

# Business Rules

## CMU Department Templates

Seven Heads Design

Last updated: 1/13/17

### Introduction

This document provides recommendations for template functionality in the context of the CMS.

Each template is displayed on the left, while specific elements are identified on the right. Each element in a template is annotated with guidelines for display, use, and implementation.

### Contents

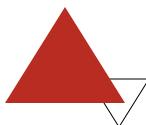
#### Global elements

- Colors
- Headers
- Navigation

#### Templates

- Homepage A
- Homepage B
- News Landing
- Faculty Bio
- Course Listing
- Article
- Programs
- Research Group
- About
- People Landing
- Topic Landing

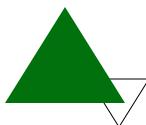
# Colors



**CMU Red**

#a81a1a

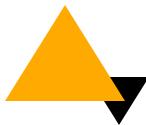
7.42:1



**Camarone**

#00610d

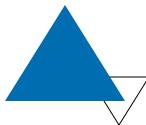
7.73:1



**Orange Peel**

#fc9a00

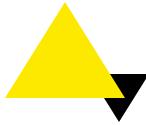
8.08:1



**Endeavor**

#0059a0

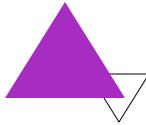
7.15:1



**Lemon**

#fce80a

13.8:1



**Purple**

#9400b4

7.19:1

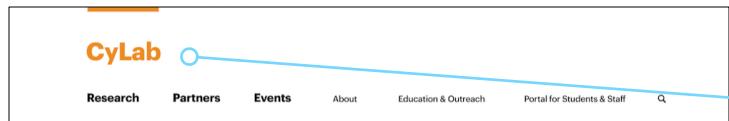
## How to select a color

All templates use a single accent color. The default color is CMU Red.

If a department or center has a brand color, that color should be used.

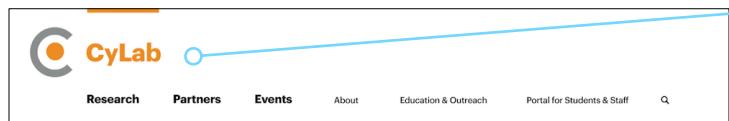
If a department or center does not have a brand color, and does not want to use CMU Red, they may choose from Orange Peel, Lemon, Camarone, Endeavor, or Purple.

# Headers

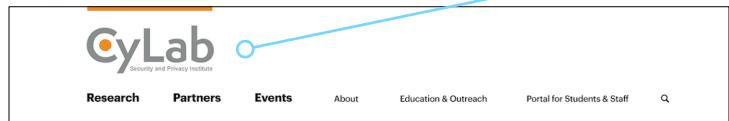


## How to select a default header

If the department or center doesn't have a logo or a wordmark, use Header 1 (default).

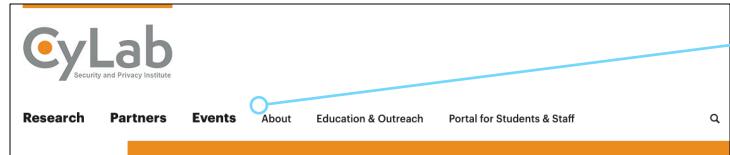


If the department or center has a logo, but no wordmark, use Header 2.



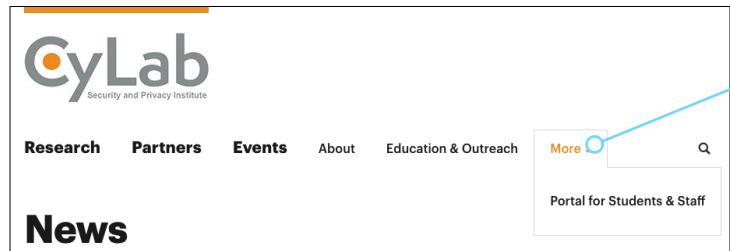
If the department or center has a logo with a wordmark, use Header 3.

# Navigation



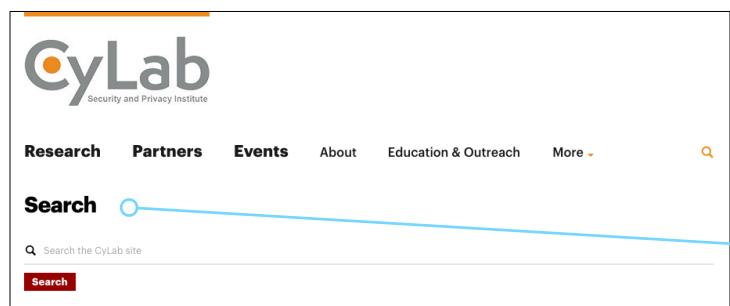
## Main navigation styles

Departments can set any number of menu items in style one (primary navigation) and any number of menu items in style two (secondary navigation). See CSS for actual styles.



## Main navigation constraints

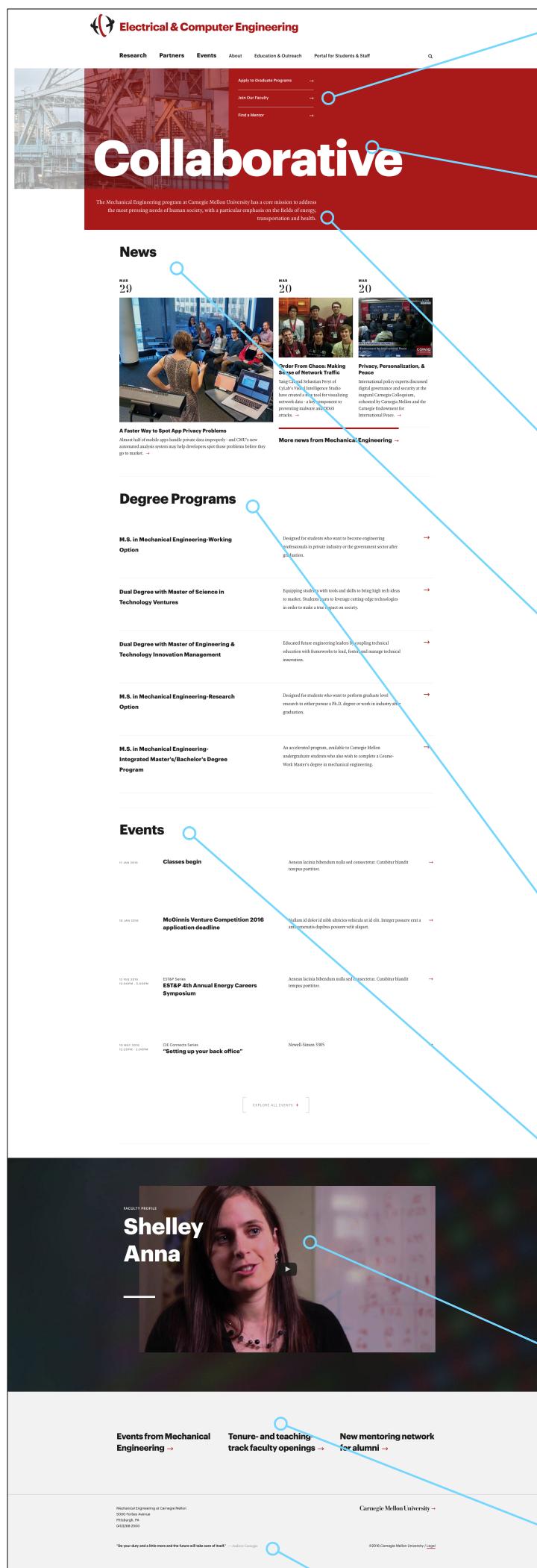
The main navigation can accommodate up to 80 characters of menu items. When main navigation menu items total more than 80 characters, the final visible menu item (before reaching the 80-character limit) will read “More,” and display a down-pointing arrow. Selecting this item reveals a dropdown menu with the remaining menu items. These items, as well as “More,” should always be rendered in style two.



