Micro Magic, Inc. tools mentioned as asset in Penn State Graduate Dept. Research Facilities Bulletin

PENNSTATE

http://www.psu.edu/bulletins/whitebook/$research.htm

RESEARCH FACILITIES

Of the University's more than 16,000 acres of land, a substantial portion consists of recreation areas, farms and agricultural experiment grounds, and forest tracts that are used by graduate students in their work and research. Animal and wildlife students, for example, are conducting nutrition and reproductive physiology studies of whitetail deer, sheltered at one of the forest tracts. Astronomy students study at an observatory housing the largest telescope east of the Rockies. Those in civil engineering can carry out research at the only highway test track in Pennsylvania. Laboratories and equipment devoted to meteorology, mining, chemistry, combustion, biomechanics, engineering acoustics, psychology, and microbiology mirror the University's strengths in those disciplines. Biotechnology and microelectronics groups have established themselves here, and centers of expertise in computer-assisted design and manufacture, as well as robotics, have emerged. The Huck Institutes of the Life Sciences provides centralized facilities for all researchers in the biological sciences, and the Materials Research Institute enables new opportunities for multidisciplinary education and research within the materials-related disciplines.

The Social Science Research Institute has a Survey Research Center (SRC) that provides state-of-the-art and cost-effective survey research services to Penn State faculty and administrative units. SRC contributes to the education and training of Penn State students in areas related to survey research, and also serves as a focal point for Penn State faculty in a variety of disciplines whose research interests touch on the methodology of survey research. The SRC provides services in the areas of survey design, sampling, and data collection (including telephone, mail, face-to-face, and Internet surveys and focus groups); survey data management; and data analysis. Center staff assist researchers in estimating the costs associated with the collection and analysis of survey data. The center employs undergraduate and graduate students, serves as a resource on primary survey data collection for students enrolled in research methods courses, and offers short survey research workshops open to students and faculty each academic year. A major goal of the center is to serve as a focal point for Penn State faculty in a variety of disciplines who have an interest in the methodology of survey research. In the near future we will be developing a program to enable faculty to become associates of the Survey Research Center. The purpose of this program is to enhance collaborative research and training activities focusing on survey research methodology.

In addition to research conducted in academic departments or in organized research units within the individual colleges, opportunities for interdisciplinary research exist in the Huck Institutes of

the Life Sciences, the Materials Research Institute, the Children, Youth, and Families Consortium, the Penn State Institutes of the Environment, the Social Science Research Institute, and in research units: the Applied Research Laboratory and the Institute for the Arts and Humanities. The Animal Resource Program also provides University-wide services.

THE UNIVERSITY LIBRARIES

The University Libraries, www.libraries.psu.edu, constitute a major resource for students and researchers in all fields of study. The Libraries contain more than 4.7 million volumes, 5.1 million microforms, and 57,000 serial subscriptions. At University Park, the Libraries include nine subject libraries in Pattee Library and Paterno Library and additional subject libraries at branch locations, including the Architecture, the Fletcher L. Byrom Earth and Mineral Sciences, Engineering, Pollock Laptop, Mathematics, and Physical Sciences libraries. There are twenty-two campus and college libraries at Penn State's campuses throughout the Commonwealth, including Abington College; Altoona College; Berks-Lehigh Valley College; Penn State Erie, The Behrend College; Capital College; Penn State Great Valley School of Graduate Professional Studies; twelve campuses of the Commonwealth College; The Dickinson School of Law; and the College of Medicine at Penn State Milton S. Hershey Medical Center.

Pattee Library houses the George and Sherry Middlemas Arts and Humanities Library, Reserve Reading Room, Class of 1994 Extended Hours Reading Room, the News and Microforms Library, and the Gateway Library. Paterno Library houses the Maps Library; The Eberly Family Special Collections Library, including Historical Collections and Labor Archives, Rare Books and Manuscripts, and the Penn State University Archives; Social Sciences Library; William and Joan Schreyer Business Library; Life Sciences Library; and Education and Behavioral Sciences Library. Special collections include the Allison-Shelley Collection, the United Steelworkers of America archives, the John O'Hara papers, and the nation's largest collections of Australiana and Utopian literature, among others.

Access to holdings is obtained through a computerized catalog, part of the Library Information Access System (LIAS), available on the Web at www.libraries.psu.edu. LIAS is a dynamic, integrated information system that provides electronic access to a great variety of materials in many subject areas, including course reserves. A growing collection of more than 350 databases, including 8,000 journals with full-text articles, is available on the E-Resource List (A-Z). Introductory sessions, announced on the Libraries Web page, are offered on a regular basis to familiarize faculty, students, and other library users with LIAS. Instructional Programs are listed at www.libraries.psu.edu/instruction on the Web.

