The world is changing

So is Higher Education

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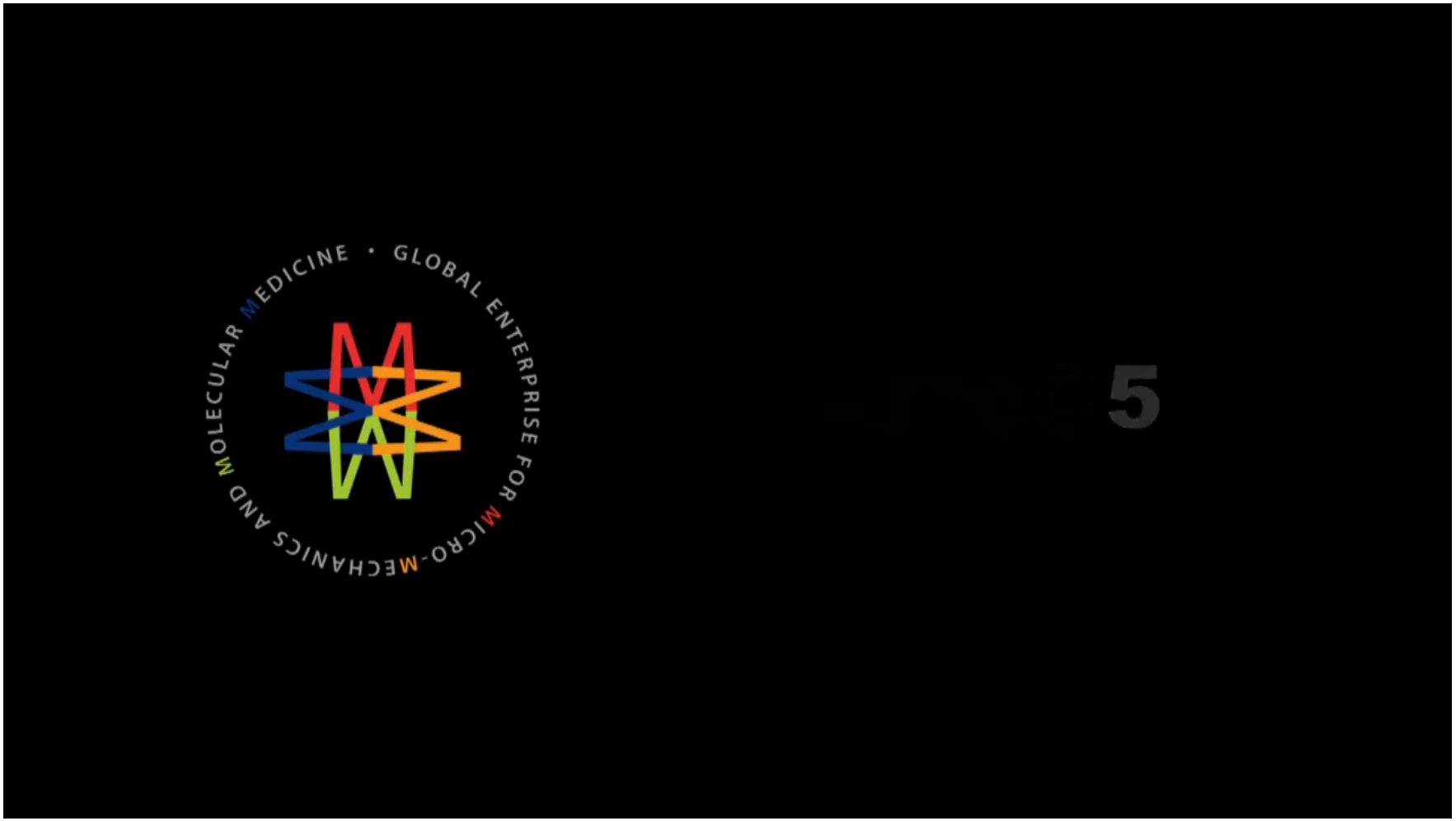
C. Fong Shih's 70th Birthday Celebration
American Academy of Arts & Sciences
May 12, 2016

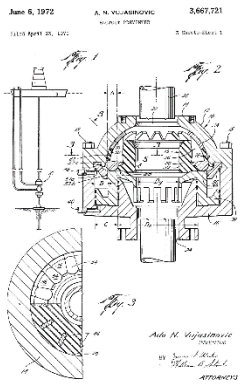
C. Fong Shih @ 70!

