CornellEngineering Update

Lance R. Collins
Joseph Silbert Dean of Engineering
April 13, 2018

Agenda

- Radical Collaboration
- New College Leadership
- New Faculty
- Research
- Diversity
- Giving Day and Philanthropy Update
- Task Force Preview

Radical Collaboration

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Radical Collaboration

- Ambitious university initiatives to enhance research in broad, cross-cutting areas.
- Faculty-led task forces driving efforts to build leadership and organize infrastructure around each initiative.
- Funding from Provost to support senior faculty hires.
- Leverage Cornell's greatest strength–collaboration: each initiative involves at least eight departments across at least four colleges, increasing interactions between Ithaca and New York City campuses.

Radical Collaboration

COE Thrusts	Nano NEXT	Data Science	Genome Biology	Arts and Humanities	Infection Biology	Social Sciences	Sustainability
Advanced Materials	●	○					●
Bioengineering	○	○	●		●		○
Complex Systems	○	●	○		○		●
Energy	○	○					●

● Extensive Collaboration
○ Some Collaboration

Nano NEXT

Nano NEXT is a multi-year interdisciplinary program at Cornell to push nanoscale science and engineering to the next level of design, function and integration.

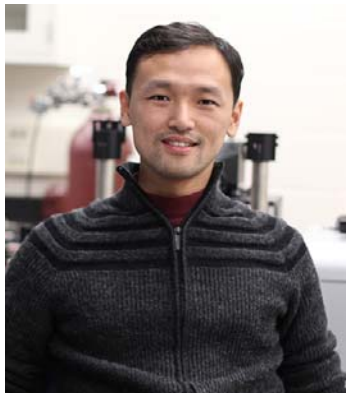
Cornell, one of the world's pioneering institutions in nanoscience (dating back to the Knight Sub-micron Facility), has embarked on recruiting 10 leaders. This collaboration between COE and A&S leverages our core strengths:

Nano NEXT Hires

- AEP–Jie Shan
- CBE–Nick Abbott (colloids and interfaces)
- MSE–Offer declined
- ECE–Offer declined
- BME–Interested, but no one yet identified
- Physics–Kin Fai Mak (spouse of Jie Shan)

Jie Shan

Nick Abbott



Kin Fai Mak

Data Science

Data Science is…

- Concerned with the core methods—computational, mathematical, and statistical—for working with data.
- Also involved with the application of these methods in the myriad of domains.
- Cornell has methodological strength spread throughout its campuses.

The Data Science Task Force was charged with…

- Defining the best organizational structure to leverage current efforts.
- Advancing educational programs at all levels.
- Defining promising focus areas.

Key Recommendations are to create a Center for Engaged Data Science

- Unify current efforts across colleges and campuses.
- Hire research faculty to connect theory with practice.

Data Science Center

Citizen science

Informatics-driven personalized health

Gravitational wave astronomy and cosmology

Global scale public health

Open access publishing

Smart transportation

Legal information and public opinion research

Digital agriculture

Computational social science

Plant sciences

Evolutionary genomics

Security and privacy for data systems

Precision medicine

Genome Biology

Understanding the Responsive Genome in Health, Agriculture, and in the Environment

What is it?

- Genome is an organism's complete set of DNA, including all of its genes.
- Genome biology focuses on the structure, function, evolution, mapping, and editing of genomes. Represents a collection of tools and a new way of thinking about biological processes and their regulation.

Why now?

- Convergence of genome sequence data, functional genomic data, new technologies to edit genes, and computational analysis provide unprecedented ability to dissect, understand and modify biological processes.

Genome Biology

- Genome architecture and regulation (Zipfel)
- Genome evolution and gene-environment interactions
- Computational Genomics (Brito, Varner)
- Technology as a driver of genome biology (De Vlaminck, Zipfel)
- Establishing connections between basic regulatory mechanisms of gene expression and disease states (Fischbach-Teschl, Wiesner)


Warren Zipfel


Ilana Brito


Jeff Varner


Iwijn De Vlaminck


Claudia Fischbach-Teschl


Uli Wiesner

Infection Biology

What is Infection Biology?

- Studies of the host response to microbial pathogens
- Basic biology of the microbes
- Development of drugs and other approaches to combat infection

Key recommendation is to establish two cross-cutting trans-campus centers

- Center for Immunology
- Center for Antimicrobial Resistance

Infection Biology

Why a Center for Immunology?