The Libraries maintain a comprehensive program of general and specialized reference and instructional services. The Libraries' faculty teach credit courses as part of the Library Studies Program, conduct topical seminars, and provide instruction on bibliography and library research to students in hundreds of University courses. Services offered include computerized literature searches in a variety of databases and resource sharing networks available through Interlibrary Loan for materials not part of the Libraries' collection.

In addition, Media and Technology Support Services (MediaTech), www.libraries.psu.edu/mtss, a

division of the Libraries, has a collection of more than 20,000 films and videotapes and more than 3.500 pieces of technology and audiovisual equipment. These titles are listed in Medianet through LIAS, in a Web-based search engine at www.medianet.libraries.psu.edu, and in The CAT, the Libraries' online catalog. Programs may be scheduled by calling 814-863-3202 (University Park), 814-865-6314 (locations other than University Park), or by e-mailing mtssmed@psulias.psu.edu. Reference service is available by calling 814-863-3202. Preview facilities are located in Special Services Building, 151 Standing Stone Lane, and in 26 Willard Building.

Additional library services include assigned carrels, photocopiers, a student lounge with vending machines, change machines, Mackinnons Café, and assistance for users with disabilities. A printed "Guide to the University Libraries" offers additional information on services and programs and is available at Libraries service desks and by calling 814-865-0401.

THE PENN STATE PRESS
The Penn State Press is a publisher of books and journals that contribute to the advancement of scholarship. It publishes in most areas of the humanities and social sciences, giving emphasis to art and architectural history, literature and literary criticism, philosophy, religious studies, history, political science, women's studies, sociology, Latin American studies, and East European and Russian studies. Its journals include the Chaucer Review, Journal of Nietzsche Studies, the Good Society, Philosophy and Rhetoric, Journal of General Education, Journal of Speculative Philosophy, Comparative Literature Studies, Journal of Policy History, Pennsylvania History, Book History, and Shaw: The Annual of Bernard Shaw Studies. The Press publishes eight series: Issues in Policy History (Editor: Donald T. Critchlow); Literature and Philosophy (Editor: Anthony J. Cascardi); Penn State Series in the History of the Book (Editor: James L. W. West III); Re-reading the Canon (Editor: Nancy Tuana); Studies of the Greater Philadelphia Philosophy Consortium (Editor: Michael Krausz); Rural Studies Series (Editor: Leif Jensen); Penn State Library of Jewish Literature (Editors: Baruch Halpern and Aminadav Dykman); American and European Philosophy Series (Editors: Charles Scott and John Stuhr); Buildings, Landscapes, and Societies; and New Modernisms.

INFORMATION TECHNOLOGY SERVICES
Information Technology Services (ITS) ensures that faculty, students, and staff have the information technology tools and infrastructure necessary to carry out the University's mission. ITS provides the infrastructure that enables members of the Penn State family to make maximum use of the appropriate information technology tools in their learning, teaching, research, outreach, administration, and support activities, and the cost-effective information technology resources required to support continuous improvement in the University's ability to fulfill its diverse mission. ITS is working to achieve five broad goals:

-Help faculty improve the way education is delivered.
-Provide students with resources to enrich their educational experience.
-Create and sustain an environment that enables leading-edge research.
-Help to improve productivity.
-Establish the information technology infrastructure necessary to maintain Penn State's preeminence in integrating high-quality programs in teaching, research, and outreach.

The necessary infrastructure, services, and resources are provided through the Office of the Vice Provost for Information Technology and its seven operating units:

Academic Services and Emerging Technologies: Designs, develops, and operates the information technology infrastructure necessary to deliver technology services in support of students, faculty, and staff in their teaching, learning, and research endeavors. Performs research and development in information technology for the purpose of developing, defining, and promoting an information technology architecture that positions the institution to take advantage of rapidly emerging opportunities.

Administrative Information Services: Serves as the central University resource responsible for supporting administrative information systems. Participates in the development, maintenance, and secure operation of the state-of-the-art applications using centralized student, business, and alumni databases.

Consulting and Support Services: Provides an interface for the services offered throughout ITS. Its mission is to provide the highest level of service to students, faculty, and staff through individual and departmental consulting, help desks, and the development of new services.

Digital Library Technologies: Provides access to electronic resources and services for students, faculty, and staff in support of the instructional, research, and public service programs of the University. Provides computing solutions to support the University Libraries' programs and services. Provides technical leadership in research and development of digital libraries initiatives.

