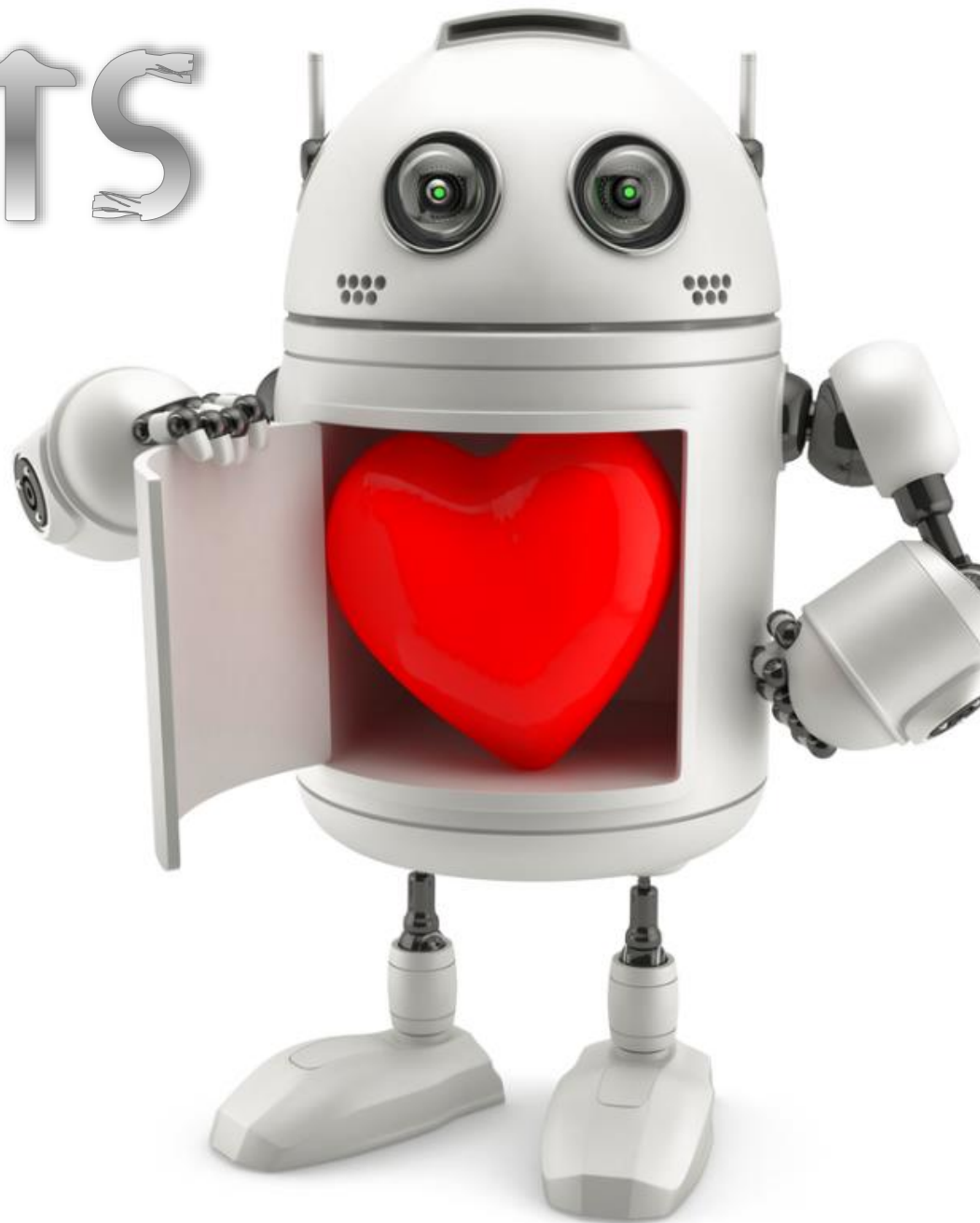
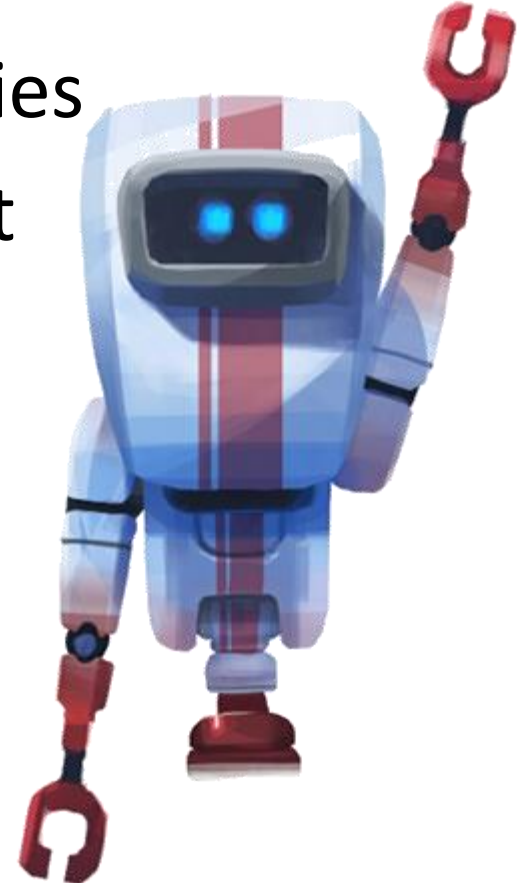


