

**International experiences**

**Undergraduate research**



Cornell University



# International experiences in health care

- Spend a month in Tanzania working with students from ATC
  - Diagnosing and repairing medical equipment
  - Identifying unmet clinical needs
- Host students from Tanzania at Cornell for a month
  - Take unmet needs to project ideas
  - Explore research and medical environments
- International senior design experience
  - Take project to a prototype device
  - Collaborate with peers from Tanzania
- Just completed first year of program.
- Students participate between Junior and Senior year.

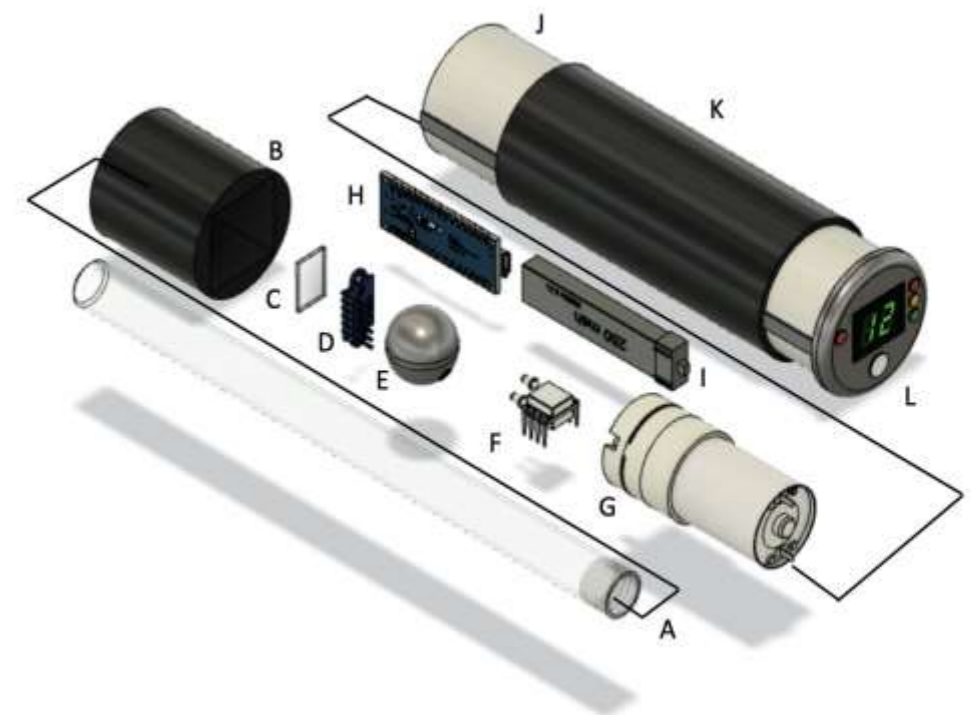
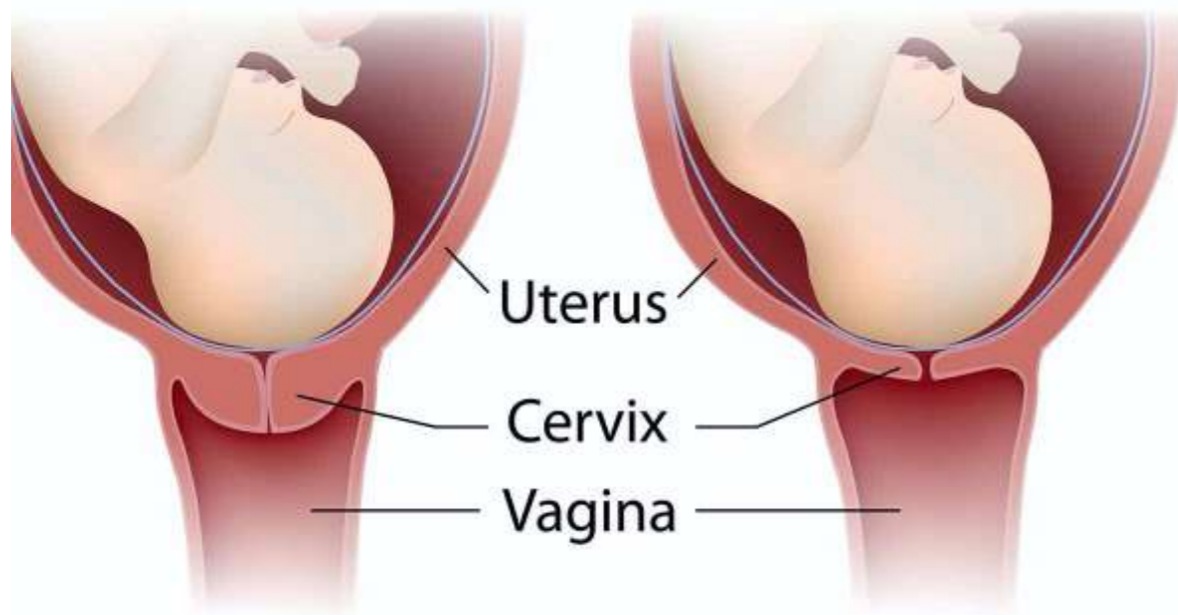