Security Operations and Services: Focuses on developing, interpreting, and enforcing University computer and network security policies. Responsible for incident response and providing forensic and litigation support, risk assessments, and vulnerability assessments. Provides education, awareness, and advice on security issues and policies.

Teaching and Learning with Technology: Helps faculty enrich the educational experience of students through wise use of technology by providing classrooms, labs, courseware, and specialized services. Through a training program, provides faculty, staff, and students with the skills they need.

Telecommunications and Networking Services: Responsible for developing, designing, installing, and maintaining comprehensive telecommunications services within and among University locations and outside networks to accommodate University communication needs.

For additional information about Information Technology Services (ITS), see http://its.psu.edu.

SPECIALIZED COMPUTING FACILITIES
Penn State also provides distributed computing and information systems. Many academic computing facilities exist to support the specialized research and instructional requirements of the colleges and the intercollege research programs. Some of these facilities are described below.

Colleges

College of Arts and Archiecture

The School of Architecture and Landscape Architecture operates dedicated student computer labs and has integrated desktop computers into the studio environment. Students have access to high-performance networks via either wired or wireless connections. The school's computer labs, including the Stuckeman Center for Design Computing, are primarily used for teaching and research in such areas as computer graphics, computer-assisted drawing, design, GIS, and digital imaging, as well as exploration into computer visualization, virtual reality, and digital fabrication. A wide variety of available input and output equipment, such as large-format printers, color printers, scanners, a CNC laser cutter, site survey, and video imaging and capturing equipment, provides faculty and students with opportunities to explore and master a variety of technologies and presentation techniques.

The Immersive Environments Lab (IEL) is a joint venture between Penn State's Information Technology Services (ITS) and the School of Architecture and Landscape Architecture (SALA). The IEL is a stereo visualization system consisting of a three-screen panorama display and a cluster of graphics workstations. Students have the capability of displaying a range of 2D and 3D presentations or they may launch 3D to a full three-screen stereo panorama for a group walk-through. Using virtual reality to visualize interior and exterior spaces allows students to follow the design process from conception to construction to completion.

The School of Music provides students and faculty in all disciplines within the school with a Macintosh-based electronic music laboratory and two computerized music rooms. These facilities afford faculty and students opportunities to create, analyze, and perform music as well as develop innovative music teaching materials.

The School of Theatre maintains lab facilities to support its technical theatre program, including set design, lighting, sound, and costume design. Interaction with common and professional applications affords students the opportunity to gain familiarity and experience with tools being used in the field. In addition, computers are regularly used in performance to control lighting and sound systems and to facilitate such complex tasks as moving scenery.

The School of Visual Arts' computer facilities are customized for the advanced technological needs of students and faculty in the School of Visual Arts and the Department of Integrative Arts. Located in 302, 304, and 401 Patterson Building and maintained by Information Technology Services (ITS), the Patterson computer laboratories are specialized for design, animation, and high-end multimedia production. Within close proximity, the Graphic Design computer laboratory, 208 Visual Arts Building, is designed to meet the specific needs of students enrolled in the Graphic Design program. The Digital Photography computer laboratory, customized for students enrolled in the Photography program, is located in 209 Visual Arts Building. All five labs are Macintosh environments and are used as both teaching and study facilities. Most labs are open twenty-four hours a day, seven days a week.

The College of Earth and Mineral Sciences has installed a high-speed communications network

that provides computer-to-computer communications within the college, as well as with external networks and computers via University facilities. Wireless access to this network is provided throughout the college.

Computing facilities are distributed throughout the five departments and two institutes of the college, and include extensive local PC, UNIX/LINUX, and Macintosh computer laboratories accessible to undergraduate and graduate students. Many graduate students have a PC or UNIX computer supplied to their desktop. In addition to these distributed facilities, high-performance computing is available, centered on the dedicated Cray SV1 system and associated large-capacity mass storage system.

In the College of Education, the Education Technology Center, located in 201 Chambers Building, provides technical support services, multimedia and graphic design services, Web design and development services, and computer application training for College of Education faculty and staff. The Education Technology Center also maintains the Education Technology Demonstration Classroom and video conferencing services. The Demonstration Classroom is used by College of Education faculty for implementing technology into teaching and learning for undergraduate and graduate College of Education courses. It also provides a computer facility equipped to instruct College of Education students how to use technology in their teaching and learning experiences.

