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Appendix
SUMMARY

Volume 1 focuses on the history and characteristics of the College of Engineering, its academics, current statistics and key aspects of the College’s physical environment in its current and historical form. This volume’s content is built upon existing data and interviews with faculty and members of administration. The foundation that this volume establishes will serve as the basis for future explorations into the analysis of space use, its future growth requirements and ultimate solutions for solving these interrelated issues.

Key to an understanding of the College of Engineering is its roots in a practice based education. Over time it transformed into a teaching College and ultimately into an interdisciplinary research focused College while simultaneously maintaining a top undergraduate education. At the opening of Cornell University in 1868, degrees in civil engineering in the College of Mathematics and Engineering and mechanical engineering in the College of Mechanic Arts, were offered. Shortly following this Civil Engineering was established as a separate College in 1870 and the College of Mechanic Arts was renamed the Sibley College of Mechanic Arts.

Each of these programs prepared students for a practice based education where significant time was spent in shops, foundries and testing facilities. At its inception the vast majority of the College’s space was located in the north quad in buildings such as Sibley, Franklin, Lincoln, Rand Halls and in a collection of different shops, foundries and other temporary facilities near the primary buildings. At the end of the nineteenth century the College enjoyed an increasing enrollment and responded with the construction of additional buildings for electrical engineering and chemistry. The enrollment peaked in 1910 at 1,745. In 1921 the College of Engineering was established by combining a number of different fields to establish the program.

The trend of increasing enrollment, combined with aging facilities, resulted in a change for the worse during the first half of the 20th century. Enrollment declined and the general state of the facilities also declined. As a result, multiple master plans were prepared to develop the next stage of the College’s future in the north quad. However, the first World War and the Great Depression stalled attempts to move forward. During the tenure of Solomon Cady Hollister a different direction was established. A new master plan was developed for a parcel of land in the south area of the campus adjacent Cascadilla Gorge. Starting in 1942 Olin Hall was built. After a brief hiatus from construction during World War II several buildings were built in rapid succession, thus creating an engineering quad. Many of these buildings were built for the purposes of teaching an undergraduate education in Engineering.

As the pedagogy shifted toward the development of a research focused graduate education these buildings were deemed inappropriate for this purpose. In 2004 Duffield Hall was built. Duffield created state-of-the-art research and core facilities for the benefit of the College at large. Also, at this time a significant emphasis was placed on interdisciplinary research. The College of Engineering now also occupies space outside of the engineering quad in buildings such as Weill Hall, Clark Hall and the Physical Sciences Building.

The College of Engineering’s presence in these buildings and others is significant as it reinforces the goals established in the previous Strategic Plan developed in 2006. One of the primary goals of this vision was the focus on six key areas of research focus:

- Systems biology and biomedical engineering
- Nanomaterials, nanosciences and nanodevices
- Energy, environment and sustainable development
- Information, computation and communication
- Advanced materials
- Complex systems and networks

These foci are overlays to an academic structure that includes many existing research centers that are associated with the College of Engineering; some located directly within the quad itself. In addition to these there are ten Departments.

Departments/ Programs

- School of Applied and Engineering Physics (AEP)
- Department of Biomedical Engineering (BME)
- School of Chemical and Biomolecular Engineering (ChemE)
- School of Civil and Environmental Engineering (CEE)
- Department of Computer Science (CS)
- Department of Earth and Atmospheric Sciences (EAS)
- School of Electrical and Computer Engineering (ECE)
- Department of Materials Science and Engineering (MSE)
- Sibley School of Mechanical and Aerospace Engineering (MAE)
- School of Operations Research and Information Engineering (ORIE)

The current buildings of the College of Engineering include 13 that surround the quad itself and five additional buildings outside of this immediate area (Weill, Clark, Physical Sciences Building, 109 Dearborn and the High Volt Laboratory). The total area is over 1.7 million gross square feet. As opposed to a more typical incremental growth of square footage, the College’s buildings came in large step functions of buildings. The first of which included Olin, Kimball, Thurston, High Volt Lab, Phillips Hall, Carpenter Hall, Grumman Hall and Upson Hall. These buildings developed a well defined quad space over a seventeen year period, with the majority of these built in seven years. The second group brought Hollister, Bard and Ward and ended in 1963. These buildings surrounded the original quad and began to extend the perimeter of the College’s footprint closer to the gorge. The final group included Snee, Rhodes and Duffield Hall. The vast majority of these buildings was built during the 1950s and early 1960s and were designed based on the school’s focus on teaching space for an undergraduate education. Many were even designed by the same architectural team of Perkins and Will. Although the College benefited from a large number of new science buildings all coming on line at the same time it now faces the potential that the laboratory type and systems are outdated and badly in need of repair and renovation.

This issue, along with the College’s focus on interdisciplinary research, will become the cornerstone of potential options for matching the College’s Strategic Plan, now in development, with the buildings that house it.

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Fig. 1.1 School of Engineering Building Area and Enrollment Historical Patterns
HISTORY

Cornell University, founded as part of the lands set aside by the Morrill Land Grant Act of 1862, includes 14 colleges and schools. Each of these defines its own academic programs, admits its own students, provides a faculty and confers degrees on its own students. The College of Engineering is one of these schools and currently enroll 2,740 undergraduates and 1,472 graduates. There are 13 undergraduate majors, 18 undergraduate minors, 16 MS/PhD fields and 15 Master of Engineering fields. The 236 faculty members teach approximately 450 undergraduate courses annually.

At the opening of Cornell University in 1868, degrees in civil engineering in the College of Mathematics and Engineering and mechanical engineering in the College of Mechanic Arts were offered. Shortly following this, Civil Engineering was established as a separate College in 1870 and the College of Mechanic Arts was renamed the Sibley College of Mechanic Arts.

Dean Hollister acted as dean for 22 years and marked the beginning of the next phase of the College of Engineering’s future. At the inception of his tenure enrollment was at its lowest level and the facilities were in dire need of attention. Through consultation with the Chairman of Cornell’s Architecture Advisory Board, Dean Hollister embarked on an entirely new vision for the College of Engineering: a move from the north campus to an open area of land at the south adjacent to Cascadilla Gorge. Shreve, Lamb and Harmon drew plans for the new engineering campus. The plan allowed for growth of the College while simultaneously providing room for expansion of the College of Arts and Sciences and the College of Architecture, Art and Planning.

Enrollment in the College of Mechanical Engineering and the Mechanic Arts continued to rise reaching 1,000 in 1905 and peaked in 1910 at 1,745. The College of Arts and Sciences also reached 1,000 in 1910 and peaked in 1918 at 1,620. The construction of East Sibley Hall in 1894 and finally completed with the dome in 1902. Throughout the area providing much needed teaching and laboratory buildings. Following its completion, Franklin Hall was completed in 1882 and became home of the nation’s first electrical engineering department.

At the same time West Sibley Hall was extended to the east. Lincoln Hall was next in 1887 and was the home for the College of Civil Engineering and its Department of Architecture. Despite the growth of these buildings, the College continued to grow at a rapid pace and additional buildings were required. Morse Hall was built in 1888 and housed the facilities for chemistry. The building suffered multiple fires and ultimately was demolished in 1954. Expansion continued through the construction of East Sibley Hall in 1894 and finally completed with the dome in 1895. Throughout this great time of expansion, the College enjoyed a significant influence on the field of engineering and had one of the strongest faculties in the country led by Robert H. Thurston.