- Immune system plays key-role in defense against pathogens, inflammatory disease, cancer.
- Diseases such as obesity, metabolic disorders, neurodegenerative, are related to immune system.
- New biologic therapies that target immune response.

Existing Strengths at Cornell

- Fundamental and Comparative Immunology (Microbiology & Immunology + CVM)
- Vaccines (Putnam, Singh, DeLisa)
- Genomics related to immunology
- Microbiome (CALS, CVM, WCM – 5 new assistant professors in COE)

David Putnam

Ankur Singh

Matt DeLisa

Infection Biology

Why a Center for Antimicrobial Resistance?

- Antibiotics are cited as the greatest medical invention of all time
- Antibiotic resistant bacteria pose a serious threat to human health
- CDC - 2 million people acquire resistant bacterial infections; at least 23,000 people die

Builds on Existing Strengths at Cornell

- Monitoring and modelling antibiotic resistance (CVM and CALS)
- Developing "smarter" antimicrobials (Brito, Alabi)
- Tuberculosis (CVM and WCM – significant expertise including BSL3 drug discovery platform)
- Microbiome and antimicrobial resistance (CALS, COE, CVM WCM)

Ilana Brito

Chris Alabi

Sustainability

- Definition: Satisfying the needs of humans today should not come at the expense of satisfying the needs of future generations.

- Transformational societal change is required, and is as dependent on changes in attitudes, policies, and institutions as on technological discoveries.

Sustainability

Specific recommendations:

- Focus interdisciplinary research on the UN Sustainable Development Goals (17 SDGs, relevant for CoE: water; energy; industry, innovation, infrastructure; sustainable cities and communities).
- Fill critical intellectual gaps through coordinated hires of eight faculty.
- Educate the next generation of sustainability professionals by creating a university-wide graduate program in Sustainability Studies administered by the Atkinson Center.
- Create organizational structures in the Atkinson Center to support interdisciplinary research programs that are co-created with non-academic organizations (e.g., foundations, NGOs). To support this activity, a professor of practice or executive in residence will be hired.

New College Leadership

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Associate Dean of Engineering for Research and Graduate Programs

David Erickson
Associate Dean for Research and Graduate Studies

Joined Cornell in 2005.

David Erickson is the Sibley College Professor in Mechanical Engineering, and focuses his research on mobile health technology, microfluidics, photonics and nanotechnology. In addition to supporting research and graduate programs in the college, he helps faculty and graduate students bring their technologies to the world through entrepreneurship. He oversees programs such as the Scale Up and Prototyping Awards and the Commercialization Fellows Program.

Degrees received:
Post-Doc, Electrical Engineering, California Institute of Technology, Pasadena, CA, 2005
Ph.D., Mechanical Engineering, University of Toronto, Toronto, ON, 2004
M.A.Sc., Mechanical Engineering, University of Toronto, Toronto, ON, 2001
B.Sc., Mechanical Engineering, University of Alberta, Edmonton, AB, 1999

Associate Dean for Student Services

Miranda Swanson
Associate Dean for Student Services

Joined Cornell in December 2017.

Associate Dean for Student Services oversees offices of undergraduate admissions, advising, engineering learning initiatives, the registrar and the career center.

Previously Dean of Students at the University of Chicago's Physical Sciences Division where she has 16 years of experience in student services. She oversaw services for about 1,300 students, including recruitment, admissions, registrar, financial aid, crisis management, disciplinary affairs and student programming.

Degrees received:

M.A. in Humanities, University of Chicago, 2001

B.F.A. in Studio Art, University of Nebraska, 1997

Director of Electrical and Computer Engineering

Alyssa B. Apsel
Professor,
Electrical and Computer Engineering

Joined Cornell in 2002. Becomes Director of ECE in July 2018

Alyssa Apsel is currently Professor of Electrical and Computer Engineering. Her research is on power-aware mixed signal circuits and solving the problems that arise in highly scaled CMOS and modern electronic systems. She has authored or co-authored over 75 refereed publications in related fields of RF mixed signal circuit design, interconnect design and planning, photonic integration with VLSI, and circuit design techniques in the presence of variation resulting in five patents and several pending patent applications.

Degrees received:

B.S., Electrical Engineering, Swarthmore College, 1995

M.S., Electrical Engineering, California Institute of Technology, 1996

Ph.D., Electrical Engineering, Johns Hopkins University, 2002

Chief Scientist, Earth Source Heat

Jefferson William Tester
David Croll Sesquicentennial Fellow and Professor, Chemical and Biomolecular Engineering

Joined Cornell in 2009. Named Chief Scientist of ESH in January.