# ROBOTS



# INTRODUCTION

- Access prior knowledge with videos and books
  - Ex. [BURN-E](#) or [Robot](#)
- Discuss range of robot jobs & abilities
- Determine how students feel about Robots, ex. trust vs distrust





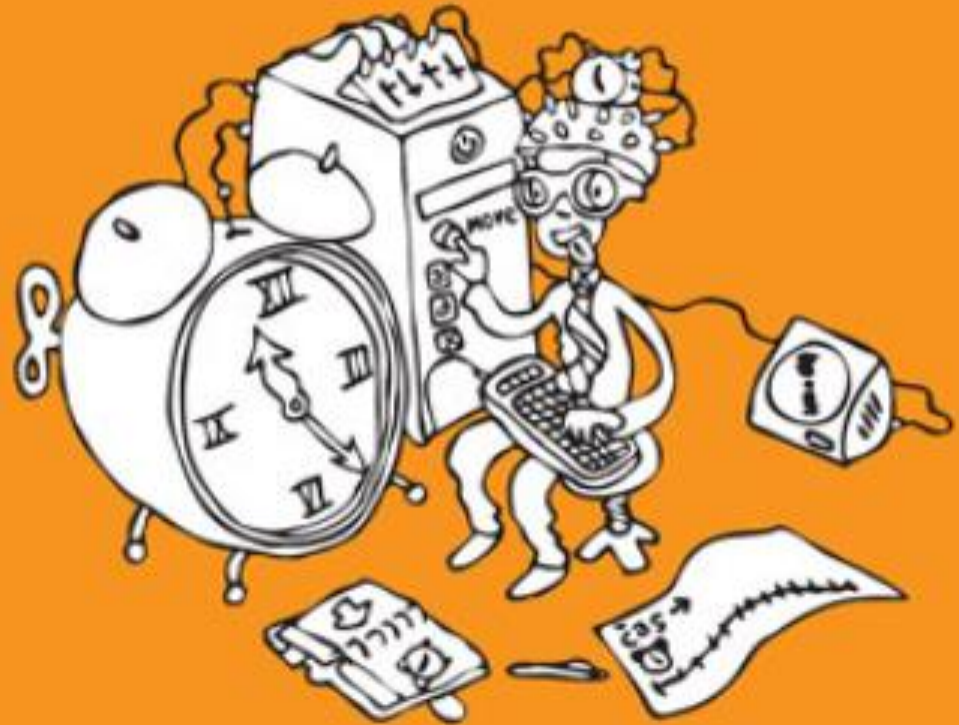
# I, ROBOT

- Discuss robot and humans' ability (or lack of ability) to read each other
- Begin to explore history of robots & where the word itself began