Multiple master plans ensued starting with the plans of York and Sawyer in 1925. This plan allowed for growth of the College while simultaneously providing room for expansion of the facilities. The cost of these buildings was approximately $12 million and was funded primarily by a small group of engineering alumni. Following an 18 year hiatus the Knight Laboratory was completed in 1981 and Snee Hall in 1984.
In 1990, Rhodes Hall, a 252,000 square foot, seven story structure with offices, research space, and computer rooms was constructed along Hoy Road to advance the computational sciences and associated engineering fields. Rhodes Hall is home to the numerous research-oriented departments associated with the computation sciences and engineering. Among them: Cornell Center for Advanced Computing, Center for Applied Mathematics, Program of Computer Graphics, Electrical Engineering, Operations Research and Industrial Engineering, and Mechanical and Aerospace Engineering. With grants from leading corporations like Microsoft and Dell, Rhodes Hall is stocked with supercomputers that are readily accessible to undergraduate computer scientists and faculty to conduct innovative research in advancing the field.

Following the completion of Snee Hall and Rhodes, a significant step was taken in the role of the physical environment and the pedagogy of the College. Significant emphasis was placed on interdisciplinary research, both within the College of Engineering Quad and in buildings beyond. Duffield Hall was completed in 2004 to house state-of-the-art research facilities for nanoscale science and engineering. This facility focuses specifically on a type of science versus a sole occupation by the College of Engineering. More significantly, the College of Engineering also occupied space in Weill Hall, completed in 2008, and the Physical Sciences Building, completed in 2010. These two buildings are not located on the engineering quad, but rather are situated in other areas of campus with strategic relationships with other departments, both academically and physically.

Weill Hall’s focus is specific to life science research. It provides research labs for interdisciplinary research and teaching in the biological, physical, engineering, computational and social sciences. It houses The Joan and Sanford I. Weill Institute for Cell and Molecular Biology and the Department of Biomedical Engineering (part of the College of Engineering). Not only do these share space in the interdisciplinary center, but key to their research is a connection to the Weill Cornell Medical College faculty in NYC. The building is also home to the Department of Biological Statistics and Computational Biology, where researchers apply mathematical and statistical methods to biological sciences.

The Physical Sciences Building has recently been completed and creates a physical connection to existing buildings (Clark and Baker Halls and Olin Lab). The primary focus of the building is to promote interdisciplinary research in areas such as nanoscale science, X-ray and accelerator physics, chemical biology and biological physics. As part of this initiative the School of Applied and Engineering Physics will occupy space in the building. Prior to the completion of this project the school already occupied space within Clark Hall. The location of this School is significant given its close ties to adjacent departments such as Physics.

The College of Engineering has prepared a number of different planning studies to discover options for the physical environment of the College in synchronicity with the academic and administrative goals. The most recent study was completed in 2007 by Ballinger. This study was built upon the idea that due to significant growth in the number of faculty in the College, commensurate space would be created to house this growth. A new building and multiple additions were proposed. This required the demolition of multiple spaces and would have made a significant impact on the campus character of the College. At the time the economic environment of the College, University and economy at large supported this premise. Since then the economic conditions severely declined and forced the College of Engineering to rethink how it approaches the next ten years. Specifically, a short term significant growth in faculty is unlikely and there are not enough resources to build a large amount of new construction. As a result, the focus of this study is to determine the best way to leverage existing space to transition the College for the academic and research requirements of the next ten years and beyond.
COLLEGE CHARACTERISTICS

The College of Engineering is one of the founding Colleges of Cornell University and as such plays an integral role in the rich diversity of the campus. The College originally began as a practice oriented school, then transformed to a teaching school primarily for undergraduates. Now, the College has a strong foundation in research while retaining these earlier commitments. Although the College offers degree programs solely within the College’s departments, the College has also made a strong commitment to interdisciplinary education. This focus relies on collaborations with the physical sciences, life sciences, mathematics, the Colleges of Arts and Sciences, Agriculture and Life Sciences, Veterinary Medicine, the Johnson School of Management, the Faculty of Computing and Information Science and the Weill Cornell Medical College. Furthermore, graduate study at the College of Engineering is managed by a unique system known as graduate fields that further promotes this interdisciplinary commitment. Graduate fields are groups of faculty who chair committees for graduate students based on their research interests. Hence, a graduate field is a collection of faculty with similar research areas, but the faculties can be from different departments and programs and a faculty member may also be a member of more than one graduate field. The graduate field system gives the University and College flexibility, because a graduate field can easily be created in an up-and-coming area as opposed to the complexities of starting a program or department.

Strategic Plan

The College is currently undertaking the development of a new Strategic Plan. The last was completed in 2004. This plan set clear objectives and reinforced the College’s goal “to be recognized as the premier research university in advanced materials, information sciences, and nanoscience, and a world leader in bioengineering, complex systems and energy and the environment”.

The College of Engineering’s Strategic Plan includes objectives for the physical environment that look toward goals of interdisciplinary research and collaboration. It is understood that the quality of space and the research environment can either constrain or inspire creativity. To address the needs of research the following objectives were outlined:

- Develop a long-range comprehensive master plan and timeline. (2007 master plan - completed).
- Renovate existing facilities and infrastructure. (Several renovations have been completed).
- Create a learning library and service center. (The library renovation has been completed).
- Provide significant additional research, instruction and office space for Computer Science, Electrical and Computer Engineering, Mechanical and Aerospace Engineering, and Operations and Industrial Engineering. (In progress).
- Provide additional research, instruction and office space for Chemical and Biomolecular Engineering and Civil and Environmental Engineering. (Some projects completed).
- Provide offices, laboratories and instructional facilities for Biomedical Engineering. (This has been completed with the occupation of space in Weill Hall).

In addition the following were also defined as goals:

- Be considered one of the top five engineering colleges in undergraduate and graduate studies.
- Recruit and enable a diverse community of exceptional faculty, students, and staff.
- Educate future leaders who are the most sought-after engineering graduates in the world.
- Establish and maintain facilities and infrastructure that are second to none in supporting the achievement of the College’s vision, mission and values.

The 2004 Strategic Plan also outlined six key strategic areas of significant research focus. These areas are critical since it will guide the College’s future in terms of the new strategic plan, curriculum, hiring and infrastructure. Three of these foci build on the college’s current research and are expected to grow in importance as emerging interdisciplinary areas of inquiry.

- Systems engineering and biomedical engineering
- Nanomaterials, nanosciences, and nanodevices
- Energy, environment, and sustainable development

The remaining three areas of research focus are intended to provide significant research opportunities across departments and include methods and technologies that can be applied to a wide variety of topics in both the current and emerging research areas.