## Search

Selecting the search icon reveals a dropdown search bar. The search bar’s initial text should read “Search the [name of website] site.”

# Homepage A



## Featured subpages

A selection of up to three subpages, which are set to “featured,” with a unique text string and a URL.

## Thematic hero area

Departments may choose a single word to display in the hero area. This word should be selected in conversation between the department and the College, expressing the spirit and goals of the department in a way that aligns with the College and University brand.

## Introduction

Up to 280 characters of copy. Should provide an introduction or summary of the department or institute.

## News

Three most recent articles with photos published by the department. The department may choose to share articles published by the College which have been tagged as relevant to the department. Articles without photos should be excluded from this display.

## Programs or focus area listing

Displays a list of program offerings or focus areas. Each program has a title and a sentence of description, linking to their program pages.

## Related events

Shows up to four upcoming events. “Explore all events” button links to the events landing page.

## Featured video

Featured YouTube video sits behind HTML content, but moves up upon play. Video home screen must be dark.

## Calls-to-action

Displays three calls-to-action, as displayed. Links to appropriate subpages. Customizable per page.

## Footer

Displays one of fifteen randomized quotes on each load. This applies to all department templates.

## CMS data elements

- Introduction
- Articles
- Programs or focus areas (tags)
- Featured video
- Calls-to-action
- Footer quotations

# Homepage B

The screenshot shows the CyLab homepage with the following sections:

- News:** Features a large orange banner with three images and text about privacy problems. Below it is a news item about a faster way to spot app privacy problems.
- CyLab Partners:** Shows logos for 3M, Boeing, Disney, and Facebook, with a "Become a partner today" button.
- Seminars & Events:** Displays four upcoming events: McGinnis Venture Competition 2016, EST&T 4th Annual Energy Careers Symposium, CIE Connects Series, and Newell-Sorenson 9305.
- Twitter feed:** Shows four recent tweets from the @CyLab account.

## News hero

Three most recent articles with photos published by the department. The department may choose to share articles published by the College which have been tagged as relevant to the department. Articles without photos should be excluded from this display.

## Partnerships

Partnership introductory text is editable. All partnerships are represented by the corporate logo of the partner. Logos are not links.

## Related events

Shows up to four upcoming events. “Explore all events” button links to the events landing page.

## Twitter feed

Displays four most recent tweets.

## Calls-to-action

Displays three calls-to-action, as displayed. Links to appropriate subpages. Customizable per page.

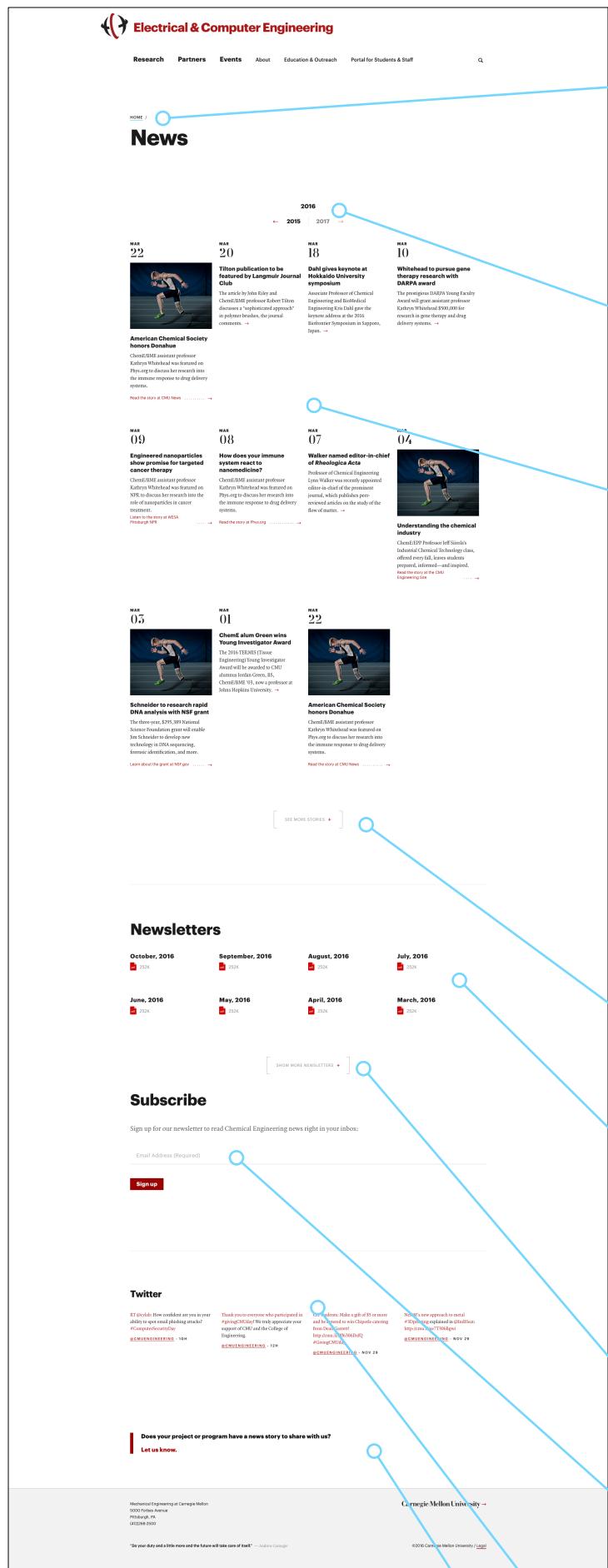
## Footer

Displays one of fifteen randomized quotes on each load. This applies to all department templates.