His research on renewable and conventional energy extraction and conversion and environmental control technologies has resulted in over 200 scientific publications and 10 co-authored books. Professor Tester is a fellow of the Royal Society of Chemistry and currently a member of the IPCC's Working Group on Renewable Energy Sources, and advisory boards of the National Renewable Energy Laboratory, the American Council of Renewable Energy, Idaho National Laboratory, and Los Alamos National Laboratory.

Degrees Earned:
B.S., Chemical Engineering, Cornell University, 1966
M.S., Chemical Engineering, Cornell University, 1967
Ph.D., Chemical Engineering, MIT, 1971

Director of the Energy Systems Institute

Lynden A. Archer
James A. Friend Family Distinguished Professor in Engineering

Joined Cornell in 2000. Elected to NAE in 2018

His research focuses on transport properties of polymers and organic-inorganic hybrid materials. Archer is also interested in applications of hybrid materials for energy storage and carbon capture technologies.

Mission of the Energy Systems Institute is to:

Make smart energy systems with low carbon footprint the norm through innovations in materials, technology, and systems design

Degrees Earned:

B.S., Chemical Engineering (polymer science), University of Southern California, 1989

Ph.D., Chemical Engineering, Stanford University, 1993.

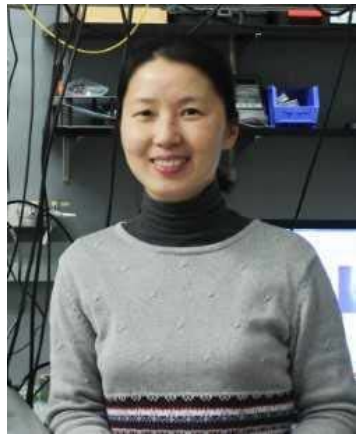
CESI CORNELL ENERGY SYSTEMS INSTITUTE

New Faculty

James F. Anataki
Lowell and Susan McAdam Professor of Heart Assist Technology, Biomedical Engineering

Mahsa Shoaran
Assistant Professor, Electrical and Computer Engineering

Nikolaos Bouklas
Assistant Professor, Sibley School of Mechanical and Aerospace Engineering



Jie Shan
Professor, Applied and Engineering Physics

New Faculty

April Gu
Professor,
Civil and
Environmental
Engineering

Mahdi Esmaily Moghadam
Assistant Professor,
Sibley School of
Mechanical and
Aerospace Engineering

Brenda Lynn Dietrich
Arthur '59 MIE '61 and
Helen Geoffrion Professor
of Practice,
Operations Research and
Information Engineering

Nicholas Abbott
Professor,
Chemical and Biomolecular
Engineering
Starts August 2018

Research Highlight

Breakthrough made in atomically thin magnets

Shengwei Jiang, postdoctoral researcher, aligns an optical setup for magneto-optical Kerr rotation microscopy measurements on atomically thin magnets

Cornell researchers have become the first to control atomically thin magnets with an electric field, a breakthrough that provides a blueprint for producing exceptionally powerful and efficient data storage in computer chips, among other applications.

The research is detailed in the paper, "Electric-field switching of two-dimensional van der Waals magnets," published March 12 in *Nature Materials* by **Jie Shan**, professor of applied and engineering physics; Kin Fai Mak, assistant professor of physics; and postdoctoral scholar Shengwei Jiang.

Research Highlight

Collaboration seeks to reduce health care disparities through technology

Cornell's Institute for Nutritional Sciences, Global Health and Technology (INSiGHT) is dedicated to "applying modern technological tools to solve nutritional and global health problems." Its co-founders are **Saurabh Mehta**, professor of global health, epidemiology and nutrition in the Division of Nutritional Sciences in the College of Human Ecology, and **David Erickson**, the Sibley College Professor in Cornell's Sibley School of Mechanical and Aerospace Engineering.

INSiGHT projects include the development of point-of-care diagnostic devices such as the Cornell NutriPhone and FeverPhone, which can diagnose infections and provide other analyses from a drop of blood in a few minutes using a standard smart phone.