- Information, computation, and communication
- Advanced materials
- Complex systems and networks

Biomedical Engineering

The Program of Systems Engineering and Department of Biomedical Engineering build on a complex interdisciplinary model that brings together the physical sciences and engineering, Cornell’s College of Veterinary Medicine and the Weill Cornell Medical College. This Department sits in the center between the life sciences and engineering providing the ability to design and control cells in a way that cannot be achieved by investigating the various subcellular components alone. The Strategic Plan outlines particular areas that Cornell already provides key leadership: nanobiotechnology, optical imaging, biomaterials, bioprocess development, genomics and proteomics, metabolic engineering, biomechanics and drug delivery.

Nanomaterials, Nanosciences, and Nanodevices

The emerging focus of nanomaterials, nanosciences and nanodevices starts from a preexisting excellence that began in the 1970s with the creation of the National Submicron Facility, now the Cornell NanoScale Science and Technology Facility. From this starting point, and with the addition of newfound technologies to create very small scale materials, the ability to develop materials with fundamentally different properties has grown. These properties create materials ideal for sensors, optical switches and devices the size of biological cells with the ability to operate autonomously. Further research in this area reinforces Cornell’s leadership in this area.
Vol. 1 COLLEGE PROFILE: College Characteristics

Energy, Environment and Sustainable Development

Currently, much of world attention has turned to the problems associated with the sustainability of our planet. The current research regarding the instability of our ecosystem reinforces Cornell’s research focus on energy, environment and sustainable development. Key to the development of solutions related to this emerging concern is a focus on interdisciplinary research. A few areas of research in which the College is engaged currently involve hydrogen fuel cells, renewable sources of energy and low power efficient lights.

Information, Computation, and Communication

The information age has resulted in the need to look toward and develop devices that support a wide range of data, communication, computation and storage. Research in this area has the ability to inform and enable research in other fields furthering productivity and the ability to visualize and analyze the information produced. The focus on information, computation and communication builds upon the college’s leadership in information science and engineering. The effects of this research will have wide reaching applicability in everything from speech recognition to genomics.

Advanced Materials

Historically, Cornell University has been a leader in advanced materials research. In 1960 Cornell was awarded funding by the Department of Defense to create one of the first three materials research centers in the nation. Since that initial support, this research center has received consistent national funding and is now the called the Cornell Center for Materials Research (CCMR). In addition, three other major research centers, the Cornell NanoScale Science and Technology Facility (CNF), the Cornell Nanobiotechnology Center (NBTC), and the Cornell Center for Nanoscale Systems (CNS) all conduct research on advanced materials.

Advanced materials characterization capabilities at Cornell, such as ultra-high-resolution transmission electron microscopy and scanning-probes (atomic force microscopy), provide unique opportunities for the study of the structure and dynamics of multiple materials systems. Areas of advanced materials innovation include computationally designed materials; enhanced functionality through convergence and integration of biological, organic, electronic and structural materials; self-assembly creation of new materials; and tailoring of interfaces to produce nanocomposites.

Complex Systems and Networks

Complex systems research, by its nature, focuses on the interrelationship of multiple factors. The wide variety of these types of systems requires a complete interdisciplinary approach by computer scientists, applied mathematicians, and engineering faculty from across the college and university at large. Some of these systems include intelligent machine systems that integrate actuation, sensing, digital communication, and control into physical devices to create automated systems. Other systems include biological areas through the interaction of molecules, cells, neurons, tissue and organ systems.

The key to each of these areas of focus requires an integrative approach both academically and in their physical environment. This principle will be at the heart of concepts that will be applied to the use and possible modification of existing college facilities.
The College Organization

The Dean of the College of Engineering is Lance Collins. Lance Collins joined Cornell University in 2002 and is a professor in the Sibley School of Mechanical and Aerospace Engineering. The College is organized into six main areas that report to the dean:

- **Undergraduate Programs and Student Services** overseen by David Gries and Betsy East respectively. These programs include Career Services and Advising, the registrar, admissions, records, learning initiatives and communications.

- **Research and Graduate Studies** overseen by Rajit Manohar works to bring together the available facilities with management of research foci and support the immersion of instruction in a research environment that is at the forefront of the engineering sciences through programs.

- **Diversity Programs** overseen by Rick Allmendinger this program seeks to enhance and reinforce the commitment to diversity in a world of increasing global interconnectedness.

- **Alumni Affairs and Development** overseen by Kathi Warren; works to support faculty and staff in regards to alumni programs and fundraising.

- **Administration:** Cathy Dove brings together work on finance, human resources, communications, IT, facilities research and graduate studies and corporate relations.

- **The Departments:** Each department chair, currently a total of 12, report on departmental status from their respective groups.
Student Life and Culture

Like the College itself much of Engineering student life is focused around the Pew Engineering Quad. The Engineering Library, located in Carpenter Hall, has long played a role in student life, research and studies. In 2005, the Engineering Library was renovated into three major divisions: a computer lab, free-form study areas and structured reading areas. Upon further review of the growing trend of library patrons using primarily electronic resources and online materials, the university has engaged in a strategic planning effort to move all print materials out of the Engineering Library at Carpenter by the end of this summer to convert it into an electronics only collection. The university believes this transformation will facilitate research and learning in the College of Engineering by providing for an increase of online resources, more seating for group study areas and collaborative learning, along with a high quality computer lab. The role of the librarians will be expanded to include literature orientation and instruction, teaching support and research data curation.

The Student Commons in the Duffield Hall Atrium at the juncture of Duffield, Phillips, Upson and the engineering quad is the center of engineering student life. Food, work space and open areas for presentations and gatherings keep this lobby activated throughout the day.

Cornell, specifically the College of Engineering, strives to support the success of its students. Services aimed at facilitating and improving student life include academic advising, support for study abroad, peer advising and tutoring, co-op and career services. Within these resources are opportunities for students to shape and grow their leadership skills and further their exploration of engineering.

There are more than 30 engineering student organizations available to join as well as Student Project Teams where engineering students can gain a range of positive experiences from provided water treatment technologies in rural communities like Honduras to designing, building and competing in a Formulae SAE competition.

Project Teams:  ACM Programming Team  
Aqua Clara  
AIChE Car Team  
Autonomous Underwater Vehicle  
Baja SAE  
Big Red Chip  
Concrete Canoe  
CU Air  
CU AUV  
CU GEM  
CU Sat (Nanostat-4)  
CU Sustainable Design  
Formula SAE (FSAE)  
Human Flight Project  
Mars Rover  
Phoenix Society  
Steel Bridge  
Violet (Nanostat-6)
Social Activity

The College of Engineering Quad is not only home to the academic and administrative heart of the college, but also is the place where significant hours are spent by students outside of their daily academic requirements. This activity gives critical life to the buildings in the College of Engineering and acts as their home for most of their time at Cornell. The types of spaces where this occurs can be everything from an unintended corner of a room or building with a chair and table to more established areas of congregation that are intentionally created within the buildings.

One of the most significant spaces within the quad is the Duffield Hall atrium, which acts as the commons for the College of Engineering. This space is almost always full of students and faculty in a range of activities including eating, study sessions, sleep, informal gathering, working groups and computer access. This space also provides one of the few areas where group work can be accomplished. Due to the scarcity of these types of spaces these areas are highly coveted and it can be difficult to find an open area. During our interviews with administration and faculty a desire for additional space like this was discussed. The atrium benefits from the range of different types and sizes of spaces, visual connection to labs in Phillips, Duffield and Upson, and the café located in the center of the atrium. This area also has visual connection to the outdoor terrace at the intersection between Duffield and Upson.