The IBM Personal Computer Lab, located in 202 Chambers Building and the Macintosh Computer Lab located in 205 Chambers provide microcomputer access to the University community. Thirty networked IBM and twenty-eight Macintosh computers are available for student and faculty use. (The labs are restricted during certain hours; check schedule outside each room.)

The College of Engineering has several classes of general and special-purpose computational resources and services available for educational and research use. Each department maintains multiple laboratories that include various servers and workstations. These laboratories employ a number of Sun, PC, and Macintosh workstations running under the latest Sun, Microsoft, LINUX, or UNIX operating system. In addition to these general-purpose education and research facilities, several departments have faculty who maintain High-Performance Parallel Computing facilities with multiprocessor computing nodes. These facilities typically use PC-based systems running LINUX or Macintosh OSX servers running Open BSD in Beowulf clustering configurations. The University's Information Technology Services also maintains a multinode High-Performance Parallel Computing facility, available to faculty and graduate students for their research.

The Department of Computer Science and Engineering maintains computer system laboratories in Pond Laboratory. The department currently supports 2,400 user accounts on 425 UNIX workstations and servers. A number of computer vendors are represented in the department's collection of systems, including Sun Microsystems, Silicon Graphics, and IBM. These computer systems are connected to one or more of the thirty currently running subnets. A connection to the campus ATM backbone allows any user to easily communicate with other research facilities around the world. The University has connections to the VBNS and commercial ISPs for access to other sites. Programming languages available to users in the department include C, C++, Pascal, FORTRAN, Scheme, Prolog, ML, and Common LISP. TeX, troff, and Framemaker are available

for typesetting and document preparation. A large collection of VLSI/CAD tools, including design system software from Cadence, Synopsys, and Micro Magic, Inc., as well as the MathWorks MATLAB package and a number of its toolboxes, are available.

Several college departments collaborate with faculty in other colleges to offer a minor in High-Performance Computing. The minor educates graduate students in scientific and high-performance computing with an emphasis on the capabilities and uses of parallel computers. This minor offers an opportunity for students in all colleges and majors to pursue a focused set of courses that emphasize the use of high-performance computers to solve problems in science and engineering. The success of this program has led to the establishment of the multidisciplined Institute for Computational Science. This institute will address the need for resources and computing power required for fields such as computational fluid dynamics, computational chemistry, computational meteorology, computational physics, artificial intelligence, computational materials science, business computing, etc.

The college's Electronic and Computer Services (ECS) provides faculty and graduate students with engineering expertise and support in the areas of hardware and software system design, prototyping, and complete systems integration. ECS's resources include high-performance workstations and design tools (ViewLogic, H-Spice, Cadence, LabView, AutoCAD, etc.). Also available are tools for embedded system development. Prototyping facilities consist of Xilinx and Altera systems for FPGA design implementation and a Direct Imaging System that allows rapid construction of printed circuit boards. Distributed access to college, departmental, and ECS resources is through the college's maintained high-speed secure data network.

The Noll Physiological Research Center in the College of Health and Human Development has an Ethernet system, access to the Penn State backbone, UNIX, Image telemetry system, electronic mail services, and many types of PCs to collect and process data from a wide variety of physiological testing.

The Department of Communication Sciences and Disorders uses several microcomputers for educational, research, and clinical needs related to speech, language, and hearing development and disorders. Specialized computer technology including CAFET, Speech Master II, VisiPitch, computerized speech laboratory, and computerized hearing assessment programs are available for use by students and faculty.

Within the Eberly College of Science, each department has an array of computer facilities.
-- Department of Astronomy and Astrophysics computing resources include a large and ever-expanding network of workstations and personal computers. The current census includes seventy-five Sun workstations, three DEC/Compaq Aphas, and 100 PCs. Many of the workstations are configured for maximum processing power so that data sets from various ground- and space-based observing platforms from around the world can be intensively analyzed by faculty and graduate students. The department has a 100-MB intranet with a fiber optic 100-MB connection to the University backbone, allowing fast, unlimited access to the Internet from any machine. LINUX is the primary OS used on the PCs, but Windows OS's are used in several offices and labs for specialty purposes. There are four Beowulf clusters used for complex simulation and visualiza-

tion. Ten TB of online disk space serves data to department science and research teams.

-- The Department of Biochemistry and Molecular Biology maintains a 100-Mbps Ethernet with ~500 IP addresses currently in use. Most of these serve desktop computers in individual research groups. Twelve desktop computers are maintained in one room for general or instructional use, and eight workstations are dedicated to special equipment for phosphorimaging, laser densitometry, analytical ultracentrifugation, surface plasmon resonance measurements, and X-ray crystallography. Laptops and projectors also are available for general use.