A mentor, a friend, a leader



Some Inventions in 1946 (per Wikipedia)

Annular blowout preventer



Tepperware

Filament tape

Credit card

Diaper (waterproof)

Some Observations

- Majority of the top 70 companies in the US in 1946 are no longer top companies today

- (Almost) ALL of the top 70 universities in the US in 1946 are still top universities today

Higher education institutions are conservative, with large inertia

Higher Education has changed in the past 70 years

The changes are accelerating recently

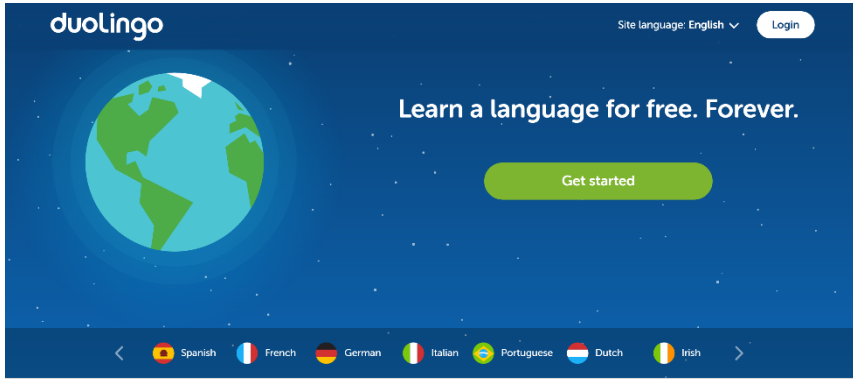
- **Development of new technologies**

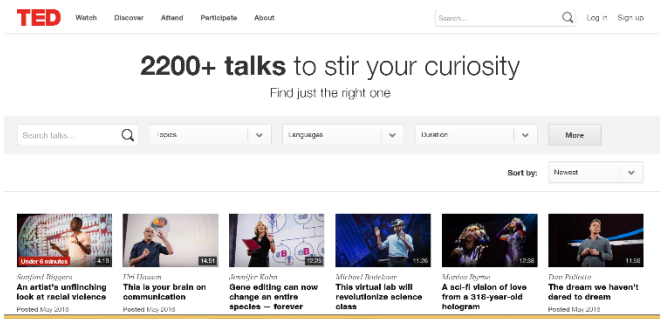
- **Globalization**

Impact of new technologies (personal stories)

My wife Mei and Zhigang's wife Denian are "classmates"

Mei is also learning French and German using Duolingo (developed by CMU faculty member Luis von Ahn)





Mei and kids sometimes learn new things through TED Talks

ALL FOR FREE!!

Impact of Globalization (needs are global)