Erickson and the Fever Phone

Diversity in Engineering

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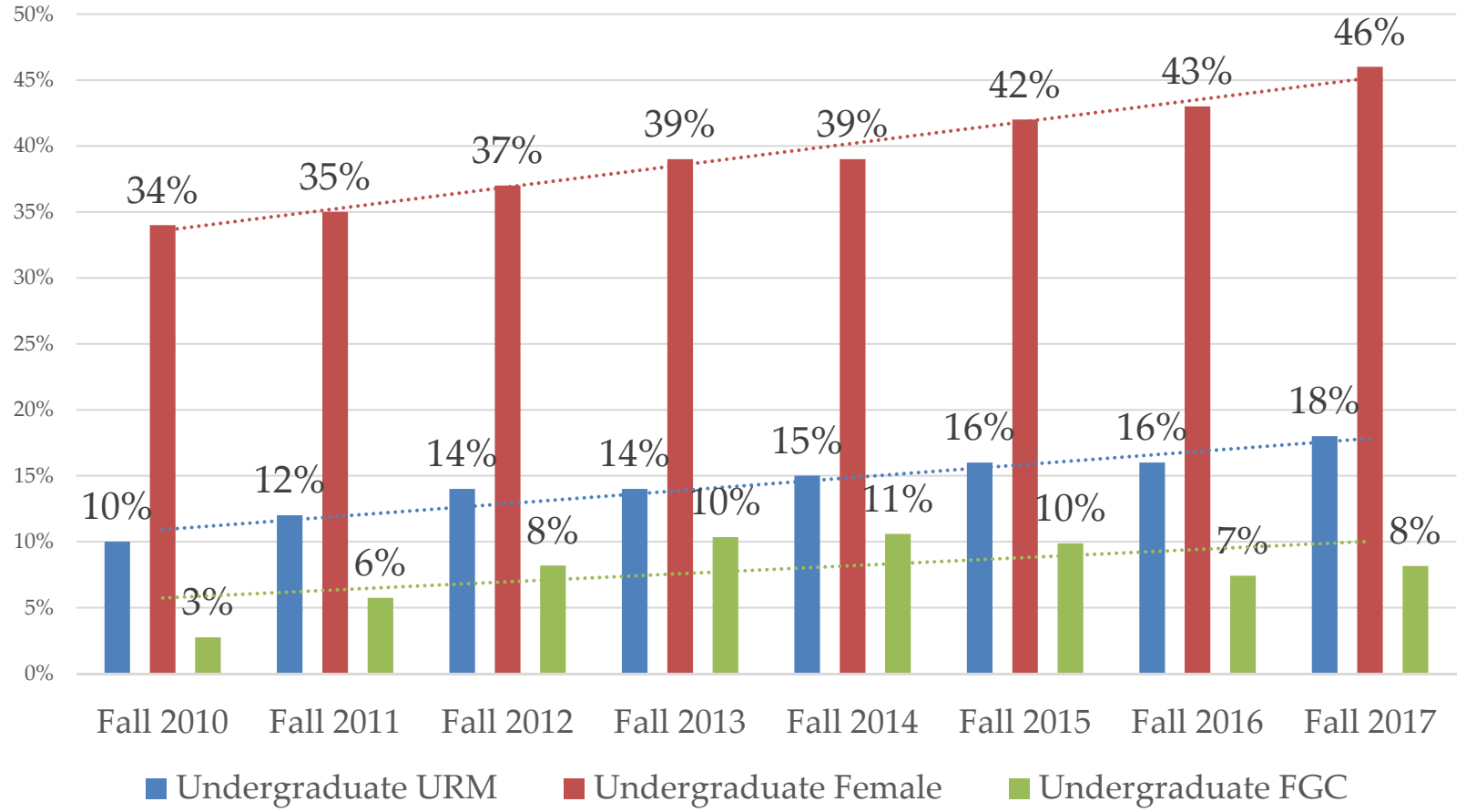
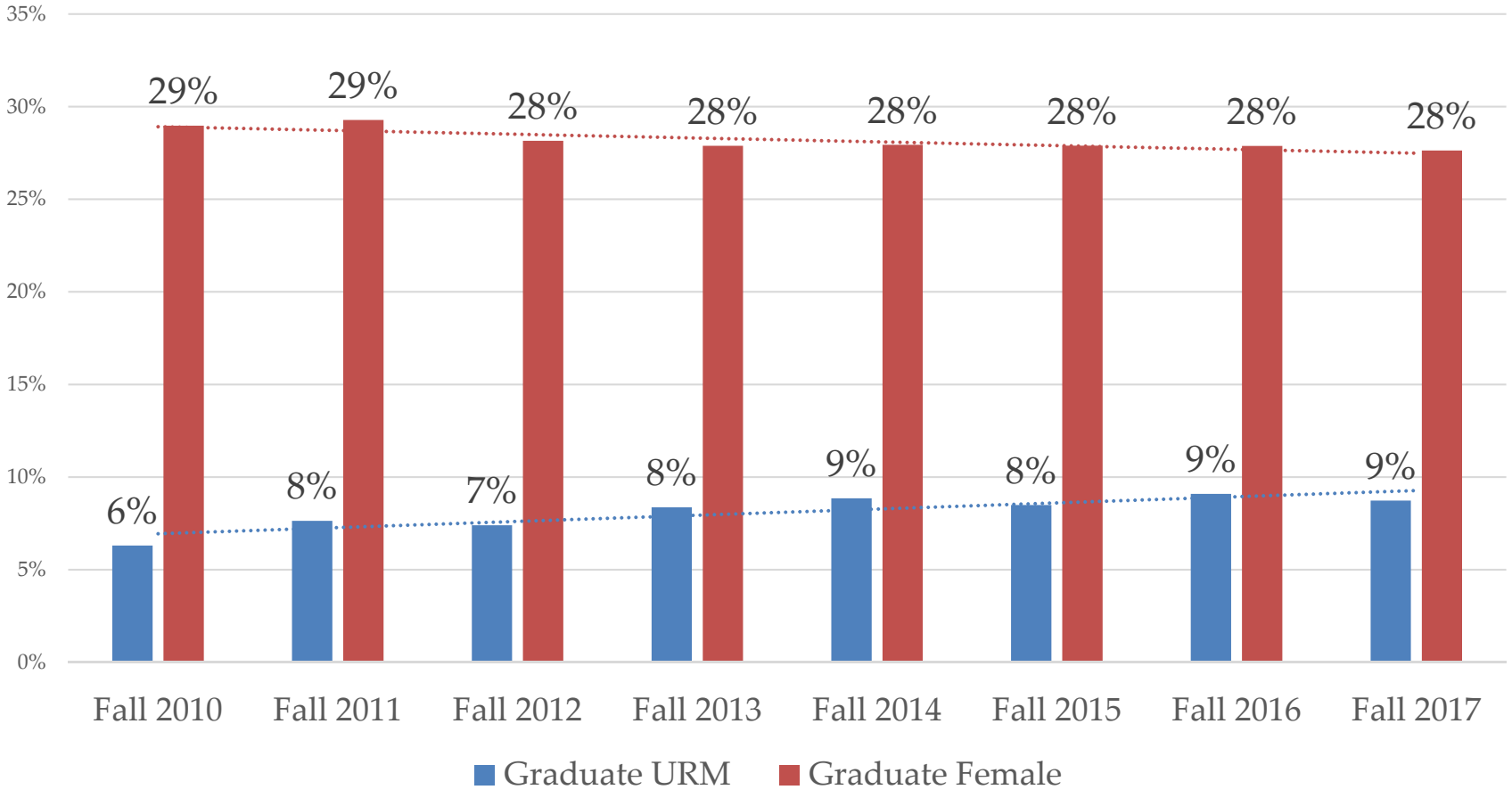
Undergraduate Enrollment