# WHERE IT ALL BEGAN

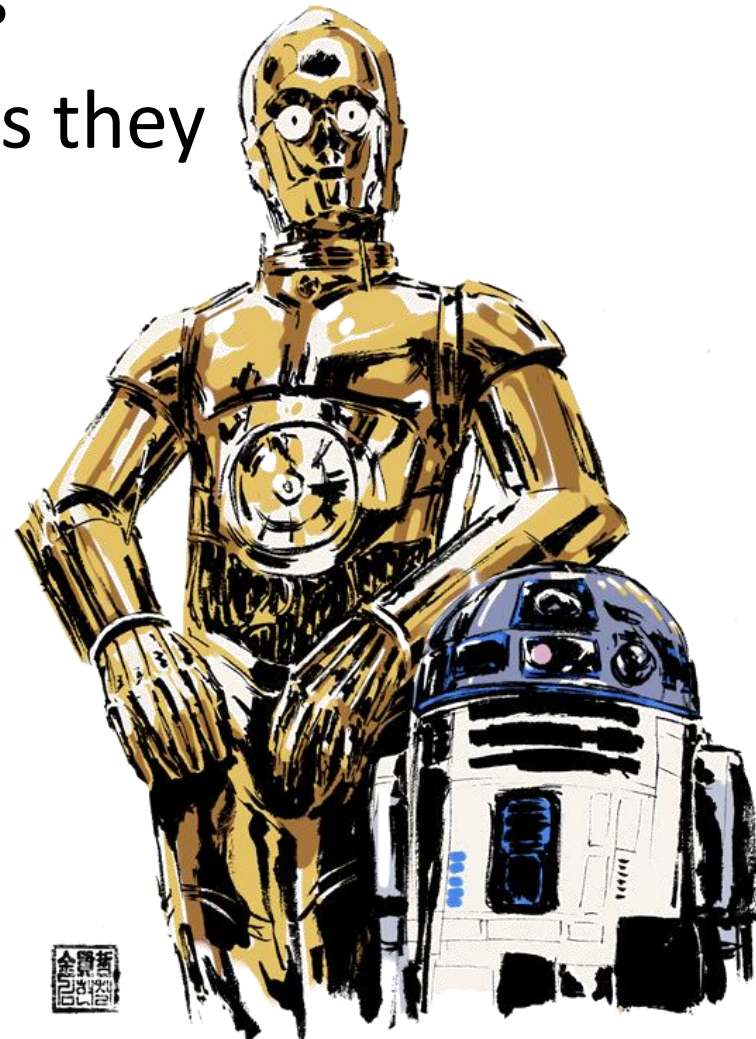
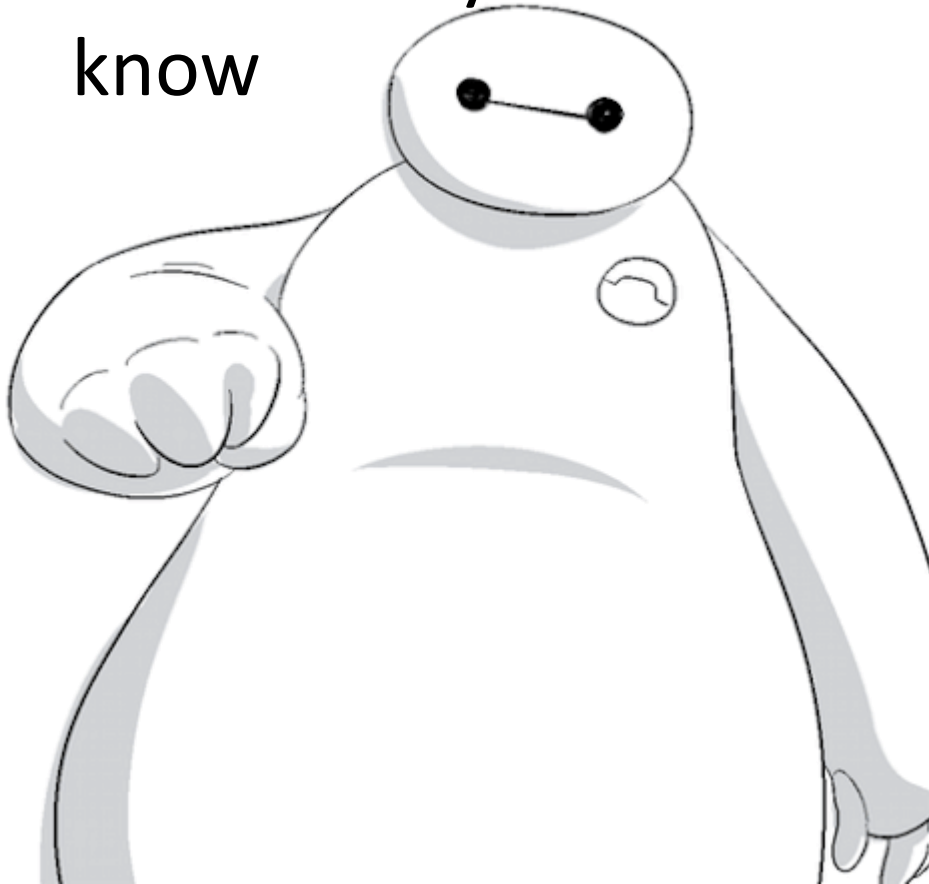
Discover Ancient Egyptian and Greek styles of  
'robots'