# Cornell-ATC program senior project

- This year's team developed a device to diagnose cervical insufficiency, a leading cause of premature birth that is difficult to diagnose.

Normal

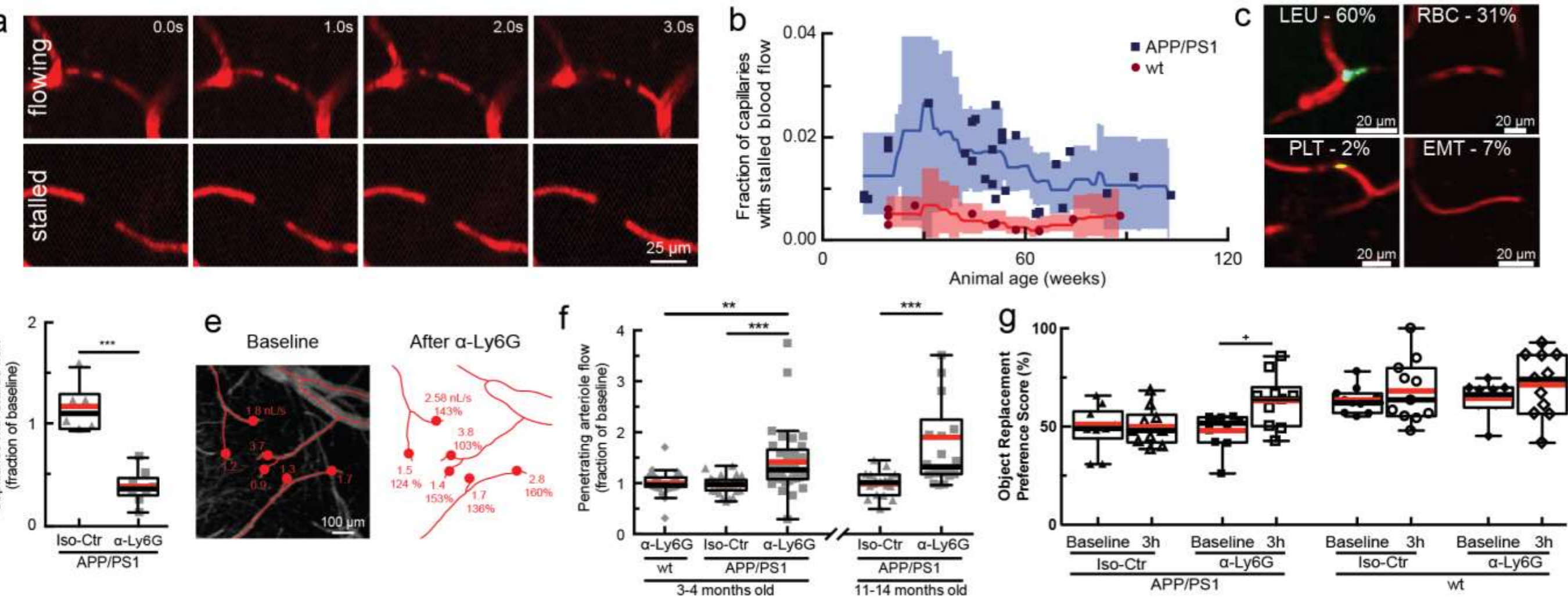
Insufficient



# Undergraduate research

- More than half of BME undergraduates participate in research with faculty.
- All BME labs, and most research groups at Cornell, have significant numbers of undergraduate researchers, often coming from many different disciplines.
- Research provides opportunities to interact with faculty, graduate students, and other scientists to discover new knowledge and invent new technologies.
- In BME, this means developing the tools and knowledge to improve our understanding, diagnosis, and treatment of human disease.
- Undergraduates play a major role in the research enterprise at Cornell.

