



Theoretical + Applied Mechanics

CORNELL ENGINEERING

ENG

Degree Programs and Research Areas

- M.S. & Ph.D. in (1) Solid Mechanics, (2) Dynamics and Space Mechanics, (3) Fluid Mechanics and (4) Mechanics of Materials.
- M.Eng. in Engineering Mechanics.
- Instruct sophomore engineering mechanics and provide leadership in the instruction of engineering math.
- Foundational graduate courses in engineering mathematics, dynamics and solid mechanics.
- Research focuses on fundamental mechanical and mathematical models. Principal areas are nonlinear dynamical systems, continuum mechanics and biomathematics.

Trends

- Multi-disciplinary work is a long-standing hallmark of the department. We have recent collaborations with AEP, CEE, EAS, ECE, BEE, CS, CBE, MAE, Physics, Astronomy, Chemistry, Fiber Science, Mathematics and Neurobiology and Behavior.
- Research productivity as measured by papers, citations and Ph.D.s granted remains high despite challenging funding environment.
- Excellent students continue to apply and matriculate to the TAM Ph.D. program.
- The use of computation has evolved to the point where simulation pervades most of our research and teaching.
- Bio- related research projects have increased greatly.
- Large enrollment increases in our composites and nuclear engineering courses.

Achievements

- Steve Strogatz awarded Mathematics Communications Award.
- Andy Ruina broke world endurance record for walking robots.
- Three articles, by Strogatz, Ruina and Burns in *Nature* in 2005-'06 AY.
- Strogatz and Herbert Hui received Tau Beta Pi teaching awards. Richard Rand named Weiss Teaching Fellow.
- Leigh Phoenix received NASA Engineering Safety Center Award.
- IGERT Program in Nonlinear Science renewed under leadership of John Guckenheimer who was also named Fellow of the American Academy of Arts and Sciences.
- Joe Burns curated shows on Saturn at the Johnson Museum and the American Museum of Natural History.

We study freely flying insects in order to gain insights into the dynamics, control and stability of nature's solutions to flight. Shown is the reconstruction of a 3 view image of a fruitfly, recorded at 8000 fps. From a sequence of such images the dynamic orientation of the body and wings are revealed.



In TAM the success of our graduate students is our first priority. Students are given broad latitude to select their thesis advisor and research projects. A current student, when asked why he joined TAM, wrote: "Who wouldn't want to be? I am here because TAM offers me an opportunity to learn from and work with the finest minds in dynamical systems."

Priority Goals

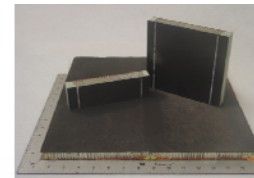
- Make excellent faculty hires.
- Increase research funding and visibility.
- TAM should be even more renowned within the College for providing excellent, responsive instruction in engineering mechanics and mathematics.
- TAM graduate courses should be highly valued by students from other Fields.



The Cornell Ranger robot walked 5.6 miles on April 3, 2008 powered by a 2 lb Li-Ion battery. The project demonstrates the synergy of theoretical mechanics with practical engineering and the education of our students.



Images of Saturn from the Cassini-Huygens mission are not only spectacularly beautiful (and currently exhibited at the Johnson Museum), but provide scientists with a wealth of data from which questions concerning the formation of the solar system can be addressed.



Current and future spacecraft, aircraft, ships, ground vehicles and wind turbines abound in composite material structures. Through sponsored research and consulting TAM faculty are working practical problems in lifing, damage tolerance and prediction of high temperature performance.

Challenges

- Identify exciting candidates as current faculty near retirement.
- Raise resources to mitigate limited department operating funds.
- Sustain support for fundamental research in the current funding environment.
- Secure additional resources to support entering Ph.D. students.

Opportunities

- Our tradition of applied science and engineering in a multi-disciplinary context renders TAM a great place for the growth of exciting new areas and the recruitment of brilliant, creative individuals.
- Not being confined to any one particular engineering discipline, TAM enjoys unusual latitude in the directions of research. We can take advantage of this latitude to increase both our research funding and the number of Ph.D. students.
- Renewed interest in energy and the rapid increase in the deployment of composite materials may increase interest in and support for research in mechanics of materials and structures.
- We can develop M.Eng. programs in mechanics of materials and in engineering mathematics. Enrollments will provide additional funds for department operations.
- An effort is underway to improve contact with TAM alumni. This should yield long term benefits in terms of directed giving, job opportunities for current students and research collaborations.