



# Mechanical + Aerospace Engineering



## Degree Programs and Research Areas

The Sibley School of Mechanical & Aerospace Engineering (M&AE) offers the Bachelor of Science in Mechanical Engineering, the Master of Engineering, Master of Science, and Doctorate degree in either Mechanical Engineering or Aerospace Engineering. Additionally we offer an undergraduate minor in Aerospace Engineering.

### Research Areas in M&AE

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

## Trends

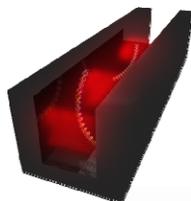
The boundaries of M&AE have expanded dramatically over the past 10 years. While research and education in traditional M&AE topics such as engines, aeronautics, fluid mechanics, heat transfer, and space continue, we have seen explosive growth in emerging areas such as micro- and nano-fluidics, biomechanics and tissue engineering, and advanced controls systems.

The graduate programs in Aerospace Engineering and Mechanical Engineering continue to attract outstanding students. A revised admissions policy that gives students more flexibility in choosing their advisor has improved the recruitment in recent years.

At the undergraduate level, project teams have grown into a major component of the mechanical engineering curriculum. Students are attracted to the opportunity to be entrepreneurs and run "little startup companies". M&AE is now the most popular major in the college, due in part to the excitement around project teams.

## Achievements

- The Sibley School continues to be ranked among the top 10 departments
- Stephen Pope elected Fellow of the Royal Society and American Academy of Arts and Sciences
- Al George awarded Stephen H. Weiss Presidential Fellow
- Frances Moon awarded Lyapunov Prize by ASME
- Charles Williamson chosen New York State Professor of the Year
- Hod Lipson wins CAREER and DARPA Young Investigator Award
- David Erickson wins DARPA Young Investigator Award
- Brian Kirby wins PECASE;
- Thomas Avedisian wins ASME Heat Transfer Memorial Award
- FSAE (advised by Al George) has 9 championships in 21 years
- CUSat (advised by Mason Peck) selected for a free launch.



Opto-fluidics (movement of fluids using light) can manipulate individual molecules such as DNA to facilitate rapid sequencing.

Multi-legged robot synthesizes an internal predictive model which in turn enables the robot to develop new behaviors such as movement (including quadraped walking and snake-like slithering).



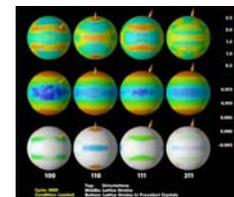
MicroCT of cortical bone.

## Priority Goals

Over the next 5 years, nearly one quarter of the faculty will retire; additionally, we are slated to grow by 10%. Hiring outstanding, diverse faculty is our top priority. The past two directors have hired 11 faculty (of 28), and there will likely be another 10 hired over the next five years. New faculty will continue to broaden our research into new and exciting directions.

We anticipate continued growth in our graduate program as young faculty establish their research programs. Our highest campaign priority is to support each PhD student in their first year by a fellowship.

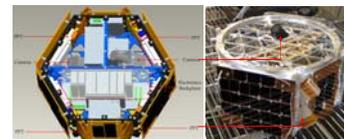
We expect continued interest and growth in experiential learning through project teams and consequently rising undergraduate enrollments.



Experimental measurement of crystal orientations and lattice strains made using X-ray diffraction at the Cornell CHESS facility.



FSAE 2008 car. Nine world championships in 20 years makes this the most successful team of them all.



Cornell's winning nanosatellite entry: CUSat. The ambitious mission involves two satellites separating at launch and inspecting each other.

## Challenges

We must hire outstanding faculty while improving the diversity of the faculty, under stiff competition from universities across the country. Faculty hiring is stressing department financial and space resources. We desperately need additional laboratory (particularly "wet" laboratories) and office space.

We need to grow our graduate program to accommodate the new faculty. To facilitate this growth, we need to expand our graduate student fellowships; our goal is to support all first-year PhD students on a fellowship.

We need to manage our disproportionate teaching loads resulting from high enrollments and project team activities.

## Opportunities

The turnover in faculty provides an opportunity to modernize the department culture. A younger, more diverse faculty will seize new opportunities for interdisciplinary research in strategic areas like energy and sustainability, biomedicine, advanced materials, nanotechnology, and advanced systems design.

The new M&AE building will provide the facilities required for this expansion of research activities to be successful. We have the opportunity to be leaders in these emerging areas and therefore to improve our national ranking.