TIME TRAVELLER



# ANDROID DREAMS

- Learn about fictional robots
- Students try to think of ones they know



# TALOS

- Learn the myth of Talos, the first robot in history
- Students write & illustrate their own myths.



# TALOS' ISLAND

## TALOS

Finish up with a fun game of Talos' tag to reinforce the concepts learned in the myth.



WALTER PLITT QUINTIN

# WHIM-AGINATION

Students are inspired to come up with a solution to a problem.

A robotic solution.

Then illustrate it through paint, name it, and explain how it solves the problem.





# MR. ROBOT? OH!

- Explore just what makes a robot a robot.
- Determine how many robots students think they deal with daily
- Discuss whether they agree with the Sense, Think, Act theory



**Thinking**



**Sensing**



**Acting**

# ROBOT, OR NOT?

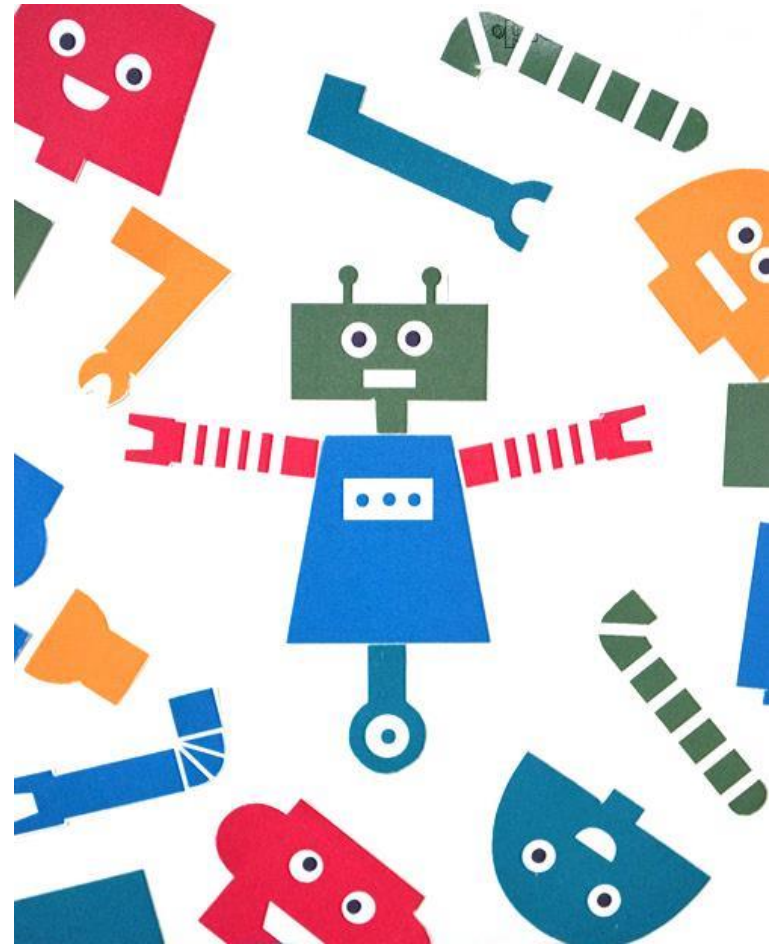
- Go on a fun scavenger hunt (and follow the flow-chart) to determine just how many robots are around!
- Track data and see if everyone agrees whether something is a robot...or not.

