suite, commercial microarray services are available. For custom arrays, the core offer two arrayers, a macroarrayer with 96 pins (Genetix Qpix) and a microarrayer with 1~48 pins (Biorad VersArray ChipWrite Pro spot arrayer). Three scanners are available for arrays, one for macroarrays and two for microarrays. For macroarrays and nucleic acid and protein blots, a Typhoon scanner (GE) with a resolution of 10~500uM can generate and quantify images from a variety of fluorophores and phosphoimage screens. For microarrays, the core offers two different scanners, the GenePix 4000B (Molecular Devices) and the ScannArray Express (Perkin Elmer) along with appropriate software for analysis. For commercial Affymetrix arrays, hybridization (Hybridization Oven 640), staining and washing (Fluidics Station 450), and quality control of RNAs (Bioanalyzer, Agilent) are offered. For array data analysis, two software packages (Molecular Devices Acuity and Stratagene ArrayAssist) are available. Gene expression can be validated by quantitative PCR using one of three instruments (ABI-7700, BioRad-iQ5 and BioRadMYQ). For fluorescence cytometric and sorting applications with whole cells, the facility houses an advanced cell sorter (BD FACSAria) which is a high-speed sorter with fixed-alignment cuvette flow cell and three air-cooled lasers (488nm, 633nm, and 407nm).

Next Generation Sequencing:

The Genomics Core also houses a state-of-the-art Illumina Genome Analyzer II with paired-end read capability. Full bioinformatics support for sequencing and data analysis are housed within the IIGB Bioinformatics Core. This next generation sequencer is capable of utilizing a bead-based amplification of templates. The instrument can generate more than a GB of data per run. This huge yield of sequence data results in a very low cost per base. The applications for the instrument are broad. Some of the applications include re-sequencing of genomes, small RNA and cDNA sequencing, CHIP seq, gene expression, and methylation studies.

The Center for Plant Cell Biology (CEPCEB)

Bioinformatics Core: The Keen Hall Bioinformatics Core provides: (1) **HARDWARE:** 8 triple-bootable Windows/Apple/Linux workstations, one molecular modeling workstation from Silicon Graphics. Four 16 CPU production, database, backup and web servers with over 32 TB of storage space and 500 GB of RAM. Two supercomputing Linux clusters with over 300 CPU cores are fully integrated into this hardware infrastructure. (2) **SOFTWARE AND DATABASES:** The facility maintains over 300 open-source bioinformatics software tools and local copies of all relevant compound and screening databases. The most important commercial software packages for molecular modeling and compound analysis tasks include Insight II, Catalyst and Cerius2 from Accelrys.

Proteomics Core: The Keen Hall Proteomics Core has a series of instruments for protein separation, sample preparation, and mass spectrometry analyses and houses a Waters Q-TOF nano-ESI MS/MS, an ABI Q-STAR XL MALDI MS/MS, capillary LC equipment, protein digestion, and 2-dimensional gel electrophoresis equipment. The facility has been upgraded with the most recent Q-TOF Premier technologies including continuous expression scanning, ultra performance liquid chromatography (UPLC) with non-splitting direct nano-flow, and more advanced data processing software, which will enable researchers to perform large-scale quantitative proteomics analyses with increased sensitivity and sequence coverage. In addition, a BIACORE X100 system has been added to the core to enable researchers to characterize protein-protein or protein-ligand interactions. Further upgrade of the UPLC to a two dimensional LC system by the end of 2008 will enable researchers to perform large scale proteomics experiments using the MudPIT method.

Microscopy Core: The ~2000 ft² Keen Hall Microscopy Core provides a comprehensive suite of confocal microscopes, and supporting peripheral equipment. Under the supervision of a full-time imaging expert and Academic Coordinator, Dr. David Carter, the Center is developing high throughput imaging capability and a range of optical imaging applications for use in plant and other systems. The Microscopy Core has five confocal microscopes: A high resolution UV spectral system with 9 laser lines (Leica TCS SP2 UV); a high resolution visible system with five laser lines (Zeiss LSM-510) and built-in laser ablation capability (Photonic Microsystems MicroPoint); one fully automated white-light confocal imaging workstation (BD Pathway HT), a real time ocular viewing laser confocal microscope (Meridian InSight Point); and a high speed Yokogawa spinning disc system with EMCCD camera (PhotonMax 512B) for very low light imaging. The Yokogawa system has a Terabyte of storage memory and includes an Optical Insights DualView eyepiece for simultaneous imaging of CFP/YFP fluorescent proteins for FRET analysis. Imaris Bitplane and Mercury Amira software are used for 3D image rendering and analysis. Other microscopy core equipment include a Hitachi TM-1000 tabletop scanning electron microscope; a Molecular devices Arcturus XT for laser capture; one ultramicrotome for electron microscopy sample preparation (Leica Ultracut T), with cryosectioning system for EM immunolocalization studies (Leica EM FCS); two fluorescence dissection stereo microscopes (Leica MZIII), one having attachments for fluorescence imaging at sub-cellular resolution (Fluoro Combi/ SPOT RT210-3), and the other having a Spot Pursuit 4Mpixel camera for fluorescence and color imaging; a cryostat for rapid sectioning of frozen tissue (Microm HM 500 OMV); a microtome for sectioning wax or plastic embedded samples (Hacker 5030 Microtome); an oscillating tissue slicer (EMS5000); a particle gun for inserting DNA into living tissue (BioRad PDS1000/HE Hepta); an automated microscope with premium image analysis system (GE MCID Elite) and a fluorescence microplate reader (Wallac Victor 2). For chemical genomics screens, we have two small BioTek Precision 2000 liquid-handling robots in laminar flow hoods for clean work, and a Beckman Coulter Biomek FX double bridge fluid handling robot with Cytomat hotel, for library management and distribution. The Biomek FX has eight independent Teflon tipped dispensers for cherry picking, a 96 tip head for bulk

distribution, and two pin tool fixtures for dispensing sub-microliter volumes. There is also a Percival Arabidopsis growth chamber, and a Stanford Photonics Onyx luminescence imager with mouse handling capability (warm pad and anaesthetic manifold). The equipment is available on a user fee basis, and training is provided free of charge.