## CMS data elements

- Articles
- Partnerships
- Events
- Twitter data
- Calls-to-action
- Footer quotations

# News Landing



## Breadcrumbs

Breadcrumbs show all page parents separated by slashes. The final page parent (may be “HOME” if page is in top-level navigation) is followed by a slash. Current page is NOT included in breadcrumbs.

## Year navigation

Displays the twelve most recent articles published in the year selected.

## News

Twelve most recent articles published by the department. The department may also choose to share relevant articles published by the College. Render rules (which style of module) are based on thumbnail image size/ratio and availability of image, choosing from Blocks A1, A3, A4, and A5. Articles housed on external sources will display a call-to-action linking the source, while articles displayed on the department website will use an arrow to link to the article page. If more than 20 articles are in the system, a “See more stories” button should be displayed. Selecting the button will load more article modules, eight (or fewer) at a time.

## PDF listing

Optional for departments that publish regular PDF newsletters. PDFs are listed in reverse chronological order. If more than eight newsletter files are in the system, a “See more newsletters” button should be displayed. Selecting the button will load more PDFs, eight (or fewer) at a time.

## Subscribe call-to-action

Simple form for email intake. Clicking “Sign up” takes users to a confirmation page.

## Twitter feed

Displays four most recent tweets.

## Story idea call-to-action

Links to form subpage for story idea intake.

## CMS data elements

- Breadcrumbs
- Articles
- PDFs
- Subscribe CTA
- Twitter data
- Story CTA
- Footer quotations

# Faculty Bio

The screenshot shows the faculty profile page for Gabriela Hug-Glanzmann. At the top, there is a navigation bar with links to Research, Partners, Events, About, Education & Outreach, and Portal for Students & Staff. Below the navigation is a photo of Gabriela Hug-Glanzmann. The page title is "Gabriela Hug-Glanzmann" and the subtitle is "Assistant Professor, Electrical and Computer Engineering, Engineering and Public Policy". Below the title, there is a brief biography: "Dr. Hug is the Co-Director of the Electric Energy Systems Group (EESG) at Carnegie Mellon University, the leader of the thrust area on Transmission & Distribution Management in the SRC Smart Grid Research Center and a member of the Carnegie Mellon Electricity Industry Center (CEIC)." The page also lists her research areas (Infectious disease transmission, Water resources, Risk analysis and risk communication, Biosecurity), keywords (Environmental and human health implications of manmade nanomaterials, Risk management for the environmental and human health impacts of unconventional natural gas development), and websites (Personal website, DataLab, Complex Fluids Engineering, Process Systems Engineering). To the right of the biography is a contact section with office information (Office: Foster Hall 316, Phone: 412-268-2215, Fax: 412-268-7139), email (gphug@cmu.edu), assistant (Shelly Phelan), Google Scholar profile (Gabriela Hug-Glanzmann), and a Curriculum Vitae download link. Below this is a featured video titled "Optimizing energy systems" featuring Dr. Hug. The video summary states: "Dr. Hug's research focuses on control and optimized operation of the electric power systems to enable a renewable energy future. She develops control schemes based on predictive control to overcome the variability and intermittency of renewable energy generation, investigates the usage of power flow control devices to increase the transfer capacity of the existing transmission system and explores how to optimally integrate and use storage devices in the power system." The page also includes sections for Education (Ph.D. in Electrical and Computer Engineering, ETH Zurich, Switzerland; Diploma in Higher Education Teaching, ETH Zurich, Switzerland; M.Sc. in Electrical and Computer Engineering, ETH Zurich, Switzerland) and Affiliations (Center for the Mechanics and Engineering of Cellular Systems, CMU Inter Molecular Biophysics and Structural Biology, Late Center for Computational Biology, CMU Inter Computational Biology). The bottom of the page features a "Media mentions" section with three examples: "Scan reveals lost gravestone text" (Scienze at Carnegie Mellon University are making high-resolution 3D scans of tombstones to help researchers in the area. A computer matches the patterns to a database of cognitive scans to find the words), "Carnegie Mellon scanner unlocks secrets from the past" (Carnegie Mellon's Yang Cai uses new scanning system to plot digital graveyard), and "Tech to thwart food poisoning, bioterror" (research from Carnegie Mellon University are working with various companies to develop a "spatiotemporal" data mining system for food safety that could revolutionize the way archaeologists work). There is also a "SEE MORE MENTIONS" button. At the very bottom, there are links to "Events from Mechanical Engineering", "Tenure- and teaching-track faculty openings", "New mentoring network for alumni", and "Carnegie Mellon University". The footer includes the address "Mechanical Engineering at Carnegie Mellon, 5000 Fifth Avenue, Pittsburgh, PA 15213-3690" and the quote "Do your duty and a little more and the future will take care of itself" — Andrew Carnegie.

## Breadcrumbs

Breadcrumbs show all page parents separated by slashes. The final page parent (may be "HOME" if page is in top-level navigation) is followed by a slash. Current page is NOT included in breadcrumbs.

## Page content

Page content includes the following elements:

- Contact information: Includes fields for Office, Phone, Fax, Email (mailto link), and Assistant (mailto link), as well as links to a Google Scholar profile and a Curriculum Vitae file download. Email is the only required field.
- Biography: A one- to three-sentence biography of the faculty member.
- Research areas: List of tags compiled by the College. Tags link to Directory page search results for all faculty tagged with the same research area.
- Keywords: Text list, editable, unlinked.
- Websites: Link list, editable.
- YouTube video embed: Optional YouTube video sits behind HTML content, but moves up upon play. Video home screen must be dark.
- Research focus: One to two paragraphs summarizing the focus of the faculty member's research. If a video is used, this text appears inside the video module. With no video, text appears on its own.
- Education: Text list, editable, items displayed in reverse chronological order.
- Affiliations: Link list, editable.

## Media mentions

Pulls in media mentions collected by the College tagged with the faculty member's or research group's name. Includes media source, article title, article summary, and link to source article. If more than four tagged media mentions are in the system, a "See more mentions" button should be displayed. Selecting the button will load more mentions, four (or fewer) at a time.