Another significant space is the library located in Carpenter Hall. Due to the nature of the space as a library it primarily serves the function of quiet individual study, small group study areas and computer access. The different places where these activities occur occupy a relatively equal proportion of space as the primary book collection, but are the primary use of the library in total.

Most buildings also contain student lounges which provide a space for activities similar to the library. However, in our observations these spaces are generally not as utilized as the library itself, but are still useful areas for students. Part of their lack of success may be attributed to the level of finish in these rooms as compared to the library and Duffield Hall. Another significant space within the College is the basement level of Upson Hall. In this location many of the student clubs have an area that is dedicated to them. Also, within the corridor a series of two person study desks are included.

Although the Ithaca climate is not always sympathetic to outdoor gathering, exterior spaces within the landscape are critical to the vibrancy of the quad itself. Critical areas include the spaces directly in front of Duffield Hall, outside Carpenter Hall and outside Hollister Hall.
ACADEMICS — The Centers

Research centers are a key enabler of departmental research. The research centers are significant resources in achieving interdisciplinary, interdepartmental collaboration. Also while faculty members have appointments in the departments, much of their research funding is granted because of the availability of sophisticated equipment supported by the centers. According to various interviews, surveys and sources there are many centers, facilities, labs, institutes and programs in which the College of Engineering faculty participate. They vary in size and scope. However, around the Engineering Quad, a number of them impact the work of the College of Engineering, furthering collaborative research, providing resources and creating opportunities for researchers and faculty to do their work. They include:

Cornell NanoScale Science and Technology Facility (CNF)
- The largest of the research centers it occupies space in Duffield Hall and exemplifies the multidisciplinary collaboration that is at the core of College of Engineering Values. Researchers from engineering, arts and agriculture schools make use of this facility – 1/3 of users are from the life sciences.

Nanobiototechnology Center (NBTC)
- Started in 1999 this center manages work associated with the Center for the Microenvironment and Metastasis in concert with the Cornell New York City campus.

Cornell Center for Materials Research (CCMR)
- The oldest center and occupies space around the campus: in Snee, Kimball, Bard and Duffield Halls. CCMR focuses its work in four areas: Electronic Interfaces, Nanoscale Growth, Atomic Membranes and Complex Materials.

Center for Advanced Computing (CAC)
- Working with the Faculty of Computing and Information Science this center’s focus is to enable interdisciplinary research via “high performance computing solutions”.

The KAUST Center for Energy and Sustainability
- Investigates nanomaterials for varied uses such as photovoltaics; water desalination and purification; oil and gas exploration and carbon dioxide capture technology.

Center for Applied Mathematics (CAM)
- Focuses research on algorithms, dynamical systems, mathematical finance, fluid mechanics, mathematical biology and physics, numerical analysis, optimization, probability and stochastic processes and communications technology.

Program of Computer Graphics
- Works closely with Computing and Information Systems and the Department of Computer Science while providing support to the design efforts of students in the Department of Architecture and Mechanical and Aerospace Engineering.

The Center for the Study of Pulsed-Power-Driven High Energy Density Plasmas
- Works to study high-energy density applications of pulsed power generation in the Laboratory of Plasma Studies.

Northeast Regional Climate Center (NRCC)
- Located in EAS this center serves 12 northeastern states to acquire and disseminate climate data.

Cornell Fuel Cell Institute (CFCI)
- Researchers from MSE and CBE in concert with faculty from the College of Arts and Sciences work to research, collaborate and educate in regards to advanced fuel cell technology.

Institute for the Study of the Continents (INSTOC)
- Researchers from EAS participate in the profiling and measurement of the continent.

Kavli Institute at Cornell for NanoScale Science (KIC)
- Located in the Physical Sciences Building, the Kavli Institute is devoted to the development and utilization of next-generation tools for exploring the nanoscale world.

Atkinson Center for Sustainable Future (ACSF)
- Created to advance multidisciplinary research and cultivate innovative collaborations within and beyond Cornell to foster a sustainable future for all.

Other centers located around the College and University that engage College of Engineering faculty and researchers at varying levels include:

- Alliance for Nanomedical Technologies (ANMT)
- Center for Life Science Enterprise
- Center for Nanoscale Systems (CNS)
- Center for Radiophysics and Space Research (CRSR)
- Cornell High Energy Synchrotron Source (CHESS)
- Developmental Resource for Biophysical Imaging Opto-electronics
- National Astronomy and Ionosphere Center (NAIC)
- Cornell Waste Management Institute (CWMI)
- Institute for Biotechnology and Life Science Technologies
- Institute for Comparative and Environmental Toxicology (ICET)
- Institute for Resource Information Systems (IRIS)
- Laboratory for Elementary-Particle Physics (LEPP)
- Laboratory for Atomic and Solid State Physics (LASSP)
- New York State Water Resources Institute (WRI)
- Polymer Outreach Program
- Program for Biogeochemistry and Environmental Biocomplexity
ACADEMICS — Engineering Departments, Programs and other Related Groups

School of Applied and Engineering Physics (AEP)

A leader in undergraduate engineering physics, engineering science and applied physics research, AEP has 6 research foci. They include:

- Nanoscience & Nanobiotechnology
- Condensed Matter Physics and Materials Science
- Optical Physics
- Quantum Electronics and Photonics
- Biophysics
- Astrophysics and Plasma Physics and Atomic
- Molecular and Chemical Physics

Primarily, the department is located in the recently completed Physical Sciences Building and Clark Hall. These buildings are also the home to the Physics Department in the College of Arts and Sciences. This adjacency to Physics and other basic sciences such as Chemistry and Astronomy is critical and overrides the need to be located on the Engineering Quad. The new space in the Physical Sciences Building will finally give the department an appropriate departmental identity and dedicated space for classrooms, teaching labs and study space for undergraduates.

Many of the AEP labs are dry equipment-based labs with a need for vibration tables and dark, light controlled space. Several labs in the new Physical Sciences Building will have even greater environmental control with isolated slabs and dampened mechanical systems. While some of the new labs in the Physical Sciences Building will be used for recruitment of new faculty, several of the basement labs are moving to the Physical Sciences Building which allows the department to decompress.

Two AEP faculty members also have specialty labs in Duffield Hall on the engineering quad.

Department of Biomedical Engineering (BME)

The Department of Biomedical Engineering (BME) became a separate department within the College of Engineering in 2004 and moved into the new Weill Hall in 2008. The research labs in Weill Hall are mostly biomedical wet bench labs on levels 1, 2 and 3 and imaging and equipment labs in the basement. There are also two BME labs in Duffield Hall. Faculty members collaborate frequently with members of the Medical College (Manhattan), the College of Veterinary Medicine and the Department of Biological and Environmental Engineering in the School of Agriculture and Life Sciences. There is some collaboration with other members of the College of Engineering but not as frequent and for these reasons it is not critical to be located on the Engineering Quad.

