FACULTY OF ARTS AND SCIENCES

GREEN is the new Crimson

KRAMER LABORATORY | BIOLOGICAL LAB BUILDING

16 DIVINITY AVENUE, CAMBRIDGE, MA 02138

LEED-CI v2.0
SILVER

The Kramer Lab is an approximately 4,000 square foot biochemistry lab located on the first floor of the Harvard Biological Laboratory Building at 16 Divinity Avenue in Cambridge, MA. Professor Kramer's laboratory is interested in the evolution of floral morphology. They use molecular, morphological, and phylogenetic approaches to study how flowers have changed over the course of evolutionary time. Research projects in the lab cover a diverse set of topics, including gene lineage evolution and the effects of gene duplication, the morphological diversification of floral parts such as petals and fruits, and the evolutionary and ecological significance of pollinator interactions.

The laboratory space is part of the Department of Organismic and Evolutionary Biology and serves as a working space for laboratory occupants. In addition to the faculty office, the renovation included open lab space, supporting office space, and a tea room.

Sustainability played a strong roll throughout the Kramer Lab project, during both design and construction. By understanding the function of the laboratory space, the team was able to identify which components could have the most calculable and beneficial impact on the project. A heavy focus was placed on the reuse of existing elements, as well as the application of sustainable furniture and materials. Design of the mechanical and electrical systems strived to minimize the facility's energy use, while respecting the needs of laboratory occupants.

Kramer Lab
Photo: Harvard Green Building Services, 2009

PROJECT HIGHLIGHTS

LEED® Facts

Harvard Faculty of Arts and Sciences
Kramer Lab
2009 Renovation

Location	Cambridge, Massachusetts
Rating System	Commercial Interiors v2.0
Certification	Silver
Total Points Achieved	27/57
Sustainable Sites	4/7
Water Efficiency	0/2
Energy and Atmosphere	6/12
Materials and Resources	4/14
Indoor Environmental Quality	9/17
Innovation and Design	4/5

98% of the total construction waste was diverted from landfills.

82% Of regularly occupied areas have access to exterior views and daylight.

93% of the equipment and appliances are Energy Star® rated

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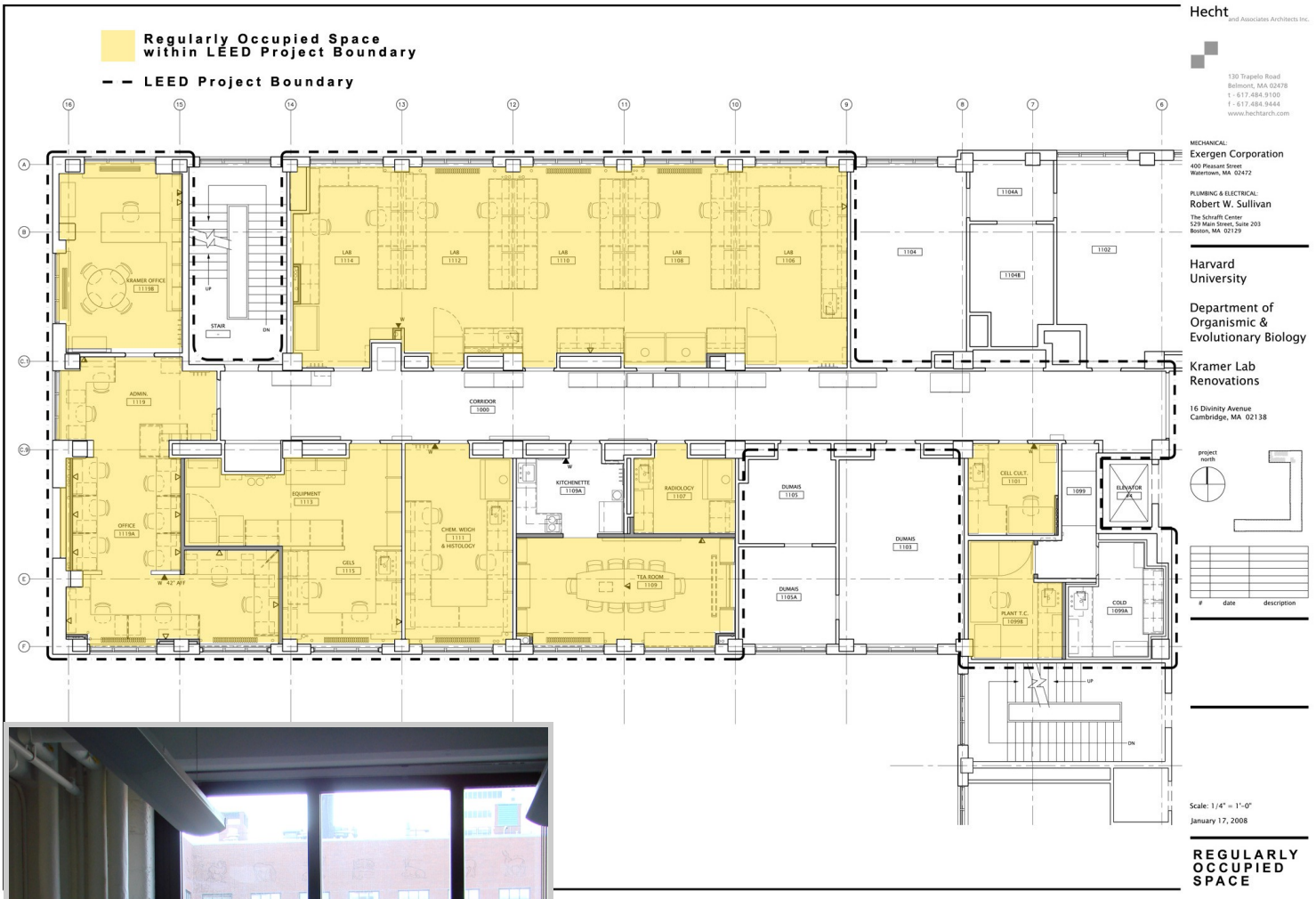
PROJECT OVERVIEW