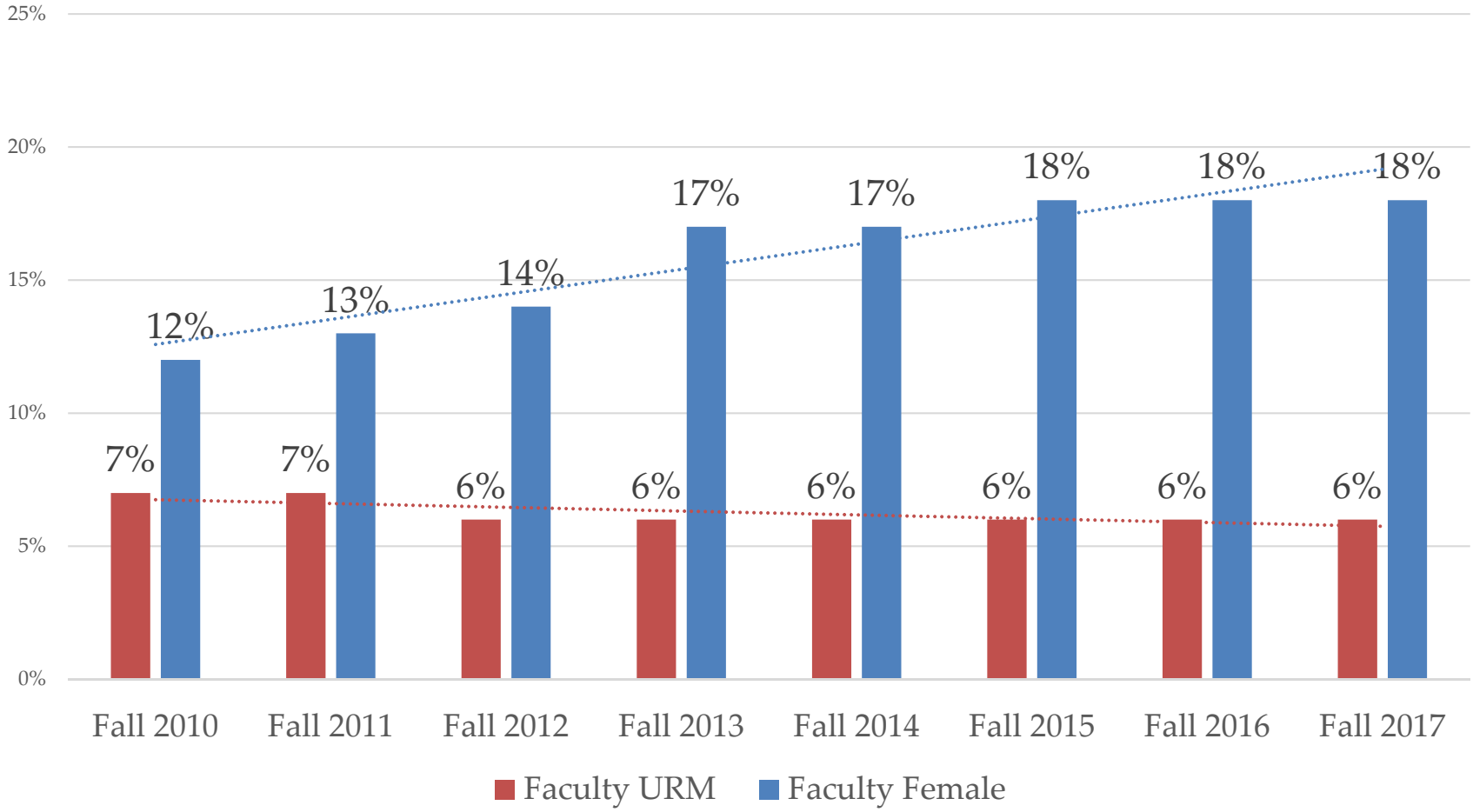
National (Fall 2016): Female 22.3%, URM 16.4%