## CMS data elements

- Breadcrumbs
- Page content
- YouTube video
- Research area tags
- Media mentions
- Calls-to-action
- Footer quotations

# Course Listing

**Electrical & Computer Engineering**

Research Partners Events About Education & Outreach Portal for Students & Staff

HOME / PROGRAMS & ADMISSIONS / Course Listing

This is a list of current, upcoming, and past ECE courses. While we try to update this list regularly, we cannot guarantee its accuracy. Before making any enrollment decisions, please talk to your advisor, check the most recent course rollout document (PDF), and refer to the CMU Schedule of Classes.

**Undergraduate Courses**

Optinal descriptive text allowed here.

Course	Course Name	Location	Units	Semester Offered
18-090	Study Abroad	Pittsburgh	Variable	Part
18-090	Topics in Signals, Multimedia Processing for the Arts	Pittsburgh	10	Current
18-100	Introduction to Electrical and Computer Engineering	Pittsburgh	12	Current
18-200	ECE Sophomore Seminar	Pittsburgh	1	Current
18-202	Mathematical Foundations of Electrical Engineering	Pittsburgh	12	Current
18-213	Introduction to Computer Systems	Pittsburgh	12	Current
18-220	Electronic Devices and Analog Circuits	Pittsburgh	12	Current
18-231	Sophomore Projects	Pittsburgh	Variable	Current
18-232	Sophomore Projects	Pittsburgh	Variable	Part
18-240	Structure and Design of Digital Systems	Pittsburgh	12	Current
18-290	Signals and Systems	Pittsburgh	12	Current
18-300	Fundamentals of Electromagnetics	Pittsburgh	12	Current
18-310	Fundamentals of Semiconductor Devices	Pittsburgh	12	Part
18-320	Microelectronic Circuits	Pittsburgh	12	Part
18-331	Junior Projects	Pittsburgh	Variable	Current
18-332	Junior Projects	Pittsburgh	Variable	Part
18-340	Digital Computation	Pittsburgh	12	Part
18-341	Logic Design and Verification	Pittsburgh	12	Current
18-345	Introduction to Telecommunication Networks	Pittsburgh	12	Part
18-349	Introduction to Embedded Systems	Pittsburgh	12	Current & Future
18-370	Fundamentals of Control	Pittsburgh	12	Current
18-372	Fundamentals in Electric Energy Systems	Pittsburgh	12	Current
18-390	ECE 10-09	Pittsburgh	0	Part
18-401	Electromechanics	Pittsburgh	12	Part
18-402	Applied Electromechanics	Pittsburgh	12	Part
18-403	Microelectromechanical Methods and Technology	Pittsburgh	12	Current
18-411	Computational Techniques in Engineering	Pittsburgh	12	Part
18-412	Neural Technology: Sensing and Stimulation	Pittsburgh	12	Future
18-413	Nano Bio-Photonics	Pittsburgh	12	Future
18-418	Electric Energy Processing: Fundamentals and Applications	Pittsburgh	12	Part
18-421	Analogy Integrated Circuit Design	Pittsburgh	12	Current
18-422	Digital Integrated Circuit Design	Pittsburgh	12	Current
18-431	Senior Projects	Pittsburgh	Variable	Current
18-432	Senior Projects	Pittsburgh	Variable	Part
18-447	Introduction to Computer Architecture	Pittsburgh	12	Part
18-451	Networked Cyber Physical Systems	Pittsburgh	12	Future
18-452	Wireless Networking and Applications	Pittsburgh	12	Future
18-474	Embedded Control Systems	Pittsburgh	12	Part
18-482	Telecommunications, Technology Policy & Management	Pittsburgh	12	Part
18-487	Introduction to Computer and Network Security and Applied Cryptography	Pittsburgh	12	Current
18-491	Fundamentals of Signal Processing	Pittsburgh	12	Part
18-492	Special Topics in Speech Processing	Pittsburgh	12	Current
18-493	Electromechanics	Pittsburgh	12	Current
18-496	Introduction to Biomedical Imaging and Image Analysis	Pittsburgh	12	Part
18-499	Internship	Pittsburgh	Variable	Part
18-510	Sensor Systems Design	Pittsburgh	12	Part
18-525	Integrated Circuit Design Project	Pittsburgh	12	Future
18-540	Rapid Prototyping of Computer Systems	Pittsburgh	12	Part
18-545	Advanced Digital Design Project	Pittsburgh	12	Current
18-549	Embedded Systems Design	Pittsburgh	12	Part
18-551	Signal Processing System Design	Pittsburgh	12	Future
18-578	Mechanics Design	Pittsburgh	12	Part
18-587	Energy Conversion, Control, and Management	Pittsburgh	12	Current

**Graduate Courses**

Optinal descriptive text allowed here.

