

# EN1-06: Simple Robotics

November 14th, 2016





# Schedule

- In the News
- Visitors?
- Upcoming Schedule
- Project 7 Showcase



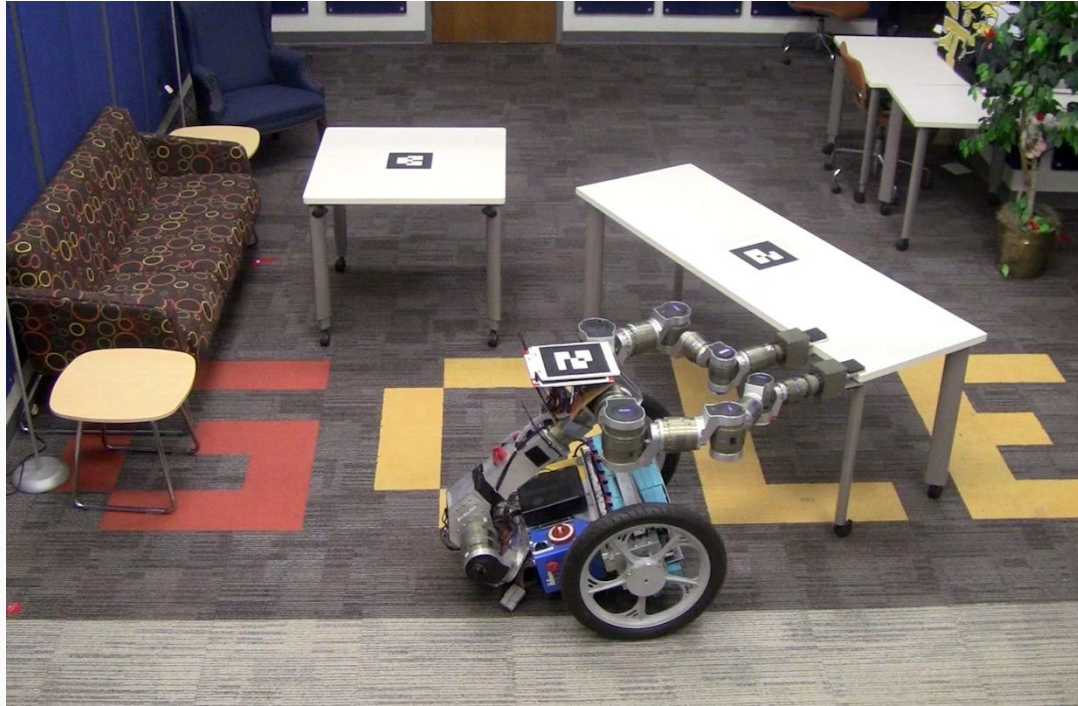
## Swarm of Origami Robots Can Self Assemble Out of a Single Sheet



<http://spectrum.ieee.org/automaton/robotics/robotics-hardware/harvard-self-folding-origami-robots/>



## You Can't Stop Robots With Furniture Barricades Anymore



<http://spectrum.ieee.org/automaton/robotics/home-robots/you-cant-stop-robots-with-furniture-barricades-anymore/>



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### Here's some advice for you, President Trump, from scientists

By Jeffrey Mervis | Nov. 9, 2016 , 10:00 AM

The voters have chosen Donald J. Trump as the 45th president of the United States. So now it's time for scientists to share their thoughts with the business tycoon who triumphed over both Democrat Hillary Clinton and much of the Republican party he represented in the election.

There's been almost no interaction between the science community and the campaign over the past 18 months. Most academics didn't support Trump and never expected him to beat Clinton. Trump operatives didn't do any outreach to the scientific establishment, and its agenda wasn't addressed during the campaign. Last night the election results confirmed the community's status as outsiders.

"I am simply stunned," says Neal Lane, a Democrat who led the National Science Foundation and served as White House science adviser under President Bill Clinton. "Trump's election does not bode well for science or most anything else of value," adds Lane, a physicist and university professor at Rice University in Houston, Texas.