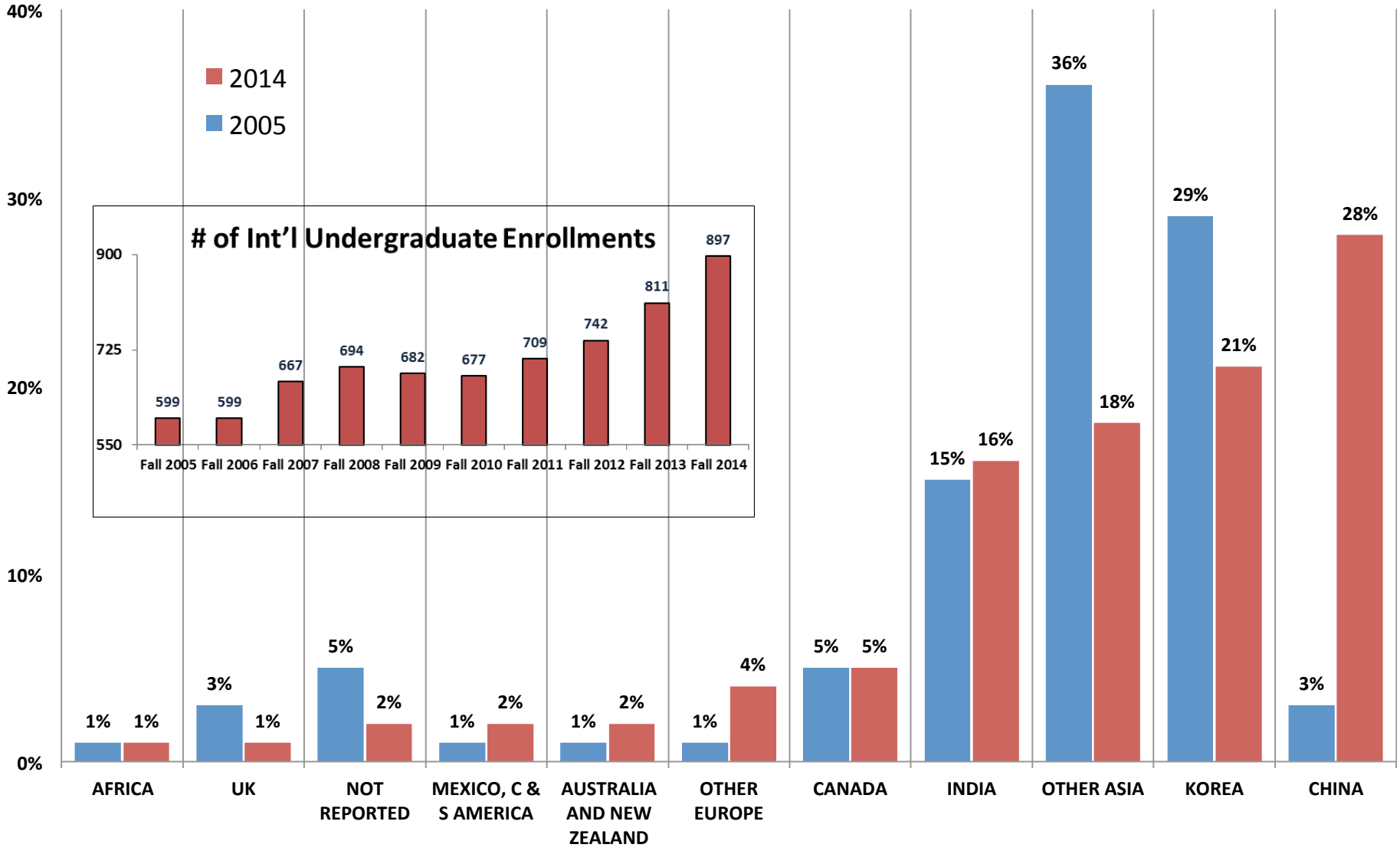
Top 25 Largest Companies Worldwide (ranked by revenue)							
Ranking	Name	Industry	Revenue (USD Billions)	As of:	Revenue Growth	Employees	Headquarters
1	Wal-Mart Stores, Inc.	Retail	$482	Jan-16	-0.70%	2,200,000	Bentonville, Arkansas
2	Samsung	Conglomerate	$305	2015	-7.20%	489,000	Suwon, Korea
3	Royal Dutch Shell	Oil & Gas	$273	2015	-7.20%	94,000	The Hague, London
4	Vitol	Commodities	$270	2015	-13.70%	5,441	Rotterdam, Geneva
5	ExxonMobile	Oil & Gas	$268	2015	-7.20%	75,300	Irving, Texas
6	Volkswagen	Automotive	$245	2015	2.80%	572,800	Wolfsburg, Germany
7	Apple	Consumer Electronics	$234	2015	28.00%	115,000	California
8	Toyota	Automotive	$227	Mar-15	6.00%	344,109	Aichi, Japan
9	BP	Oil & Gas	$223	2015	-37.90%	83,900	London
10	Glencore	Commodities	$221	2014	-5.30%	181,000	Baar, Switzerland
11	Total	Oil & Gas	$212	2014	-11.50%	100,307	Courbevoie, France
12	Berkshire Hathaway	Conglomerate	$221	2014	8.30%	316,000	Omaha, Nebraska
13	McKesson	Pharmaceuticals	$179	Mar-15	30.10%	32,000	San Francisco, CA
14	Phillips 66	Oil & Gas	$161	2014	-6.40%	13,500	Houston, TX
15	Daimler	Automotive	$157	2014	10.10%	275,087	Stuttgart, Germany
16	General Motors	Automotive	$152	2015	-1.70%	284,000	Detroit, Michigan
17	Exor	Financial Services	$148	2014	7.80%	318,562	Turin, Italy
18	Alllianz	Financial Services	$148	2014	10.40%	147,425	Munich, Germany
19	Ford Motor Company	Automotive	$144	2014	-2.00%	164k,000	Dearborn, Michigan
20	Lukoil	Oil & Gas	$144	2014	1.90%	120,000	Moscow, Russia
21	Honda	Automotive	$142	2014	20.00%	198,561	Tokyo, Japan
22	CVS Health	Retail	$139	2014	9.90%	208,000	Woonsocket, Rhode Island
23	Chevron	Oil & Gas	$138	2015	-34.90%	64,700	San Ramon, CA
24	E-ON	Electric utility	$135	2014	-9.80%	79,000	Dusseldorf, Germany
25	Foxconn	Electronics	$133	2014	6.60%	1,290,000	New Taipei City