Course	Course Name	Location	Units	Semester Offered
18-090	Study Abroad	Pittsburgh	Variable	Part
18-090	Topics in Signals, Multimedia Processing for the Arts	Pittsburgh	10	Current
18-100	Introduction to Electrical and Computer Engineering	Pittsburgh	12	Current
18-200	ECE Sophomore Seminar	Pittsburgh	1	Current
18-202	Mathematical Foundations of Electrical Engineering	Pittsburgh	12	Current
18-213	Introduction to Computer Systems	Pittsburgh	12	Current
18-220	Electronic Devices and Analog Circuits	Pittsburgh	12	Current
18-231	Sophomore Projects	Pittsburgh	Variable	Current
18-232	Sophomore Projects	Pittsburgh	Variable	Part
18-240	Structure and Design of Digital Systems	Pittsburgh	12	Current
18-290	Signals and Systems	Pittsburgh	12	Current
18-300	Fundamentals of Electromagnetics	Pittsburgh	12	Current
18-310	Fundamentals of Semiconductor Devices	Pittsburgh	12	Part
18-320	Microelectronic Circuits	Pittsburgh	12	Part
18-331	Junior Projects	Pittsburgh	Variable	Current
18-332	Junior Projects	Pittsburgh	Variable	Part
18-340	Digital Computation	Pittsburgh	12	Part
18-341	Logic Design and Verification	Pittsburgh	12	Current
18-345	Introduction to Telecommunication Networks	Pittsburgh	12	Part
18-349	Introduction to Embedded Systems	Pittsburgh	12	Current & Future
18-370	Fundamentals of Control	Pittsburgh	12	Current
18-372	Fundamentals in Electric Energy Systems	Pittsburgh	12	Current
18-390	ECE 10-09	Pittsburgh	0	Part
18-401	Electromechanics	Pittsburgh	12	Part
18-402	Applied Electromechanics	Pittsburgh	12	Part
18-403	Microelectromechanical Methods and Technology	Pittsburgh	12	Current
18-411	Computational Techniques in Engineering	Pittsburgh	12	Part
18-412	Neural Technology: Sensing and Stimulation	Pittsburgh	12	Future
18-413	Nano Bio-Photonics	Pittsburgh	12	Future
18-418	Electric Energy Processing: Fundamentals and Applications	Pittsburgh	12	Part
18-421	Analogy Integrated Circuit Design	Pittsburgh	12	Current
18-422	Digital Integrated Circuit Design	Pittsburgh	12	Current
18-431	Senior Projects	Pittsburgh	Variable	Current
18-432	Senior Projects	Pittsburgh	Variable	Part
18-447	Introduction to Computer Architecture	Pittsburgh	12	Part
18-451	Networked Cyber Physical Systems	Pittsburgh	12	Future
18-452	Wireless Networking and Applications	Pittsburgh	12	Future
18-474	Embedded Control Systems	Pittsburgh	12	Part
18-482	Telecommunications, Technology Policy & Management	Pittsburgh	12	Part
18-487	Introduction to Computer and Network Security and Applied Cryptography	Pittsburgh	12	Current
18-491	Fundamentals of Signal Processing	Pittsburgh	12	Part
18-492	Special Topics in Speech Processing	Pittsburgh	12	Current
18-493	Electromechanics	Pittsburgh	12	Current
18-496	Introduction to Biomedical Imaging and Image Analysis	Pittsburgh	12	Part
18-499	Internship	Pittsburgh	Variable	Part
18-510	Sensor Systems Design	Pittsburgh	12	Part
18-525	Integrated Circuit Design Project	Pittsburgh	12	Future
18-540	Rapid Prototyping of Computer Systems	Pittsburgh	12	Part
18-545	Advanced Digital Design Project	Pittsburgh	12	Current
18-549	Embedded Systems Design	Pittsburgh	12	Part
18-551	Signal Processing System Design	Pittsburgh	12	Future
18-578	Mechanics Design	Pittsburgh	12	Part
18-587	Energy Conversion, Control, and Management	Pittsburgh	12	Current

McGinnis Engineering on Carnegie Mellon  
5000 Forbes Avenue  
Pittsburgh, PA  
15213-3690

Carnegie Mellon University →  
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## Breadcrumbs

Breadcrumbs show all page parents separated by slashes. The final page parent (may be “HOME” if page is in top-level navigation) is followed by a slash. Current page is NOT included in breadcrumbs.

## Introduction

Should provide context for the course listing, including links to get more information or contact an office with questions.

## Course listing

Displays table of courses. A short introduction can be included before the table. “Location” column is optional. Course numbers and names both link to course detail page.

## CMS data elements

- Breadcrumbs
- Introduction
- Courses
- Footer quotations

# Article

 **Electrical & Computer Engineering**

Research Partners Events About Education & Outreach Portal for Students & Staff

HOME / NEWS / [Jayan receives prestigious Air Force Young Investigator Award](#)

This is an optional subtitle.

NOV 19, 2016

By John Tozzi

Trips and stumbles too often lead to falls for amputees using leg prosthetics, but a robotic leg prosthesis being developed at Carnegie Mellon University promises to help users recover their balance by using techniques based on the way human legs are controlled.

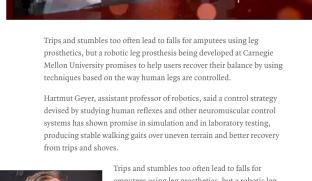
Hartmut Geyer, assistant professor of robotics, said a control strategy devised by studying human reflexes and other neuromuscular control systems has shown promise in simulation and in laboratory testing, producing stable walking gaits over uneven terrain and better recovery from trips and shoves.

**Learn more about:**

  
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[COMMUNICATIONS OFFICE WEBSITE](#)

Trips and stumbles too often lead to falls for amputees using leg prosthetics, but a robotic leg prosthesis being developed at Carnegie Mellon University promises to help users recover their balance by using techniques based on the way human legs are controlled.

Hartmut Geyer, assistant professor of robotics, said a control strategy devised by studying human reflexes and other neuromuscular control systems has shown promise in simulation and in laboratory testing, producing stable walking gaits over uneven terrain and better recovery from trips and shoves.

  
**Student Exposure**

Trips and stumbles too often lead to falls for amputees using leg prosthetics, but a robotic leg prosthesis being developed at Carnegie Mellon University promises to help users recover their balance by using techniques based on the way human legs are controlled.

Hartmut Geyer, assistant professor of robotics, said a control strategy devised by studying human reflexes and other neuromuscular control systems has shown promise in simulation and in laboratory testing, producing stable walking gaits over uneven terrain and better recovery from trips and shoves.

  
**Hartmut Geyer and his team focus their research on principles of legged dynamics and control.**

Hartmut Geyer, assistant professor of robotics, said a control strategy devised by studying human reflexes and other neuromuscular control systems has shown promise in simulation and in laboratory testing, producing stable walking gaits over uneven terrain and better recovery from trips and shoves.

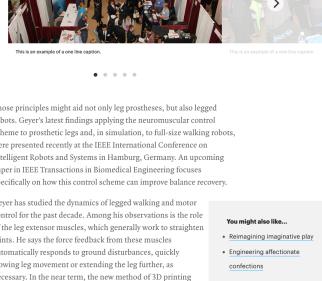
  
**Melissa Garry, Director of Robotics, and Lisa Kulick**

Over the next three years, as part of a \$900,000 National Robotics Initiative study funded through the National Science Foundation, this technology will be further developed and tested using volunteers with above-the-knee amputations.

Joining Geyer on the research team are Steve Collins, associate professor of mechanical engineering and robotics, and Santiago Munoz, a certified prosthetist orthotist and instructor in the Department of Rehabilitation Science and Technology at the University of Pittsburgh.

**"Understanding how humans control their limbs unlocks unlimited possibilities for robotic prosthesis."**

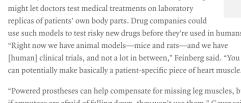
"Powered prostheses can help compensate for missing leg muscles, but if amputees are afraid of falling down, they won't use them," Geyer said. "Today's prosthetics try to mimic natural leg motion, yet they can't respond like a healthy human leg would to trips, stumbles and pushes. Our work is motivated by the idea that if we understand how humans control their limbs, we can use those principles to control robotic limbs."