## Will Trump slash public funding for scientific research?

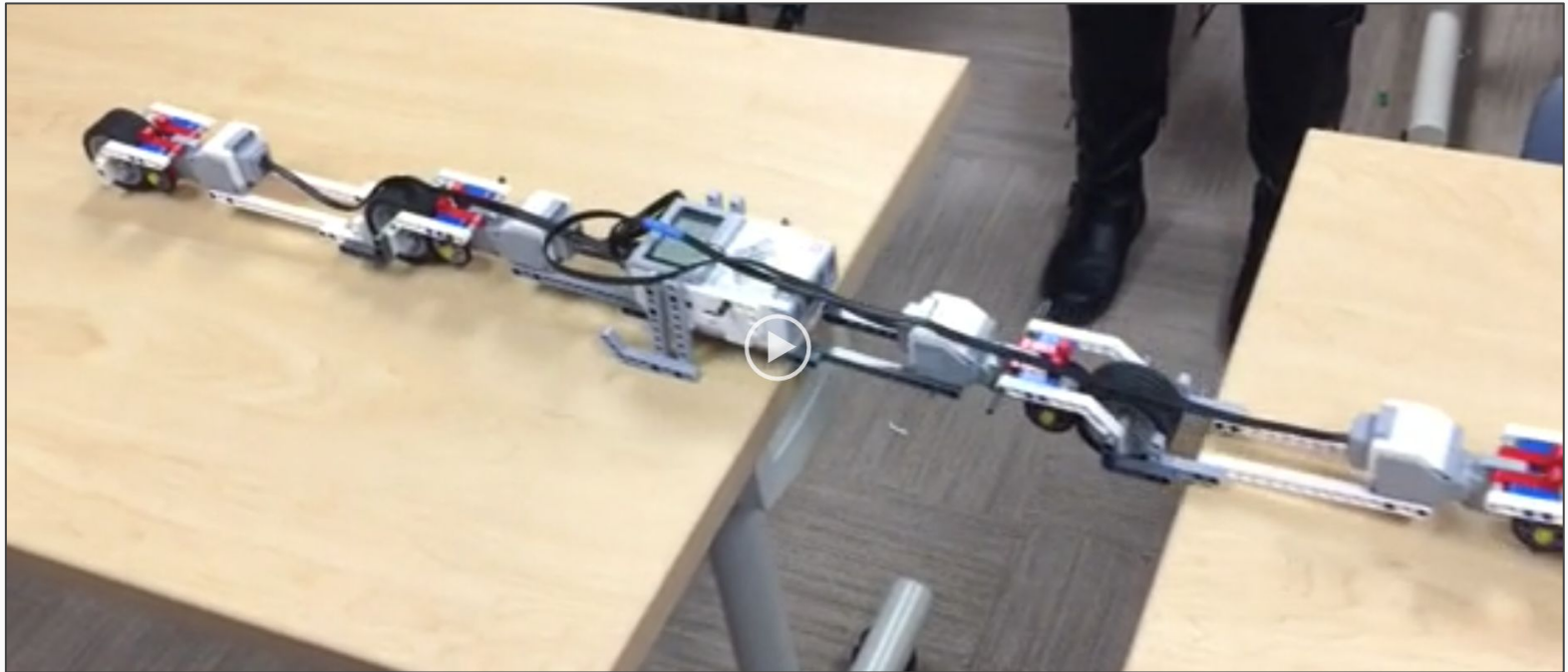
### CLIMATE SCIENTISTS ARE THE MOST CONCERNED

Climate scientists are the most concerned, since Trump has denied man-made climate change exists. The current NSF budget is already a fraction of the NIH's — \$7.46 billion. And with Trump's decision to appoint a climate skeptic to lead the Environmental Protection Agency transition, climate scientists fear that public funding for their research will be slashed. "We don't expect a lot of support for climate initiatives," says Joshua Adam Drew, a professor at the Department of Ecology, Evolution and Environmental Biology at Columbia University. "I hope I'm wrong and that I'm just being depressed about the future, but I don't see there being a large... support for an increased federal budget for research."