Ph.D. Enrollment



National (Fall 2016): Female 25.2%, URM 4.8%

Faculty Demographics



National (Fall 2016): Female 16.3%, URM 6.3%

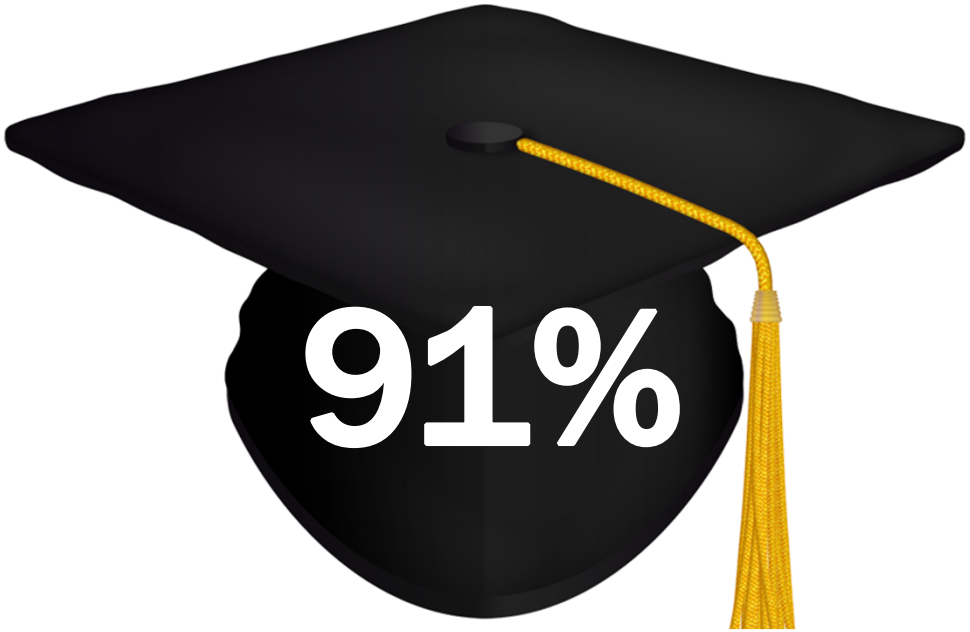
Engineering Faculty Hiring, 2016-17

We anticipate reaching our goal by 2018!