  
**This is an example of a one-line caption.**

Those principles might aid not only leg prostheses, but also legged robots. Geyer's latest findings applying the neuromuscular control scheme to prosthetic legs and, in simulation, to full-size walking robots, were presented recently at the IEEE International Conference on Intelligent Robots and Systems in Hamburg, Germany. An upcoming paper in IEEE Transactions in Biomedical Engineering focuses specifically on how this control scheme can improve balance recovery.

Geyer has studied the dynamics of legged walking and motor control for the past decade. Among his observations is the role of the leg extensor muscles, which generally work to straighten joints. He says the force feedback from these muscles automatically responds to ground disturbances, quickly slowing leg movement or extending the leg further, as necessary. In the near future, instead of 3D printing might go 3D bioprinting, using medical printers to directly replicate patient's own body parts. Drug companies could use such models to test risky new drugs before they're used in humans. "Right now we have animal models—mice and rats—and we have [human] clinical trials, and not a lot in between," Feinberg said. "You can potentially make basically a patient-specific piece of heart muscle."

"Powered prostheses can help compensate for missing leg muscles, but if amputees are afraid of falling down, they won't use them," Geyer said. "Today's prosthetics try to mimic natural leg motion, yet they can't respond like a healthy human leg would to trips, stumbles and pushes. Our work is motivated by the idea that if we understand how humans control their limbs, we can use those principles to control robotic limbs."

  
**Hartmut Geyer and his team focus their research on principles of legged dynamics and control.**

Those principles might aid not only leg prostheses, but also legged robots. Geyer's latest findings applying the neuromuscular control scheme to prosthetic legs and, in simulation, to full-size walking robots, were presented recently at the IEEE International Conference on Intelligent Robots and Systems in Hamburg, Germany. An upcoming paper in IEEE Transactions in Biomedical Engineering focuses specifically on how this control scheme can improve balance recovery.

Feinberg's research was supported by grants from the National Health and the National Science Foundation. But the shooting strategy he started with, hacking an off-the-shelf printer and buying some gelatin packs, still informs how his lab works. Though Carnegie Mellon has applied for a patent on the printer modification, he has also demonstrated the bioprinting technique at a local school, using chocolate frosting instead of collagen.

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"We think it's a lot easier to use these less expensive machines," Feinberg said. "We can essentially modify it any way we need to make it work." ■

For more information or to reach Professor Geyer, contact Lisa Kulick at (412) 268-5444.

## Breadcrumbs

Breadcrumbs show all page parents separated by slashes. The final page parent (may be "HOME" if page is in top-level navigation) is followed by a slash. Current page is NOT included in breadcrumbs.

## Article content

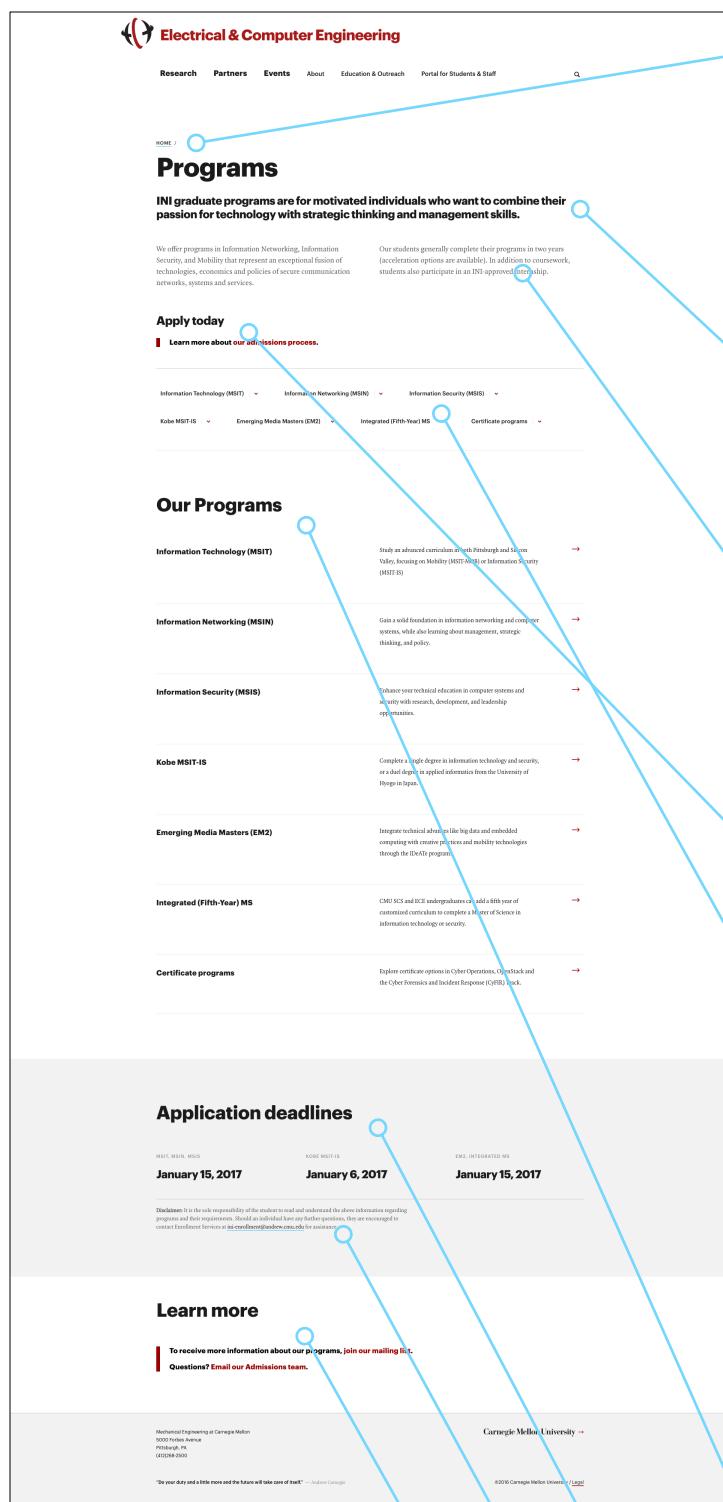
Article content includes the following elements:

- Title
- Subtitle (optional)
- Date of post
- Author (optional)
- Associated social media sharing icons (Twitter, Facebook, email, etc., up to four, can change per article)
- Inline image(s) with photo source and caption (optional)
- "Learn more" module (optional)
- YouTube video embed (optional)
- Photo slider (optional)
- Blockquote with attribution (optional)
- Suggested articles, up to five, manually selected
- Article contact attribution (end of article)

## CMS data elements

- Breadcrumbs
- Article content
- Footer quotations

# Programs



## Breadcrumbs

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## Summary sentence

A single sentence that summarizes the page content. Limited to 150 characters. Optional.