Source: Wikipedia

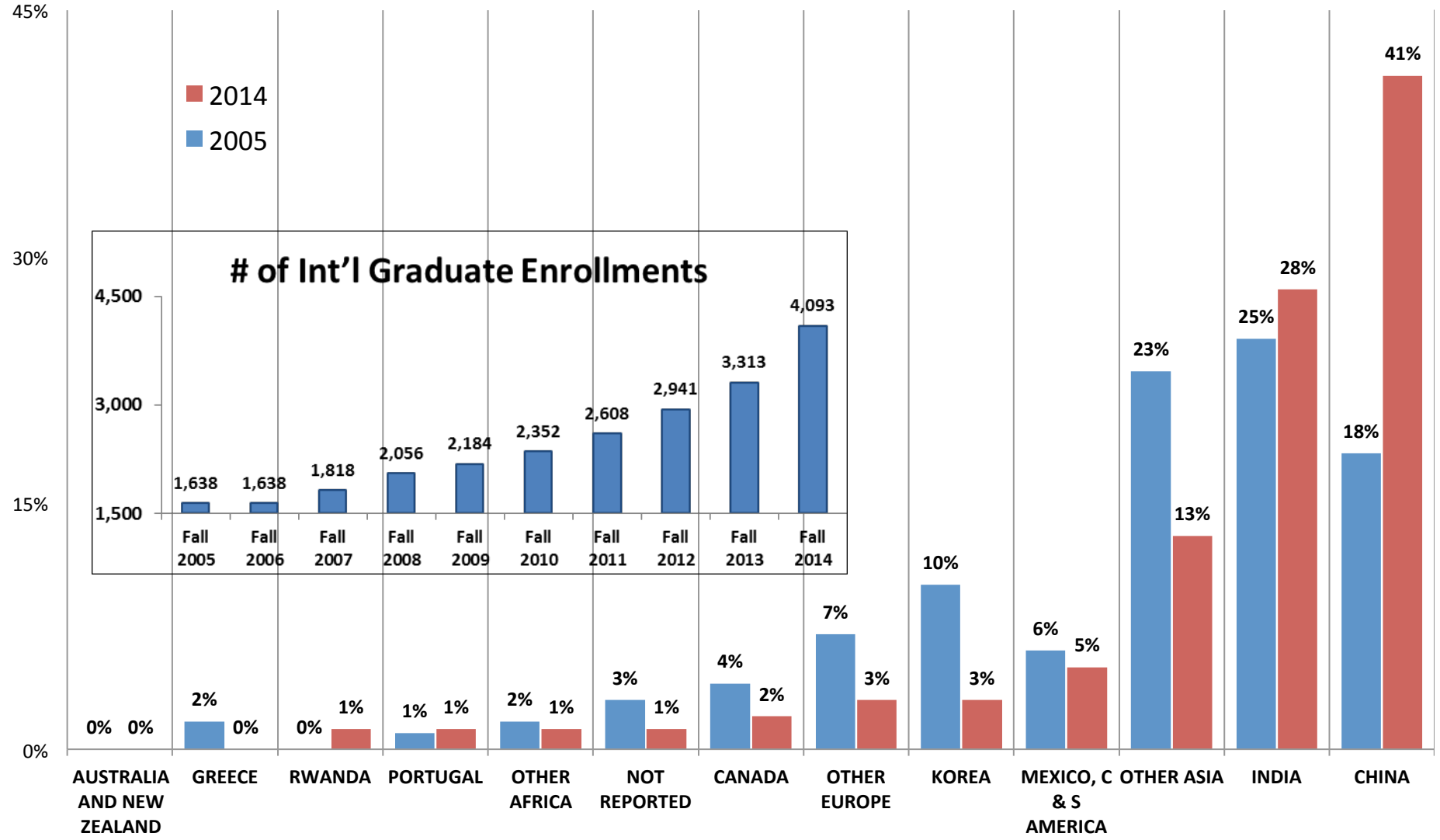
Impact of Globalization (customers are international)