Kramer Lab
Photo: Harvard Green Building Services. 2009

PROJECT TEAM

Owner	Harvard Faculty of Arts and Sciences
Project Manager	Petrini Garbarini, Harvard FAS
Architect	Hecht and Associates Architects
Contractor	Wise Construction
HVAC Engineer	Exergen BSD
Commissioning Authority	Sebesta Blomberg
Sustainability Consultant	Harvard University Green Building Services

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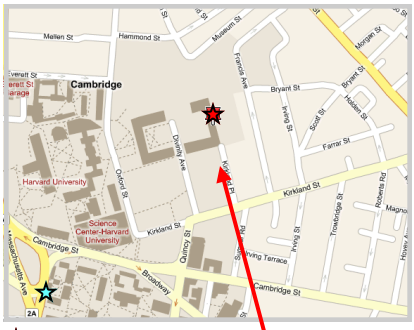
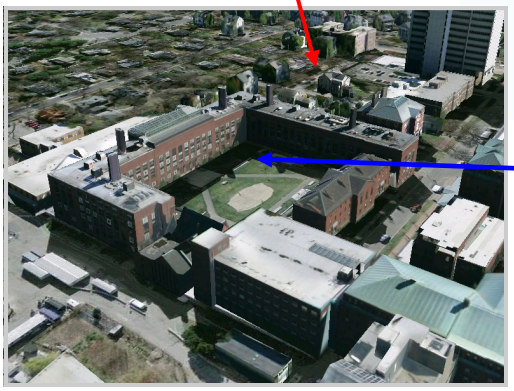
SITE

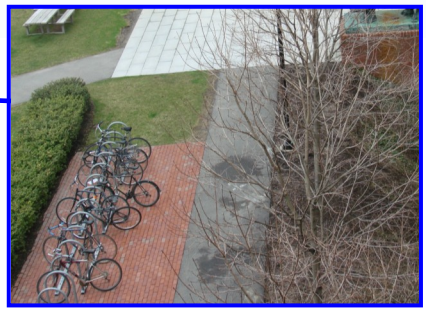


★ BioLabs Building
☆ MBTA Subway Station

- To encourage alternatives to driving, all occupants of Kramer Lab, as well as the BioLabs Building, have access to Harvard's comprehensive ***CommuterChoice Program***, which provides incentives, such as discounts, for all modes of alternative transportation as well as carpooling and fuel efficient vehicles. The Program is promoted through informational kiosks in building common areas and an extensive website. (www.commuterchoice.harvard.edu)
- The BioLabs Building is located within a quarter mile of 5 MBTA bus stops and 2 Harvard shuttle bus stops. The Harvard subway station is also in walking distance. The building is located in a dense urban area with several services, which allows occupants to walk and easily access amenities such as restaurants, parks, churches, and daycares.
- The BioLabs building provides bicycle racks with storage for 32 bicycles at the building entrance, with one shower and changing facility located in the basement of the building. Two additional facilities are located 85 yards away on the fourth floor of the Herbaria Building.