ROBOT  
OR NOT

The text 'ROBOT OR NOT' is displayed in a stylized font. The 'O' in 'ROBOT' is replaced by a simple robot face with two dots for eyes and a small antenna. The 'O' in 'NOT' is replaced by a large, thin question mark. The word 'OR' is in a smaller font size. The word 'NOT' is in a larger font size and colored red.

# ASSEMBLE!: ROBOT PROBLEM SOLVERS

Student teams race to create their own robots out of parts in this fun 'hangman' style math skills practice game.



# BETWEEN THE GREEKS AND THE GEEKS: AUTOMATONS

- Explore the evolution of robots from ancient Greek inventions to automatons in the Middle Ages.

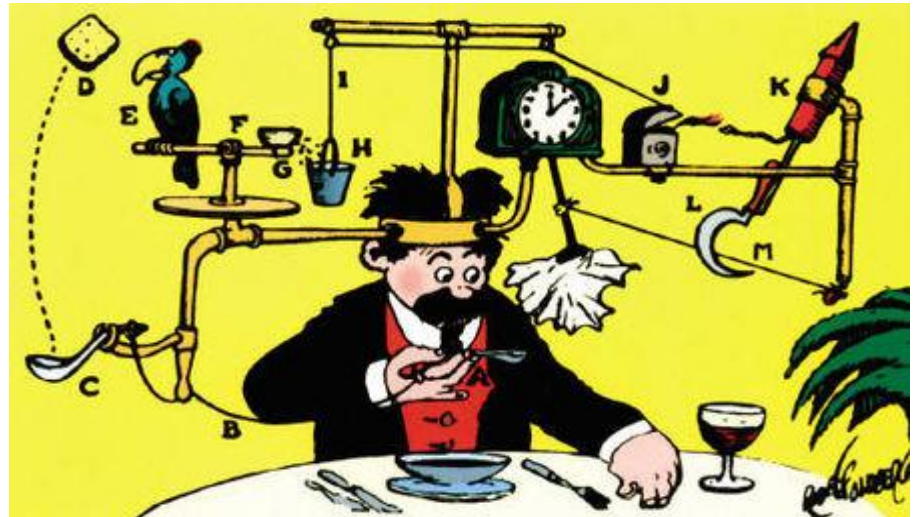
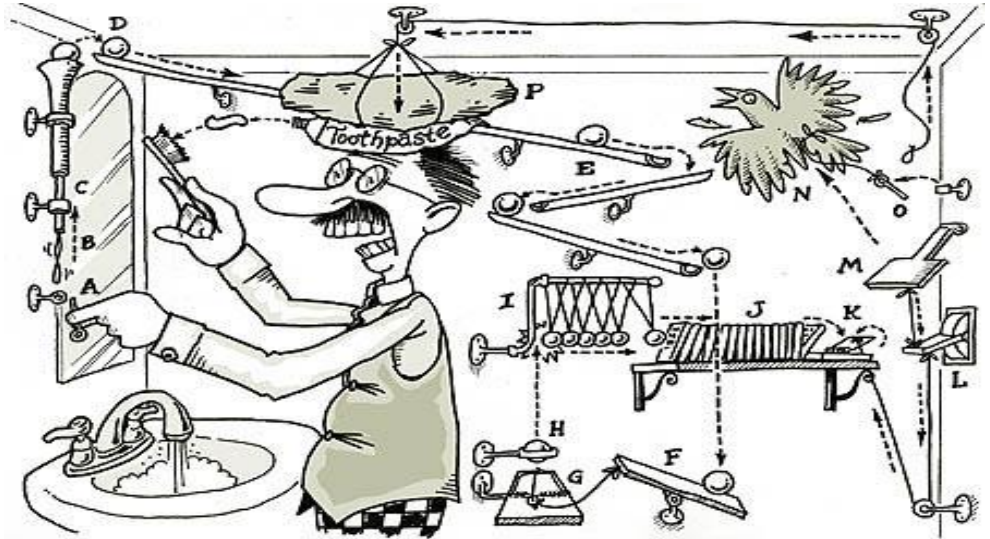
Watch [Pipe Dreams](#): a modern form of 'automaton.' [*Voted one of the 50 best 3D animation projects ever. Most of the other winners were big-budget movies (The Matrix, Toy Story, Star Wars) and a few video/computer games (Doom, Tomb Raider, Myst).*]

And see how it was made into [a real world version](#) by intel.