-- The Department of Biology maintains two 100-MB fiber backbones that support nearly 500 PC and Macintosh machines. Most of these computers are used to run research machinery and for individual research label workstations. The department also houses thirteen servers, including a state-of-the-art firewall, two domain controllers, automated Windows patch management, automated antivirus system management, and an advanced Web application cluster. Licensed software within the department includes a wide array of Microsoft and Macintosh products.

-- The Department of Chemistry maintains approximately 1,152 nodes comprising numerous PCs, workstations, and servers of varying operation systems, all supported by 10/100/1000 MB Fast Ethernet. Chemistry also maintains its own wireless network, internal routing service, mail service, and Web services, as well as computer and instrumentation repair services providing optimal network connectivity and customer service.

Many individual research groups within Chemistry boast their own PC clusters. Several of the computer-intensive research groups participate in the shared resources of the Graduate Educational and Research Services (GEaRs) and the Institute for High-Performance Computing Applications.

-- The Department of Mathematics maintains a high-speed switched network of UNIX-based workstations and servers for use by faculty, students, and staff. Most workstations are for use by individuals or small groups. A lab is maintained for use by undergraduates, graduates, faculty, and visitors. Supported operating systems are Solaris and OSX. Supported software includes Mathematica, Matlab, TeX, and LaTeX. Supported programming languages include C, C++, Java, Fortran, and Perl. Some research groups maintain their own computing equipment including a Beowulf cluster and computers used to control high-speed cameras.

-- The Department of Physics maintains a high-speed switched network that provides several connections to each office and supports a wide variety of computing environments. Many research groups have their own computing systems, which range from simple PCs to Beowulf clusters. At the departmental level, a group of UNIX servers supports mail, Web, printing, backup, etc. All department members are entitled to accounts on a group of Sun workstations, and the Sun system has a variety of appropriate software. A computer lab, available to all department members, has Sun workstations, printers, and some PCs running Windows NT/2000.

-- The Department of Statistics maintains computer systems and laboratories to provide facilities for both research and instruction. Equipment includes thirty Sun UNIX workstations, sixty PCs

(operating Windows and LINUX), high-quality laser printers, color printers, a color scanner, and video-capture facilities. Faculty and students have computers in their offices. Software packages include BMDP, MINITAB, SAS, Splus, R, ArcInfo, Mathematica, FORTRAN, C, Java, LaTeX, and TeX. The department has two full-time system administrators to maintain a high-quality computer infrastructure.

Many colleges operate computing laboratories that provide students and faculty with microcomputing capabilities and/or batch and interactive access to the University's principal computers through Information Technology Services (ITS).

Interdisciplinary-The Applied Research Laboratory (ARL) uses more than 2,000 computers in multiple networks of Microsoft Windows, LINUX, Solaris, and VAX workstations, with software supporting data acquisition and processing, process control, modeling and simulation, visualization, data fusion, interactive problem solving, and business applications. MATLAB is used extensively. A synthetic environment lab is available for 3-D visualization. High-performance computer resources include multiple Linux clusters and grids, and access to U.S. government HPC resources. Mechanical and printed circuit CAD software is used for design, and computer-aided manufacturing software is used extensively to run the shop's multi-axis CNC machines.

The Materials Research Institute (MRI, at www.mri.psu.edu), together with more than a dozen academic departments/units, offers students access to professionally staffed materials processing, characterization, and computer simulation facilities. MRI enables new opportunities for multidisciplinary education and research within the materials-related disciplines.

The Penn State Institutes of the Environment at the Land and Water Research Building houses an up-to-date network of computers that provide faculty, researchers, and graduate students with the tools needed to facilitate research in a wide variety of areas. A high-speed local area network (LAN) ties the nearly 200 workstations together and provides access to statewide spatial data as well as software for analytical analysis. This LAN is connected to Penn State's fiber backbone through a firewall that provides secure access to the Internet. Locally, software for a variety of applications is available that includes Environmental Systems Research Institutes software for geographic analysis, Earth Resources Data Analysis System for image processing, Microsoft Office Suite, Photoshop, Dreamweaver, and Minitab, among others. Hardware, besides the workstations and network appliances, includes large disk storage, servers for disk storage and printing, large format plotters, laser-quality color printers, flatbed scanners, and mass CD duplicators. Most faculty and researchers have their own portable computers and handheld devices for mobile applications. One room in the building is a dedicated videoconferencing room, which can use the Internet or phone lines to provide conferencing worldwide.

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