There are five primary areas of research:

- Imaging and Instrumentation
- Biomedical Mechanics
- Nanobiotechnology
- Tissue Engineering
- Biomaterials & Drug Delivery
The nature of work within the BME is communicated through the following mission:

“The primary mission of the BME department is to educate students to understand the human body as an integrated system through quantitative engineering analysis and to use that understanding to design better therapeutic strategies, devices, and diagnostics. A mission of nearly equal importance is to serve society by conducting research that develops quantitative linkages across scales in the human body and uses that development to build new tools to improve human health.”

School of Chemical and Biomolecular Engineering (CBE)

Founded in 1938 and located in Olin Hall, the oldest building in the College, the school has facilities for biotech, materials studies, thermodynamics, polymer studies and fluid mechanics research. The School recently finished an office space renovation in the north wing of Olin but many of the labs in the east wing haven’t been renovated since 1986 when the high bay was converted into individual research labs. These labs were designed mainly for physical characterization and not biological work while many new recruits require new wet bench labs so this remains one of the department's current challenges. CBE has a large undergraduate population and Olin Hall also has several large classrooms and one teaching lab.

CBE has two primary missions:

- To prepare students for life-long achievement through education and guidance in the principles of chemical engineering by methods which encourage the development of communication, teamwork and leadership skills.
- To advance, through research and scholarship, an understanding of the fundamentals of chemical engineering and apply those principles to the creation of new devices or strategies for the solution of societal problems.

Research foci include:

- Biomolecular Engineering
- Complex Fluid and Polymers
- Nanoscale Electronics, Photonics and Materials Processing
- Sustainable Energy Systems

The interdisciplinary nature of the work requires researchers to be involved with programs and centers around the College. Faculty members are heavily involved with the Kaus Center, the Cornell Center for Materials Research and the newly created Energy Institute.

School of Civil and Environmental Engineering (CEE)

CEE has thoroughly defined their vision:

- Undergraduate, professional and graduate education that inspires students, confers mastery and promotes ethical behavior.
- Research that transforms the art and practice of engineering.
- Flexibility in innovation and expertise that meets the growing challenges of human society through technology advanced, yet sustainable solutions.

Mission:

- To educate future creators, innovators and communicators who will employ their grounding in engineering to become leaders in many spheres of society.
- To discover and develop new knowledge and sustainable technologies that improve the practice of engineering in service to society.
- To serve and improve the University, the engineering profession and society at large.

With these ideals in mind, CEE focuses their teaching, research and service on work in Civil Infrastructure, Environment and Engineering Systems and Management. Research focus includes:

- Environmental engineering,
- Fluid mechanics and hydrology
- Geotechnical engineering
- Remote sensing
- Materials of construction
- Structural modeling
- Static and dynamic loading of large components and systems

CEE is located mainly in Hollister Hall but also in Kimball and Thurston Hall. Many of the research labs are shared by multiple faculty members and the major facilities include:

- Bovay Laboratory Complex
- DeFrees Hydraulics Lab
- Environmental Fluid Mechanics Teaching Lab
- Environmental Teaching Lab
- Mogami Geotechnical Lab

[Fig. 1.22 Bovay Laboratory Complex]
Department of Computer Science (CS)

Organized in 1965, The CS department is one of the oldest of its kind in the nation. Areas of research within Computer Science include:

- Artificial Intelligence
- Computational Biology
- Computer Architecture
- Database Systems
- Graphics
- Programming Languages
- Robotics
- Scientific Computing
- Security
- Systems and Networking
- Theory Computing

Computer Science collaborates with Computing and Information Science (CIS), the Department of Statistical Science, the Program of Computer Graphics, the Information Science Department, Computational Biology and Computational Science and Engineering. These relationships are vital to the interdisciplinary work of CIS, CS, College of Engineering and the University as a whole. Twenty-five different academic departments "cross-list" courses with CIS and CS. The mission is to integrate computing and information sciences into every academic field.

CS is currently located in Upson Hall but is planning to move to future space in the planned new Gates Building which has an expected occupancy of 2014.

Department of Earth and Atmospheric Sciences (EAS)

EAS is centered in Snee Hall which was built in 1984 and contains research and teaching labs, classrooms and offices. Snee Hall is also home to new space for the Energy Institute, a collaboration with the School of Chemical and Biomolecular Engineering.

EAS is dedicated “to training the next generation of specialists who will use the earth system sciences in their careers and to providing broad education to the campus community and society...” Work includes the study of how to increase energy supplies and options, assure the availability and quality of water, forecast and avoid natural hazards, predict and plan for climate change and use the history of life to better understand the impact of environmental stressors.

Research Theme Groups Include:

- Geophysics, Active Tectonics and Structural Geology
- Geophysical Fluid Dynamics
- Climate & Paleoclimate
- Biogeochemistry/ Climate Interactions
- Geochemistry, Petrology and Volcanology
- Surface Processes, Sedimentary Basins and Paleobiology
- Energy, Mineral and Water Resources
- Meteorology and Applied Climatology
- Ocean Studies
- Space and Planetary Sciences
- Earth System Science

School of Electrical and Computer Engineering (ECE)

The study of Electrical Engineering was first introduced to Cornell in 1883 and the department was established in 1885 as a part of the College of Mechanical Engineering. It later became a separate entity in 1921. The school is still one of the largest schools in the College of Engineering and occupies spaces in Phillips, Duffield, Langmuir, Rhodes, Upson and Ward Buildings. The Lab of Plasma Studies is also contained within this department.

Space is currently being renovated in Phillips Hall to give the department new administration and lounge space to increase the Departmental identity for Electrical and Computer Engineering.

Research foci include:

- Bio-Electrical Engineering
- Computer Engineering and Digital Systems
- Information
- Systems and Networks
- Solid-State Devices
- Electronics and Photonics and Space Science and Plasma Physics
Department of Materials Science and Engineering (MSE)

MSE’s vision: “to be a vibrant, supportive community of materials scientists and engineers developing fundamental understanding, enabling advanced technologies and providing world leadership through education and innovative research” is supported by a multi-part mission statement that includes the following:

- Create a stimulating and nurturing educational environment broadly preparing students at all levels for successful careers.
- Advance a fundamental understanding of materials properties, processing and applications by performing leading edge, world class research in collaboration with industry and academic leaders.
- Engage in collaborative research efforts with corporate and academic partners worldwide.
- Train the most highly valued materials science and engineering students in the nation.
- Lead the advanced materials effort at Cornell University.
- Maintain partnerships with the premier materials research centers housed on-campus, such as the Cornell Center for Materials Research, the Cornell Nanoscale Facility, the Nanobiotechnology Center, the Cornell Fuel Cell Institute, the Cornell High Energy Synchrotron Source and the Cornell Center for a Sustainable Future to maximize research capabilities.
- Promote a greater understanding of the role of materials science in society.
- Actively participate in national and international professional societies.

In early years programs within the department were focused on metals and their use relative to space, energy and defense sectors. Since that early work they have expanded to include research in polymers, ceramics and semiconductors. The department has continued to evolve through the core research areas: energy production and storage, electronics and photonics, bio-inspired materials and systems and green technologies. Interdisciplinary by nature, students and faculty come from a wide range of experiences and disciplines. Within the department students may achieve a Master of Engineering, Master of Science or Ph.D. in MSE.