5-Year Engineering Graduation Rate

Undergraduate URM Cohort Admitted Fall 2012

Graduated from Engineering



Graduated from Cornell

CAP8

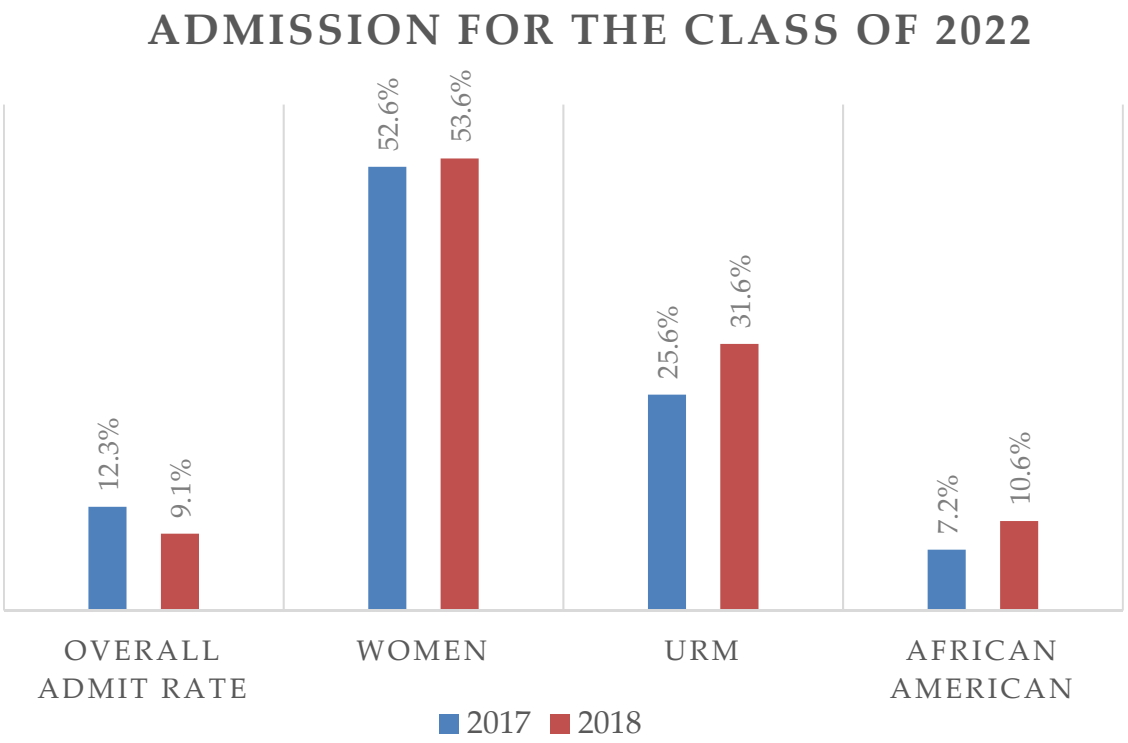
Admissions and Diversity Class of 2022

CornellEngineering

CAP8 Another oopportunity for a photo as a background?