## Introduction

One to two paragraphs that elaborate on the summary sentence (if using) and provide more details.

## Apply call-to-action

Links to another page.

## Local Navigation

Page has the option of displaying or not displaying navigation (manually set). Local navigation display rules are as follows:

1. If the page has children, it displays children.
2. If a menu element has children, it displays a drop menu of its children.
3. If the page doesn't have children, it displays siblings, with the page designated as a “current” with appropriate CSS.

## Programs listing

Displays a list of programs or degrees offered. Each program/degree has a title and a sentence of description, linking to their detail pages.

## Deadlines

Shows deadlines associated with program.

## Disclaimer

Shows disclaimer text.

## Learn more call-to-action

Includes links to two separate form pages.

## CMS data elements

- Breadcrumbs
- Summary sentence
- Introduction
- Local navigation
- Programs
- Apply call-to-action
- Deadlines
- Disclaimer
- Learn more call-to-action
- Footer quotations

# Research Group

## Ydstie Research Group

We are experimental fluid dynamics interested in microfluidics, interfacial fluid mechanics, and surface transport. We develop microfluidic experimental methods to probe and control fluid-fluid interfaces, using scaling analysis, theory, and numerics as tools to complement our experiments. By developing strategies to separate timescales for relevant processes, we have been able to advance the fundamental engineering science of multiphase flows.

Our group and our work is interdisciplinary and collaborative. We enjoy several strong collaborations with other academic research groups around campus and elsewhere, including strong connections with industry.

01 Faculty 02 Projects 03 Research team 04 Courses 05 Awards & honors 06 Publications 07 Patents

### Faculty



**Dr. Erik Ydstie**  
Professor of Chemical Engineering, Professor of Electrical Engineering at Carnegie Mellon (Courtesy)  
Professor of Electrical Engineering at NTNU, Trondheim, Norway

Dr. Erik Ydstie received his BS in Chemistry from the University of Trondheim in 1977 after he entered Imperial College of Science and Technology in London. He received his PhD in Chemistry from the University of Massachusetts in 1982 where he taught and did research until 1992 when he joined the Department of Chemical Engineering at Carnegie Mellon. Prof. Ydstie also has held or holds appointments in the Departments of Electrical Engineering and in Materials Science at the Norwegian University of Science and Technology in Trondheim. He held academic appointments at the University of Melbourne in Australia, Ecole des Mines de Paris, and Imperial College in London. He served on the Advisory Boards of the ACS Petroleum Research Fund and Worcester Polytechnic Institute. Prof. Ydstie has had industrial appointments as R&D Director of ELKEM ASA (1999-2000) and as Board Member and Chairman of Solar Silicon LLC. Prof. Ydstie founded Industrial Learning Systems to take advantage of his advances in adaptive controls. He currently works at PowerTech Development. Professor Ydstie has consulted with many major chemical companies, including PPG, Alcan, Emerson Process Management, Heileman, RGC, Silicon and Hydro Solar.

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GOOGLE SCHOLAR  
Erik Ydstie  
CURRICULUM VITAE  
[Download PDF](#)

### Projects

We study organization and mechanics of subcellular structures including the nucleus and the actin cytoskeleton to address a wide range of medically-relevant questions. Focusing on our strengths incorporating physics and engineering into complex biological questions has led us to high-impact results and a large range of biomedical applications.



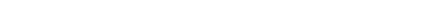
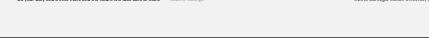
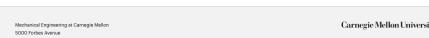
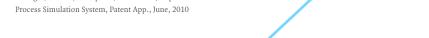
#### Student Exposure

#### Fundamental studies linking nuclear rheology and gene expression

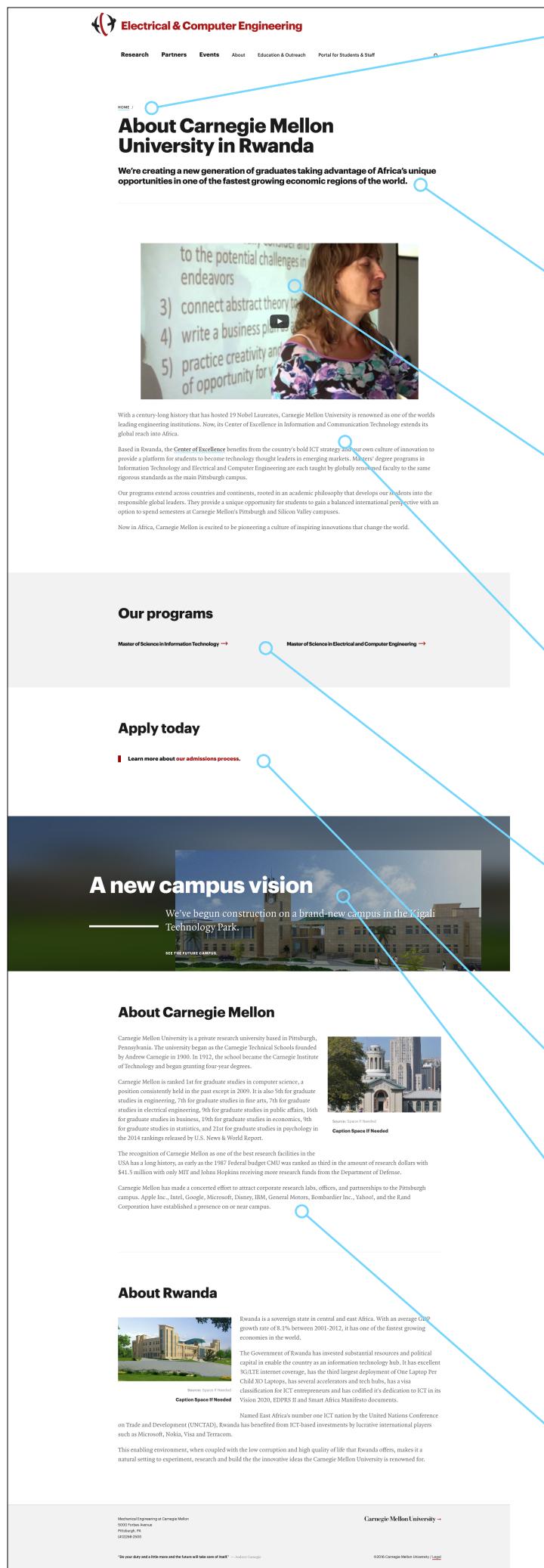


#### What have I developed? A new paradigm for how force on cells impacts gene expression. Using experiments we have shown a dose-dependent and reversible effect of shear stress on gene expression. In addition, when cells are exposed to periodic shear stress, periodic, oscillatory changes in gene expression are observed using advanced particle tracking algorithms, particle velocimetry (Figure 1) and microscopy. This work has been published in the journal *Biomechanics and Applied Nonlinear Mechanics* and is currently being submitted to *Journal of Cell Biology*.