In addition to work with in research centers around the engineering campus MSE occupies Bard, Duffield and Thurston Halls. The Department was founded in 1964/1965.

Sibley School of Mechanical and Aerospace Engineering (MAE)

The roots of MAE can be traced through the organization of the College of Engineering in 1919 to the opening of Cornell University in 1868. In 1972 it merged with Aeronautical Engineering and in 2009 merged with Theoretical and Applied Mechanics to form what is now the Sibley School of Mechanical and Aerospace Engineering (MAE).

MAE offers a broad number of research opportunities that are grouped into six primary graduate programs:

- Fluid Dynamics
- Biomechanical Engineering
- Dynamics
- Systems and Controls
- Aerospace Engineering
- Mechanics of Materials
- Thermal Systems Engineering

The largest department in space and number of faculty members, MAE is located in Upson, Grumman and Rhodes Halls. In general, research labs in this department are moving away from the large equipment based labs (wind tunnels, Harley lab) of the past and moving towards hybrid bench labs. The department has the most diverse array of research lab types as compared to any other department.

School of Operations Research and Information Engineering (ORIE)

Courses in industrial operations were offered by the College of Engineering in 1955. In 1961 the Department of Industrial Engineering and Administration and its field of Engineering and Operations were established. Fundamental principles and core areas of the work done at ORIE are: Methods of Operations, Applied Probability Modeling and Statistical Analysis, Manufacturing Systems Design and Operations, and Systems Analysis and Methodology.

ORIE faculty focus research in 9 primary areas:

- Algorithms
- Applied Probability
- Data Mining
- Financial Engineering
- Infotech Modeling
- Networks
- Optimization
- Supply Chain

ORIE is located in Rhodes Hall. The faculty work with the students and with each other in their offices and there are no department research labs in the traditional sense.
Systems Engineering

The Systems Engineering program is built on the fundamentals of systems architecture, product development, operations research and systems analysis. These core foci combined with engineering fundamentals and computational modeling allow students to achieve a Master of Engineering (MEng) degree in Systems Engineering on-campus or online through distance learning. For this reason the large distance learning classroom in Rhodes is critical for Systems Engineering classes. Ideally more classrooms could be equipped with this technology.

Students with backgrounds in Civil & Environmental, Electrical, Mathematics, ORIE, Computer Science, Engineering Physics and Mechanical Engineering exemplify the multidisciplinary nature of the program.

Related Programs and Departments

Department of Biological and Environmental Engineering (BEE)

BEE is located largely in Riley-Robb hall. While some of the research is related to the School of Engineering, the department is based in the School of Agriculture and Life Sciences and is not included in this analysis of space.

BEE is a diverse group of faculty, staff and students who approach their work with three tenets in mind:

- Educate the next generation of professionals and discover new knowledge in Biological and Environmental Engineering.
- Disseminate cutting-edge research-based engineering information through the scientific media and outreach programs.
- Conduct all programs in the context of a world-class university and deliver the highest value knowledge to our students, citizens and global society.

Computing and Information Science (CIS)

The work of CIS is rooted in the idea that computing and technology is relevant to every discipline. True to the interdisciplinary nature of work at Cornell, CIS works in conjunction with various academic and research programs. Within the College of Engineering CIS facilitates the work of the Program of Computer Graphics as well as the Center for Advanced Computing. CIS is located mostly in Rhodes Hall.

Computer Information Technologies (CIT)

CIT is the computing technology backbone for the University and College of Engineering. Occupying space in the Rhodes Halls and network rooms throughout the college they provide support to enable the high standards of teaching and research. CIT looks to develop, communicate and implement IT resources throughout the campus.
Statistical Data

Statistical Data has been compiled from the University Space Database, Cad Plans, and from information provided from the College of Engineering Administration and Departments. The University Space Database was last updated in April of 2010, and where possible was updated during Payette's space survey when more updated information was provided by the Building Coordinators. The College of Engineering Administration provided additional information on the number of undergraduates, graduates and faculty and is current as of Spring 2011.

The scope of the Space Study includes surveying and analyzing all College of Engineering buildings and College of Engineering space within other university buildings. The following statistical data looks at this surveyed area and includes only the net assignable square footage within the scope, measured from the inside wall surfaces, not including non-assignable spaces such as mechanical areas and shafts, toilets, corridors, staircases, elevators, building lobbies and custodial areas.

Of the College and Engineering Net Assignable Square Footage 46% of the space is research lab and workspace and 16% attributed to instructional space. 24% of the space is academic office and administration. This high proportion of office in comparison to other projects that we have completed seems high and might lead one to believe there is also theoretical research occurring in some of these areas. It is also appears that there is a large amount of space (35,675 NASF or 4%) allocated to unassigned (inactive, vacant) and storage.

![Surveyed Inventory by Space Type](image)

Fig. 1.30 Surveyed Inventory by Space Type
Statistical Data

<table>
<thead>
<tr>
<th>COLLEGE OF ENGINEERING DEPARTMENTS</th>
<th>NASF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical and Aerospace Engineering</td>
<td>95,300</td>
</tr>
<tr>
<td>Chemical and Biomolecular Engineering</td>
<td>57,243</td>
</tr>
<tr>
<td>Civil and Environmental Engineering</td>
<td>74,474</td>
</tr>
<tr>
<td>Computer Science</td>
<td>44,566</td>
</tr>
<tr>
<td>Earth and Atmospheric Sciences</td>
<td>43,149</td>
</tr>
<tr>
<td>Electrical and Computer Engineering</td>
<td>78,917</td>
</tr>
<tr>
<td>Applied and Engineering Physics</td>
<td>61,802</td>
</tr>
<tr>
<td>Material Science and Engineering</td>
<td>38,253</td>
</tr>
<tr>
<td>Operations Research and Information Engineering</td>
<td>18,818</td>
</tr>
<tr>
<td>Biomedical Engineering</td>
<td>36,392</td>
</tr>
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<td>548,914</td>
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</table>