Zeitler, at the Federation of American Societies for Experimental Biology, says it's too early to know. Congress could approve spending bills before Christmas; those bills include raising the NIH budget to \$34.1 billion and the NSF budget to \$7.51 billion in 2017. That would secure public funding for the first year of Trump's presidency. What would happen for the year 2018 and onward, however, is anyone's guess. And that uncertainty is what's most concerning to some. "It's a complete and whole black hole. We don't have any idea," Weiss says. "I don't think Trump has give a lot of thought to it. And maybe that's a good thing, maybe the administration will be distracted with other things and things will stay relatively status quo."



# Assignment 6: In-Class Competition (11/7)





# Upcoming Schedule



Mon, Nov 14th

Proj 7: Interactive  
Video Game demos

Mon, Nov 21st

Guest Lecture  
(for final project)

Mon, Nov 28th

Final Project  
Brainstorm

Mon, Dec 5th

Final Project  
Prototype Testing

Wed, Nov 16th

Midterm Review  
(come with questions)

Wed, Nov 23rd

No classes

Wed, Nov 30th

Wed, Dec 7th

Fri, Nov 18th

**MIDTERM**  
(in class)

Fri, Nov 25th

No classes  
University holiday

Fri, Dec 2nd

Fri, Dec 9th

Mon, Dec 12th

Final Project  
Showcase



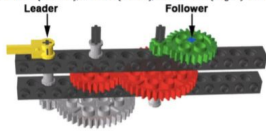
# Midterm Exam (Practice Exam)

EN1-06: Simple Robotics  
Fall 2016

## Practice Midterm

Put your name on any sheets being submitting for Midterm. Need to know who you are.  
There are two pages to this midterm (5 questions, total of 20 points)  
It is a closed-note/closed-computer/work-by-yourself exam  
You have one-hour & 15 minutes to complete the exam.

1. (4 points) For the following gear setup, calculate the ratio (amount) that the "follower" gear will turn when the yellow "leader" turns once. The three gears used in this gear train are 8-tooth (smallest), 24-tooth (middle), and 40-tooth (largest). Show your work.



2. (4 points) The color sensor in the LEGO MINDSTORMS EV3 kit can also be used to detect light levels in two different modes. For these two modes additional modes (beyond "color"), describe in general what they are/why they exist (1pt each) and give a specific example for when you would use each mode (1pt each).

3. (4 points) Professor Danahy wants his robot to turn around, clockwise, in place so that it ends up in the exact same spot but facing 180-degrees in the other direction. What power values would you suggest sending to his "A" motor and what power value to his "C" motor, and give a short explanation why you chose the values that you did.



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## Exam Question: Gear Ratios (LEGO MINDSTORMS)





# Assignment 7: Interactive Video Game

**Project Description:** For this project, you will be building an Interactive Video Game. "*Interactive*" means it needs to leverage sensors and react to the user, "*video*" means you should have some GUI (graphical user interface) for the user, and "*game*" meaning it should be fun (and have other gamelike attributes). Also, think about the "*human factors*" (branch of engineering considering the design of the interface between the user and, in this case, the robot) aspects of what you are designing. How are they holding it, interacting with it, and is the game concept well explained and makes sense to the user?

**Details (Hardware/Software):** You will use the LEGO MINDSTORMS EV3 kit as inputs (and perhaps outputs). Program the software using the LabVIEW Graphical Programming Interface. You can implement your GUI (graphical user interface) on the screen of the EV3 or use a Front Panel Picture Control in LabVIEW. You can work in pairs (2-people) or groups-of-four.

When creating an interactive game using your EV3, if you base it (conceptually) on an existing game (which is fine), try and add a unique twist/element to make it your own. Or you can invent a brand new game! It can be single player or multiplayer. Use your creativity to design the interactions and your building and programming skills to create it with the LEGO MINDSTORMS EV3 and program it in LabVIEW. Be sure to consider the "client" (the player(s) of the game) and how they are interacting and enjoying the experience. And be sure to provide them enough information (e.g. on the screen, or in terms of feedback in other ways; and remember that people don't often read instructions!).