Carnegie Mellon University International Students Statistics

Undergraduate Regions of Citizenship Fall 2005 to 2014



Graduate Regions of Citizenship Fall 2005 to 2014



Another data point:

Population of school age people in India

Impact of Globalization (operation is global for some institutions)

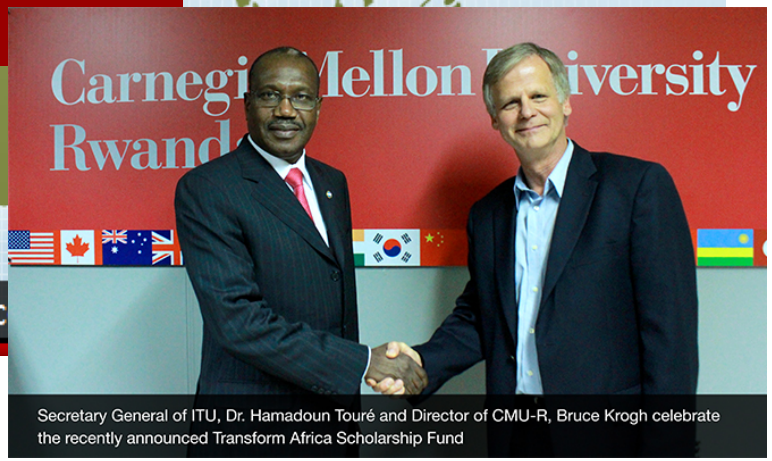
Carnegie Mellon University International Educational Programs

Educating Global Citizens: 2015 Degree Programs Outside of Pittsburgh

- BS Biological Sciences – Doha
- BS Business Administration – Doha
- BS Computational Biology – Doha
- BS Computer Science – Doha
- BS Information Systems – Doha
- Master of Arts Management – Bologna
- Master of Computational Data Science - Singapore
- Master of Entertainment Technology – various locations
- Master of Entertainment Industry Management – Los Angeles
- Master of Human-Computer Interaction – Madeira
- Master of Information Systems Management - Singapore
- Master of Science and Robotics Technology – Nanjing, Plymouth
- MS Computational Finance – New York
- MS in Biotechnology Innovation and Computation – Harbin
- MS in Civil and Environmental Engineering – Nanjing
- MS in Computer Science - Beijing
- MS in Electrical and Computer Engineering – Guangzhou, Kigali, Silicon Valley
- MS in Engineering and Technology Innovation Management –
- Silicon Valley, Singapore
- MS in Information Security Policy and Management - Singapore
- MS in Information Technology – various locations
- MS in Information Technology – eBusiness Technology - Singapore
- MS in Information Technology – Information Security – Kobe, Silicon Valley
- MS in Information Technology – Mobility – Silicon Valley
- MS in Information Technology – Software Management – Silicon Valley
- MS in Mechanical Engineering - Shanghai
- MS in Public Policy and Management – Adelaide, Washington D.C
- MS in Software Engineering – Paris, Silicon Valley
- MS in Software Management – Silicon Valley
- PhD In Applied Mathematics – Lisbon
- PhD in Civil and Environmental Engineering – Ankara, Colombia
- PhD in Computer Science – various locations
- PhD in Computer Science – Robotics – various locations
- PhD in Electrical and Computer Engineering – various locations
- PhD in Engineering and Public Policy – Lisbon, Porto
- PhD in Human-Computer Interaction – Lisbon, Madeira
- PhD in Language Technologies – Lisbon
- PhD in Mechanical Engineering – Daejeon, Singapore
- PhD in Software Engineering – various locations
- PhD in Technological Change and Entrepreneurship – Lisbon
- PPD – Professional Practice Doctorate in Architecture - Salford