<table>
<thead>
<tr>
<th>ADMINISTRATION AND STUDENT SERVICES</th>
<th>NASF</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Engineering</td>
<td>65,627</td>
</tr>
<tr>
<td>Engineering Communications and Media Relations</td>
<td>1,193</td>
</tr>
<tr>
<td>Engineering Development &amp; Alumni Affairs</td>
<td>559</td>
</tr>
<tr>
<td>Engineering Corporate &amp; Foundation Relations</td>
<td>183</td>
</tr>
<tr>
<td>Engineering Professional Programs</td>
<td>721</td>
</tr>
<tr>
<td>Engineering Registrar</td>
<td>752</td>
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<td>Engineering Undergraduate Programs</td>
<td>2,020</td>
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<td>Engineering Admissions</td>
<td>1,942</td>
</tr>
<tr>
<td>Engineering Advising</td>
<td>1,081</td>
</tr>
<tr>
<td>Engineering Placement Office</td>
<td>3,044</td>
</tr>
<tr>
<td>Engineering Life Program</td>
<td>447</td>
</tr>
<tr>
<td>Office of Diversity Programs</td>
<td>1,836</td>
</tr>
<tr>
<td>Duffield Hall Administration</td>
<td>23,453</td>
</tr>
<tr>
<td>Campus Life Dining &amp; Retail Operations</td>
<td>1,328</td>
</tr>
<tr>
<td>Engineering Library</td>
<td>24,032</td>
</tr>
<tr>
<td></td>
<td>128,218</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>RELATED CENTERS AND PROGRAMS</th>
<th>NASF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office of Computing and Information Science</td>
<td>1,743</td>
</tr>
<tr>
<td>CIT Office of Information Technologies</td>
<td>24,064</td>
</tr>
<tr>
<td>Program of Computer Graphics</td>
<td>8,256</td>
</tr>
<tr>
<td>Systems Engineering</td>
<td>1,657</td>
</tr>
<tr>
<td>Lab of Plasma Sciences</td>
<td>8,001</td>
</tr>
<tr>
<td>Cornell Center for Materials Research</td>
<td>12,394</td>
</tr>
<tr>
<td>Center for Applied Mathematics</td>
<td>6,346</td>
</tr>
<tr>
<td>Center for Advanced Computing</td>
<td>16,954</td>
</tr>
<tr>
<td>Nanobiototechnology Center</td>
<td>6,979</td>
</tr>
<tr>
<td>Cornell Nanofabrication Facility</td>
<td>22,274</td>
</tr>
<tr>
<td>Ward Center for Nuclear Sciences</td>
<td>14,143</td>
</tr>
<tr>
<td></td>
<td>123,411</td>
</tr>
</tbody>
</table>

**TOTAL 800,543**

There are ten College of Engineering academic departments. The departments with some of the largest footprints also happen to be some of the oldest departments. For example, Mechanical and Aerospace Engineering at 95,300 NASF is 17% of the total departmental space. See the chart to the left and below for the full breakdown. Each department has their own administrative offices, faculty and student offices, office support, lounge and study space, instructional spaces, research space and related support as well as storage space.

The College of Engineering consists mainly of registrar classrooms and lecture halls, the Kaust Energy Center and the College’s Administration offices. It also includes 13,375 NSF of inactive space of which most is located in the High Voltage Laboratory.

Duffield Hall Administration is made up of shared space within Duffield and the connecting Phillips Hall that is not owned by any one department or Investigator. This includes shared utility corridors, lab support rooms, workspace, conference rooms, study spaces, lounges and shared teaching labs.

Of the Centers and Programs surveyed and analyzed (and listed in the chart to the left), only the Systems Engineering Program and Lab of Plasma Sciences fall under the College of Engineering. Of the other Centers are controlled by the Office of the Vice Provost for Research (OVPR). They are included in this study as they occupy space within College of Engineering buildings and many of the users of these centers come from the College of Engineering.

![Fig. 1.31 Department NASF](image-url)
The chart to the right lists the number of current faculty, undergraduates and graduates for each of the ten College of Engineering Departments. This data is also modeled below. The only department without an undergraduate program is Biomedical Engineering, but this is under consideration. Most of the other departments have a consistent percentage of faculty as compared to the percentage of students except for the Earth and Environmental Sciences Department which appears to have a low number of students in comparison to the number of full time faculty.

### COLLEGE OF ENGINEERING DEPARTMENTS

<table>
<thead>
<tr>
<th>Department</th>
<th>FACULTY (FULL TIME)</th>
<th>UNDERGRAD</th>
<th>MENG</th>
<th>MS</th>
<th>PHD</th>
<th>TOTAL GRAD STUDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical and Aerospace Engineering</td>
<td>40</td>
<td>346</td>
<td>68</td>
<td>6</td>
<td>143</td>
<td>217</td>
</tr>
<tr>
<td>Chemical and Biomolecular Engineering</td>
<td>17</td>
<td>240</td>
<td>42</td>
<td>4</td>
<td>68</td>
<td>114</td>
</tr>
<tr>
<td>Civil and Environmental Engineering</td>
<td>26</td>
<td>179</td>
<td>78</td>
<td>6</td>
<td>64</td>
<td>148</td>
</tr>
<tr>
<td>Computer Science</td>
<td>30</td>
<td>201</td>
<td>124</td>
<td>114</td>
<td>238</td>
<td></td>
</tr>
<tr>
<td>Earth and Atmospheric Sciences</td>
<td>12</td>
<td>16</td>
<td>2</td>
<td>10</td>
<td>26</td>
<td>38</td>
</tr>
<tr>
<td>Operations Research and Information Engineering</td>
<td>35</td>
<td>213</td>
<td>84</td>
<td>162</td>
<td>246</td>
<td></td>
</tr>
<tr>
<td>Applied and Engineering Physics</td>
<td>13</td>
<td>108</td>
<td>10</td>
<td>5</td>
<td>66</td>
<td>81</td>
</tr>
<tr>
<td>Material Science and Engineering</td>
<td>16</td>
<td>113</td>
<td>11</td>
<td>9</td>
<td>51</td>
<td>71</td>
</tr>
<tr>
<td>Operations Research and Information Engineering</td>
<td>21</td>
<td>159</td>
<td>122</td>
<td>38</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td>Biomedical Engineering</td>
<td>11</td>
<td>0</td>
<td>76</td>
<td>2</td>
<td>81</td>
<td>159</td>
</tr>
</tbody>
</table>

Subtotal: 221, 1,615, 617, 42, 813, 1,472

**Fig. 1.32** Full Time Faculty

**Fig. 1.33** Undergraduate Students (Those who have declared a major)

**Fig. 1.34** Graduate Students
UNDERGRADUATE POPULATION AND SQUARE FOOTAGE EVOLUTION

The growth of the undergraduate population within the College of Engineering has seen a steady increase over time. At various point within its history there have been noticeable dips in this increase, but these are largely attributed to the two world wars and the time just prior to the move to the south campus.

Fig. 1.35 Enrollment Trends
Physical Environment of the College of Engineering

The current buildings of the College of Engineering include 13 buildings that surround the Pew Engineering Quad and 5 additional buildings outside of the immediate area. The 13 buildings surrounding the quad are Olin, Carpenter, Hollister, Snee, Bard, Thurston, Kimball, Ward, Duffield, Phillips, Upson/Grumman and Rhodes. Full occupation of buildings remote from the Engineering Quad includes 109 Dearborn and High Voltage Lab. The College also partially occupies Weill, Clark, the Physical Sciences Building and Langmuir. The total occupied area by the College of Engineering is over 1.7 million gross square feet.