Carol Ann Packard, 4/7/2018

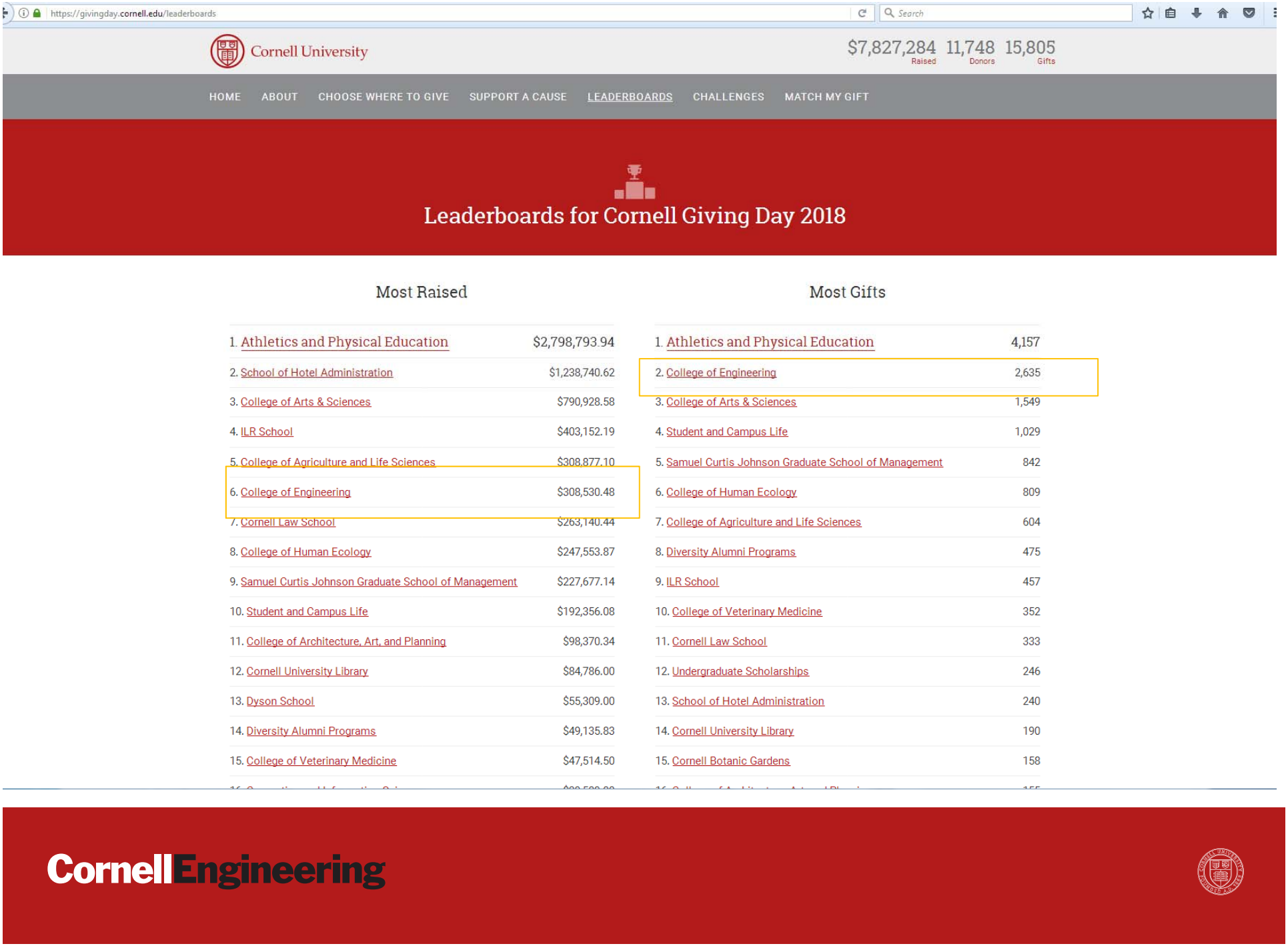
Glimpse of our Admissions/Diversity
(*Admitted students - #Amazing!)



- **13,234 applications, 7.3% increase over last year**
- **1,198 offers of admission, 322 fewer than last year**

Giving Day and Philanthropy Today

CornellEngineering



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Highlights

- **$85,545 in support to Project Teams from 1,888 donors!** This includes the matching funds. This is a game-changer for our students.

- Several gifts of $5K or higher, including two $10K gifts, and a $20K gift from a tracked but unassigned London-based parent.

Giving Totals for Fiscal Year 2018

Fiscal Year 2018 NG&C Goal	$ 50,000,000
Fiscal Year 2018 NG&C Total	$ 29,690,000
Fiscal Year 2018 Annual Fund Goal	$ 2,250,000
Fiscal Year 2018 Annual Fund Total	$ 1,883,716
ECC Member Giving to College	71%

As of 4/5/18
59% of FY18 goal
83.7% of Annual Fund $ goal with 2,078 Annual Fund donors

Task Force Preview

New Educational Paradigm Task Force Committee Report (9:45 – 10:45 a.m.)
Dan Simpkins and Molly Tschang

Energy, Environment, and Sustainability Task Force Committee Report (11:00 – 12:00 noon)
John Swanson and Elissa Sterry

Bioengineering Task Force Committee Report (1:30 – 2:30 p.m.)
Craig Wheeler

Capital Infrastructure Task Force Committee Report (2:30 – 3:00 p.m.)
Ken Goldman and Lisa Walker

Thank you!

Lance R. Collins
Joseph Silbert Dean of Engineering
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