### Research Team



# About



## Breadcrumbs

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## Summary sentence

A single sentence that summarizes the page content. Limited to 150 characters. Optional.

## Featured video

YouTube video embed can appear between summary sentence and introduction, or after introduction if not using a summary sentence.

## Introduction

One to two paragraphs that elaborate on the summary sentence (if using) and provide more details.

## Programs call-to-action

Displays two to three calls-to-action, linking to appropriate subpages. Customizable per page.

## Apply call-to-action

Links to another page.

## Featured subpage

Features one project related to the department administration. Has a title, large image, one- or two-sentence summary, and call-to-action with a URL. Manually selected.

## Secondary page content

Additional copy can be added with individual headers and inline images with sources and captions.

## CMS data elements

- Breadcrumbs
- Summary sentence
- Youtube video
- Introduction
- Programs call-to-action
- Apply call-to-action
- Featured subpage
- Secondary page content
- Footer quotations

# People Landing

**Electrical & Computer Engineering**

Research Partners Events About Education & Outreach Portal for Students & Staff

HOME / NEWS & EVENTS / Distinguished Lecture Series

We are honored to welcome regular guest speakers at the Silicon Valley campus to share their work and insights with our community.

**Join us**

The lectures are open to faculty, staff, students and the public, and broadcast to colleagues in the Pittsburgh campus and made available for remote attendees.

**Silicon Valley campus**

Distinguished lectures are held in CMU's campus at the NASA Ames Research Park, in Building 21, Room 118. No RSVP is required, but seating is limited and will be available on a first-come, first-served basis. Please see the waiver information for directions to our campus.

**Pittsburgh campus**

Please see event details to confirm time and location, as these may change for each lecture.

**Web broadcasts**

Each lecture is also broadcast live over the Web via Adobe Connect for remote attendees. Recordings will be available the following week on CMU SV's YouTube channel.

**Distinguished lecturers**

2006-2007 Past lectures

**Alvy Ray Smith** **Kenji Takahashi** **Ed Koch** **Armand Makowski**

**Fred Baker** **Shaoqi Jiang** **Randolph Aster** **Ivana Diamond**

**Sponsored by**

**Disney** **Google**

**All Silicon Valley events**

10 JAN 2016 Classes begin

10 JAN 2016 McGinnis Venture Competition 2016 application deadline

10 FEB 2016 ESTAP Series: ESTAP 4th Annual Energy Careers Symposium

10 MARCH 2016 CE Connects Series: "Setting up your back office"

**Subscribe**

For information on future events in this series, please sign up for our newsletter:

Email Address (Required)

**Sign up**

McGinnis Engineering at Carnegie Mellon  
5000 Forbes Avenue  
Pittsburgh, PA  
15213-2670  
"Do your data and a little more and the future will take care of itself." — Andrew Carnegie

Carnegie Mellon University

## Breadcrumbs

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## Summary sentence

A single sentence that summarizes the page content. Limited to 150 characters. Optional.

## Introduction

Multiple paragraphs that elaborate on the summary sentence (if using) and provide more details.

## People listing

Loads in page eight modules based on the chosen filter. Each module is manually created and includes:

- Image
- Name
- Title
- Lecture or project name (this field label should be editable depending on page use)
- Date (optional) — Pages that use the date field should display modules in chronological order. Modules that have passed their date are moved to the “Past lecturers” filter and are not shown unless that filter is selected.

If fewer than eight modules exist, the “See more lecturers” button is not displayed at the bottom. Otherwise, “See more lecturers” loads additional modules within the page, eight (or fewer) modules at a time. This button is editable.

## Sponsors

Sponsors are represented by corporate logos. Logos can be linked to unique URLs.

## Events

Display the next four upcoming events in the department. Each displays a start date (or today's date if within a range), time (if specified), name, location/description, and link to event detail page. “Browse upcoming events” button links to the events landing page.

## Subscribe call-to-action

Simple form for email intake. Clicking “Sign up” takes users to a confirmation page.

## CMS data elements

- Breadcrumbs
- Summary sentence
- Introduction
- People modules
- Sponsor logos
- Events
- Subscribe call-to-action
- Footer quotations

# Topic Landing

The screenshot shows a topic landing page for 'Cell & tissue engineering'. At the top is a hero image of a neuron. Below it is a breadcrumb navigation bar with 'HOME / RESEARCH / Cell & tissue engineering'. The main content area contains a subtopic slider with three items: 'Cellular mechano-sensing & actuation', 'Mechanics of biomolecular structures', and 'Trustworthy Computing Platforms and Devices (Alt Slider)'. Each item has a small image, a title, and a brief description. Below the slider is a 'Research calls-to-action' section with a link to 'As-If Infinitely Ranged Integer Model'. At the bottom is a 'Featured institute/center' section for 'Center for the Mechanics & Engineering of Cellular Systems'.

## Breadcrumbs

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## Hero image

Displays a large image behind the page content.

## Introduction

Up to 700 characters of copy. Should provide a summary of the research topic and the department’s research goals.

## Subtopic and/or project listings

Subtopics are listed with headers and include project listings. Projects are displayed in a slider and include a large image (optional), title, and description. If projects do not include an image, two projects can be displayed side-by-side.

## Research calls-to-action

Other topic landing pages are listed and link to their pages.

## Featured institute/center

Features one center or institute related to the topic. Manually chosen. Has a title, large image, one- to two-sentence description, and call-to-action with a URL.

## CMS data elements

- Breadcrumbs
- Hero image
- Introduction
- Subtopics
- Projects
- Topic landing pages (other topics under Research parent page)
- Featured institute/center
- Topic calls-to-action
- Footer quotations