Harvard University BioLabs Building
16 Divinity Avenue, Cambridge, Massachusetts



Bike Racks at the BioLabs Entrance
Photo: Jessica Eisenman Parks. Harvard Office for Sustainability. 2009

FAS GREEN LABS PROGRAM

The FAS Green Labs Program works with researchers, staff, faculty, and building managers to implement sustainable practices and technologies in the FAS lab buildings. Because of the resource intensity of lab science and the unique conditions and requirements in each individual lab, lab sustainability approaches must be made from both a building-wide perspective, as well as a granular perspective aimed at identifying local opportunities at the lab level. FAS Green Labs Program initiatives, with the support of paid lab sustainability representatives, help mitigate resource intensity, while respecting the resource demands of science.

LAB SUSTAINABILITY ASSESSMENTS:

The Lab Sustainability Assessment program, a component of FAS Green Labs, operates under the conviction that scientific research can be conducted in more environmentally sustainable ways without adversely impacting research quality. By involving researchers in the process of assessing potential sustainability opportunities, the program aims to share best practices regarding lab energy efficiency, lab water efficiency, lab material recycling, lab material procurement, and toxic waste reduction/prevention.

KEY ENERGY CONSERVATION MEASURES (ECMS):

- Installing occupancy sensors on lights
- Setting back building temperatures and ventilation rates slightly at night
- Replacing inefficient lighting
- Converting constant volume fume hoods into variable volume fume hoods

ENERGY EFFICIENCY

FAS has committed, along with the larger Harvard University, to reduce greenhouse gas emissions 30% below 2006 levels by 2016, inclusive of growth. To this end, energy efficiency was one of the primary sustainability-related goals in the renovation project.

MECHANICAL SYSTEMS

All control points, space temperatures and set-points for Kramer Lab are mapped to the facility's Building Automation System (BAS), which uses space conditions in its various energy management strategies, and adjusts the central HVAC system operations to match overall building loads. The local systems are then controlled to avoid simultaneous heating and cooling. Program spaces in Kramer Lab operate individually on an occupied/unoccupied scenario to allow for the reduction of exhaust and makeup air rates.

BUILDING AUTOMATION SYSTEM: All automatic temperature controls are direct digital control (DDC). Automatic controls provide energy savings based on system zoning, scheduling, occupied/unoccupied setbacks and demand control ventilation. The system monitors all carbon dioxide($C0_2$) sensors throughout the building and modulates the air handling unit return, exhaust and outdoor air dampers, as required, to maintain the $C0_2$ set-point for demand control ventilation.

OCCUPANCY-BASED VENTILATION: Occupancy sensors are used to allow for the reduction of exhaust and makeup air rates.

SET-BACKS: Where allowed by use, set-backs reset the space's temperature in increments of 2 degrees Fahrenheit per hour, up to a total of 4 degrees Fahrenheit above set-point in the cooling mode or below set-point in the heating mode.

HEAT RECOVERY: A heat recovery unit was added to the air handling unit to increase outdoor air ventilation from 25% of total air volume to 50% of total air volume.

Light Sensor
Watt Stopper Model DT-200
Photo: www.wattstopper.com

ELECTRICAL SYSTEMS

OCCUPANCY SENSORS: Duel technology daylight and occupancy responsive control sensors turn lights off when not activated by motion for a set period of time.

DAYLIGHT SENSORS: Adjustable daylight sensing to prevent light fixture use when ambient light levels exceed the required light levels in the space.

LIGHT FIXTURES: Energy-efficient fluorescent light fixtures and lamps were carefully chosen and placed to reduce electricity consumption.

PLUG LOADS: 100% of the eligible equipment, including 10 computers, a scanner and a printer, are Energy Star® rated for power savings.

COMMISSIONING: The mechanical and electrical systems were fully commissioned by a third-party Commissioning Authority, which ensured that all energy-related systems were installed as designed, and operating efficiently prior to occupancy.

RENEWABLE ENERGY: Renewable Energy Certificates (RECs) were purchased from Sterling Planet (wind power) equivalent to 100% of the anticipated electricity use. This effort prevents over 18,000 pounds of CO_2 from entering our atmosphere.