Carnegie Mellon University's Global Presence

Information and Communication Technologies Institute
Carnegie Mellon | PORTUGAL
AN INTERNATIONAL PARTNERSHIP



Challenges and Opportunities for Higher Education

- Technological challenges
- Global challenges
- Financial challenges

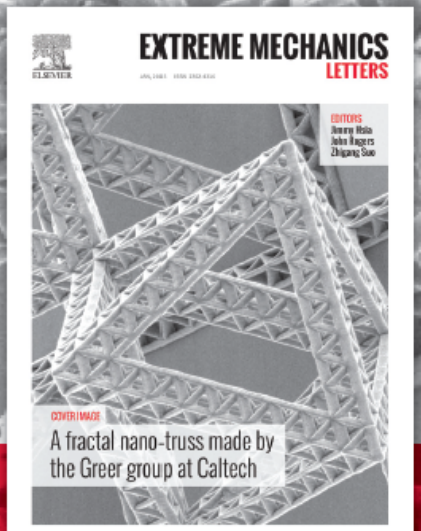
Key to success: to attract the best talents of the world

Still passionate about international collaboration

ELSEVIER

NEW JOURNAL

EXTREME MECHANICS
LETTERS



The launch of this new journal is driven primarily by rapid advances at the forefront of applied sciences, such as: micro and nanotechnologies, biotechnologies, soft materials, smart sensing/ actuation, manufacturing, device fabrication, many of them depend heavily on mechanics tools.

***Extreme Mechanics Letters* will serve as forum for novel research featuring the important role of mechanics in interdisciplinary and multi-disciplinary areas across materials science, physics, chemistry, biology, medicine and engineering.**

- Letter-sized articles
- Fast publication: 6-8 weeks publication time
- Interdisciplinary and multi-disciplinary

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EXTREME MECHANICS
LETTERS

AIMS & SCOPE

Extreme Mechanics Letters (EML) enables rapid communication of research that highlights the role of mechanics in multi-disciplinary areas across materials science, physics, chemistry, biology, medicine and engineering. Emphasis is on the impact, depth and originality of new concepts, methods and observations at the forefront of applied sciences.

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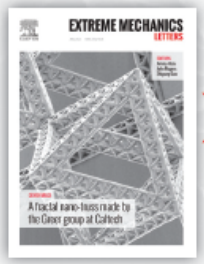

EXTREMELY **FAST**
EXTREMELY **SMALL**
EXTREMELY **LARGE**
EXTREMELY **SOFT**
EXTREMELY **HARD**
EXTREMELY **NEW**
EXTREMELY **USEFUL**
EXTREMELY **INTERESTING**

AMONG THE TOPICAL AREAS OF INTEREST ARE:

- Materials of extreme properties, such as exceptional hardness or softness
- Materials under extreme conditions, such as high temperature and high loading rate
- Stretchable, wearable, or implantable electronics for entertainment or healthcare
- Soft robots in manufacturing, surgery and assisted living
- Robots that crawl, run, swim or fly
- Biomimetics that perceive, act, learn and remember
- Active materials in response to mechanical, chemical, electrical, thermal stimuli
- Instability and large deformation in nature and engineering systems
- Force-induced configurational changes of proteins leading to cascades in cellular responses
- Deformation, transport and fracture in high-efficiency batteries
- Interfacial phenomena in interactions between fluids and solids, deformation and failure of materials, and processes of living cells
- Self-assembly of materials and devices
- Thin-membrane origami and kirigami
- Mechanics of 3D printing
- Materials and structures of hierarchical architectures
- Hybrid systems of air, liquids, and solids
- Earthquakes and hydraulic fracture
- Foldable, lightweight structures for space exploration

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