### Engineering Buildings

<table>
<thead>
<tr>
<th>Building</th>
<th>Date</th>
<th>Net Area</th>
<th>GSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olin Hall</td>
<td>1941</td>
<td>108,484</td>
<td>129,664</td>
</tr>
<tr>
<td>109 Dearborn Place</td>
<td>1942</td>
<td>4,428</td>
<td>5,101</td>
</tr>
<tr>
<td>Kimball Hall</td>
<td>1951</td>
<td>26,455</td>
<td>30,413</td>
</tr>
<tr>
<td>Thurston Hall</td>
<td>1951</td>
<td>47,199</td>
<td>54,744</td>
</tr>
<tr>
<td>High Volt Lab</td>
<td>1953</td>
<td>14,466</td>
<td>15,510</td>
</tr>
<tr>
<td>Phillips Hall</td>
<td>1955</td>
<td>87,388</td>
<td>99,774</td>
</tr>
<tr>
<td>Carpenter Hall</td>
<td>1962</td>
<td>42,909</td>
<td>50,577</td>
</tr>
<tr>
<td>Grumman Hall</td>
<td>1968</td>
<td>14,606</td>
<td>16,289</td>
</tr>
<tr>
<td>Upson Hall</td>
<td>1968</td>
<td>141,961</td>
<td>159,662</td>
</tr>
<tr>
<td>Hollister Hall</td>
<td>1959</td>
<td>102,320</td>
<td>115,288</td>
</tr>
<tr>
<td>Bard Hall</td>
<td>1963</td>
<td>43,848</td>
<td>49,366</td>
</tr>
<tr>
<td>Ward Lab</td>
<td>1963</td>
<td>21,030</td>
<td>26,303</td>
</tr>
<tr>
<td>Clark Hall</td>
<td>1965</td>
<td>222,008</td>
<td>250,151</td>
</tr>
<tr>
<td>Snee Hall</td>
<td>1984</td>
<td>64,534</td>
<td>74,599</td>
</tr>
<tr>
<td>Rhodes Hall</td>
<td>1990</td>
<td>181,805</td>
<td>214,505</td>
</tr>
<tr>
<td>Duffield Hall</td>
<td>2004</td>
<td>129,269</td>
<td>149,762</td>
</tr>
<tr>
<td>Weill Hall</td>
<td>2008</td>
<td>236,158</td>
<td>272,242</td>
</tr>
<tr>
<td>Physical Sciences Building</td>
<td>2011</td>
<td>197,000</td>
<td></td>
</tr>
</tbody>
</table>

**Fig. 1.36** Campus Plan of Engineering Quad in relation to Engineering Buildings not in the Quad
Evolution of the Physical Environment

College and Universities typically grow in a close relationship to increase in students and academic programs. However, due to the full move of the College of Engineering to the South campus a large number of buildings were required at once so that the existing programs could reestablish themselves in this new area. Olin Hall was the first building in the new area of campus. Due to the second World War it was not until 1951 that the next building would be built. This marked the start of the first building campaign that would ultimately become the College of Engineering quad. These buildings included Kimball, Thurston, Phillips, Carpenter, Upson/Grumman and Hollister. The second of which, came at a gradual rate between 1963 and 1984, with full occupation in Bard, Ward, and Snee and partial occupation in Clark. More recently Rhodes, Duffield, Weill and the Physical Sciences Building were developed in the last two decades, transforming the quad to its current form and partial occupation of buildings remote to the Quad, such as Weill and the Physical Sciences Building.
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Fig. 1.54 Engineering Quad in 1948
Scale: 1" = 400'-0"

Fig. 1.55 Engineering Quad in 1958
Scale: 1" = 400'-0"

Fig. 1.56 Engineering Quad in 1984
Scale: 1" = 400'-0"

Fig. 1.57 Current Engineering Quad in 2011
Scale: 1" = 400'-0"
Current Distribution of Departments, Programs and Centers

The subsequent plan diagrams in the following pages capture the current distribution of the different Departments, Programs and Centers within the College of Engineering, as well as space dedicated to the College of Engineering administration. The College of Engineering administration includes classrooms, student services and the Kaust Center for Energy and Sustainability.

These diagrams will serve as a basis for future discussions with each of these groups regarding their evolution over the next 10 years. These discussion will not only focus on their respective growth, but also idealized relationships between each of these groups.
DEPARTMENT PLAN LEVEL 1
SCALE: 1" = 120'-0"

DEPARTMENT & PROGRAM
- APPLIED AND ENGINEERING PHYSICS
- BIOMEDICAL ENGINEERING
- CHEMICAL AND BIOMOLECULAR ENGINEERING
- CIVIL AND ENVIRONMENTAL ENGINEERING
- COMPUTER SCIENCE
- EARTH AND ATMOSPHERIC SCIENCES
- EARTH AND ATMOSPHERIC SCIENCES (CALS)
- ELECTRICAL AND COMPUTER ENGINEERING
- MATERIAL SCIENCE AND ENGINEERING
- MECHANICAL AND AEROSPACE ENGINEERING
- OPERATIONS RESEARCH AND INFORMATION ENGINEERING
- OFFICE OF COMPUTING AND INFORMATION SCIENCE
- PROGRAM OF SYSTEMS ENGINEERING

CENTERS
- CENTER FOR ADVANCED COMPUTING (CAC)
- CENTER FOR APPLIED MATHEMATICS (CAM)
- CIT OFFICE OF INFORMATION TECHNOLOGIES
- CENTER FOR MATERIALS RESEARCH (CMRR)
- CENTER FOR NANO SCALE SCIENCE & TECHNOLOGY FACILITY (CNF)
- NANO BIOTECHNOLOGY CENTER (NBTC)
- PROGRAM OF COMPUTER GRAPHICS
- NUCLEAR CENTER FOR NUCLEAR SCIENCES

COLLEGE OF ENGINEERING
- ADMINISTRATION, CLASSROOMS, STUDENT SERVICES
- THE KAUST CENTER FOR ENERGY AND SUSTAINABILITY
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DEPARTMENT PLAN LEVEL 4
SCALE: 1" = 120'-0"

DEPARTMENT & PROGRAM
- APPLIED AND ENGINEERING PHYSICS
- BIOMEDICAL ENGINEERING
- CHEMICAL AND BIOLOGICAL ENGINEERING
- CHEMICAL AND ENVIRONMENTAL ENGINEERING
- COMPUTER SCIENCE
- EARTH AND ATMOSPHERIC SCIENCES
- EARTH AND ATMOSPHERIC SCIENCES (CALS)
- ELECTRICAL AND COMPUTER ENGINEERING
- MATERIAL SCIENCE AND ENGINEERING
- MECHANICAL AND AEROSPACE ENGINEERING
- OPERATIONS RESEARCH AND INFORMATION ENGINEERING
- OFFICE OF COMPUTING AND INFORMATION SCIENCE
- PROGRAM OF SYSTEMS ENGINEERING

CENTERS
- CENTER FOR ADVANCED COMPUTING (CAC)
- CENTER FOR APPLIED MATHEMATICS (CAM)
- CIT OFFICE OF INFORMATION TECHNOLOGIES
- CORNELL CENTER FOR MATERIALS RESEARCH (CMR)
- CORNELL NANOSCALE SCIENCE & TECHNOLOGY FACILITY (CNF)
- NANOBIOTECHNOLOGY CENTER (NBTC)
- PROGRAM OF COMPUTER GRAPHICS
- WARD CENTER FOR NUCLEAR SCIENCES

COLLEGE OF ENGINEERING
- ADMINISTRATION, CLASSROOMS, STUDENT SERVICES
- THE KAUST CENTER FOR ENERGY AND SUSTAINABILITY