Ventilation controls
Photo: Harvard Green Building Services. 2009

INDOOR ENVIRONMENTAL QUALITY

The Harvard University FAS is committed to providing a healthy indoor environment for all occupants. The project team was careful to maintain healthy indoor air quality during construction and to also ensure the space is designed to promote healthy indoor air quality during occupancy.

Indoor Air Quality During Construction: The building maintained occupancy throughout construction. Thus, a comprehensive indoor air quality management plan was implemented during construction to maintain healthy indoor air quality. For example, all grills and vents were sealed and a HEPA Filtration unit maintained negative pressure to keep any construction debris from migrating into occupied spaces.

Temperature and Lighting Control: To promote productivity, comfort and wellbeing, thermostats and control units are installed within tenant spaces and lighting controls enable 90% of the occupants to suit individual needs.

Daylight and Views: In 90% of the regularly occupied spaces, occupants have a direct line of sight to the outside, providing a connection between indoor and outdoor environments.

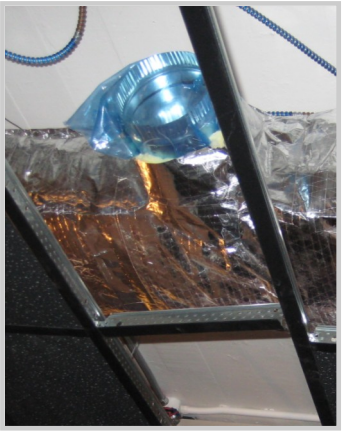
- **Composite Wood and Laminate Adhesives:** There is no added Urea Formaldehyde in any of the products used in the Kramer Lab renovation.

- **Paint and Coatings | Adhesives and Sealants:** All interior paints used in the project have low or zero VOC Contents. Below are examples of products used in the project.

Product Category	Product & Manufacturer	VOC Content (g/l)	VOC Limit (g/l)	Standard
Adhesives & Sealants	Lees Unibond Wet Set Adhesive	0.0	50.0	SCAQMD Rule #1168
	Forbo T-940 Water Base Adhesive	0.0	50.0	SCAQMD Rule #1168
	Mapei Ultra/Bond ECO 575	0	50.0	SCAQMD Rule #1168
	Johnsonite Power Tape	0.0	50.0	SCAQMD Rule #1168
	Hercules CPVC Gold, Yellow Label	490.0	510.0	SCAQMD Rule #1168

Source Control:
Enamel with Low VOC content

Pathway Interruption:
Exhaust filtered and direct to outside



Housekeeping:
Ductwork sealed after installation

Kramer Lab - Daylight & Views
Photos: Harvard Green Building Services. 2009

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MATERIALS AND WASTE

Selecting environmentally preferable materials and minimizing the amount of construction waste sent to landfill was important to the project. For the additional materials purchased, the project gave preference to low-emitting materials with recycled content and locally manufactured.

98% **of the construction waste was diverted from landfills.**

18% **of the total material value consists of post-consumer and/or pre-consumer recycled**

Kramer Lab
Photos: Harvard Green Building Services. 2009

ENVIRONMENTALLY PREFERABLE MATERIALS IN KRAMER LABORATORY | BIOLABS BUILDING

- Kitchen Cabinets (Uniboard)
  100% pre-consumer
- Wood Doors (Marshfield Doors)
  54% pre-consumer
- Door Operator (Door Max)
  49% pre-consumer, **6%** post-consumer
- Systems Furniture (Steelcase)
  74% pre-consumer, **1%** post-consumer

Examples of regional materials used in project:

Material Name	Manufacturer	Distance between project & Manufacturer (mi)
Masonry Materials	Park Ave Cement	46
Steel Framing & Accessories	Dietrich	40
Epoxy Flooring	Dur-a-flex	88

Kramer Lab
Photos: Harvard Green Building Services. 2009

ADDITIONAL RESOURCES

- HARVARD DEPARTMENT OF ORGANISMIC AND EVOLUTIONARY BIOLOGY: http://www.oeb.harvard.edu/
- FAS GREEN LABS PROGRAM: http://green.harvard.edu/fas/labs
- HARVARD GREEN BUILDING SERVICES: http://green.harvard.edu/green-building-services
- HARVARD GREEN BUILDING RESOURCE: http://green.harvard.edu/theresource

IF YOU ARE INTERESTED IN SETTING UP A TOUR OF THIS FACILITY, PLEASE EMAIL ENERGY@FAS.HARVARD.EDU OR DIAL 617.384.5496 TO REQUEST A LIST OF POTENTIAL TOUR DATES AND TIMES.