# Stalled capillaries cause brain blood flow reductions and memory impairment in Alzheimer's disease mice











**Undergraduates played a HUGE role in this work**

nature  
neuroscience

ARTICLES

<https://doi.org/10.1038/s41593-018-0329-4>

# Neutrophil adhesion in brain capillaries reduces cortical blood flow and impairs memory function in Alzheimer's disease mouse models

Jean C. Cruz Hernández<sup>1,7</sup>, Oliver Bracko<sup>1,7</sup>, Calvin J. Kersbergen <sup>1</sup>, Victorine Muse <sup>1</sup>,  
Mohammad Haft-Javaherian<sup>1</sup>, Maxime Berg<sup>2</sup>, Laibaik Park <sup>3</sup>, Lindsay K. Vinarcsik<sup>1</sup>, Iryna Ivasyk<sup>1</sup>,  
Daniel A. Rivera<sup>1</sup>, Yiming Kang<sup>1</sup>, Marta Cortes-Canteli<sup>4,5</sup>, Myriam Peyrounette<sup>2</sup>, Vincent Doyeux<sup>2</sup>,  
Amy Smith <sup>2</sup>, Joan Zhou<sup>1</sup>, Gabriel Otte<sup>1</sup>, Jeffrey D. Beverly<sup>1</sup>, Elizabeth Davenport<sup>1</sup>, Yohan Davit<sup>2</sup>,  
Charles P. Lin<sup>6</sup>, Sidney Strickland<sup>4</sup>, Costantino Iadecola <sup>3</sup>, Sylvie Lorthois <sup>1,2</sup>, Nozomi Nishimura <sup>1,8\*</sup>  
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# Undergraduates played a HUGE role in this work

Original Article

## Increasing cerebral blood flow improves cognition into late stages in Alzheimer's disease mice

Oliver Bracko, Brendah N Njiru, Madisen Swallow, Muhammad Ali, Mohammad Haft-Javaherian  and Chris B Schaffer

# JCBFM

Journal of Cerebral Blood Flow & Metabolism

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1? **High fat diet worsens Alzheimer's disease-related behavioral abnormalities and**  
2? **neuropathology in APP/PS1 mice, but not by synergistically decreasing cerebral**  
3? **blood flow**

4?

5? **Authors:**

6? Oliver Bracko<sup>1</sup>, Lindsay K. Vinarcsik<sup>1</sup>, Jean C. Cruz Hernández<sup>1</sup>, Nancy E. Ruiz-Urbe<sup>1</sup>, Mohammad  
7? Haft-Javaherian<sup>1</sup>, Kaja Falkenhain<sup>1</sup>, Egle M. Ramanauskaite<sup>2</sup>, Muhammad Ali<sup>1</sup>, Aditi Mohapatra<sup>1</sup>,  
8? Madisen Swallow<sup>1</sup>, Brendah N. Njiru<sup>1</sup>, Victorine Muse<sup>1</sup>, Stall Catchers contributors<sup>3</sup>, Pietro E.  
9? Michelucci<sup>2</sup>, Nozomi Nishimura<sup>1</sup>, and Chris B. Schaffer<sup>1\*</sup>

10?

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## **Inhibition of Vascular Endothelial Growth Factor signaling rapidly reduces leucocyte obstructions in brain capillaries and improves cortical blood flow in an Alzheimer's disease mouse model**

Muhammad Ali, Kaja Falkenhain, Mohammad Haft-Javaherian, Muhammad Murtaza-Ali, Brendah Njiru, Nozomi Nishimura, Chris B. Schaffer, and Oliver Bracko\*

*Meinig School of Biomedical Engineering, Cornell University, Ithaca, NY, USA, 14853*

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### **Abstract:**

Increased incidence of stalled capillary flow caused by adhesion of leucocytes to the brain microvascular endothelium leads to a ~20% reduction of cerebral blood flow (CBF) and exacerbates short-term memory loss in multiple Alzheimer's disease (AD) mouse models. Here, we report that Vascular Endothelial Growth Factor (VEGF) signaling at the luminal side of the brain microvasculature plays an integral role in this capillary stalling

Oliver Bracko

<https://www.ncbi.nlm.nih.gov/pubmed/25751166>

must!!

<https://elifesciences.org/articles/33670>

Atwell!!!

Marta!!!!

Welcome back!

IMPORTANT!!

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0023789>

<https://www.nature.com/articles/srep02053>

crosstalk with VEGF

<https://www.sciencedirect.com/science/article/pii/S0005273607003057>

Chris Schaffer