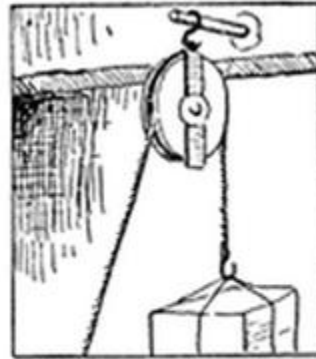
# CHAIN REACTION: RUBE GOLDBERG PROJECT—CREATIVITY IN MOTION

- Learn about who Rube Goldberg was
- Explore his cartoons and ideas



# SIX MACHINES TO DO IT ALL, SIX MACHINES TO BIND THEM

Explore the six simple machines, how they work, and make sample models of them.



Pulley



Wedge



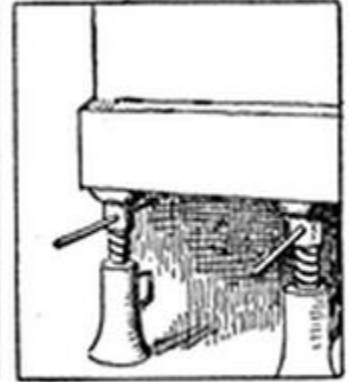
Wheel and axle



Inclined plane



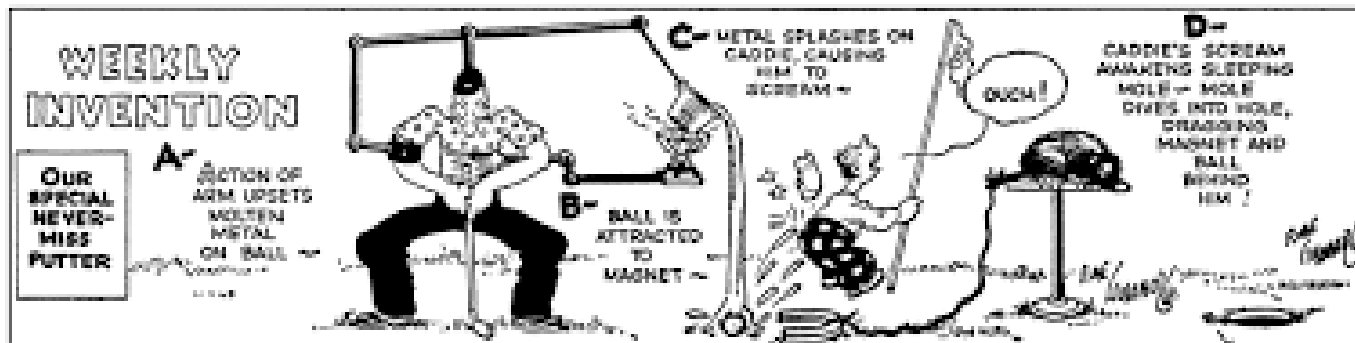
Lever



Screw

# THAT'S SO RUBE OF YOU!

- Now that we know about simple machines, let's combine a few into something new, a chain reaction or complex machine (several simple machines working together)!
- Get inspiration from videos and Rube Goldberg's illustrations



# SAMPLE CHAIN REACTION MACHINE VIDEOS

Get students' creative juices flowing by having them watch clips from the following and seeing how and what others used to make their Rube Goldberg Inspired Machines:

Rube Goldberg TV <https://www.youtube.com/user/RubeGoldbergTV>

Sesame Street: Rube Goldberg Machines (which also does an excellent job of reinforcing concepts about simple machines and how they can all work together.)

<https://www.youtube.com/watch?v=pMpmit5YMcg>

75 Rube Goldberg Ideas & Inventions

<https://www.youtube.com/watch?v=6FzUx2EFk8s> [This video is split up into 3 sets of 25 ideas by 3 different youtubers. These short screen linked clips can help you with school projects or making your own chain reaction. This video is intended to help individuals obtain ideas and/or inspiration for building their own Rube Goldberg Machine. It is not meant to look like one actual machine. It is simply screenlinked to give more flow and continuity to the video.]

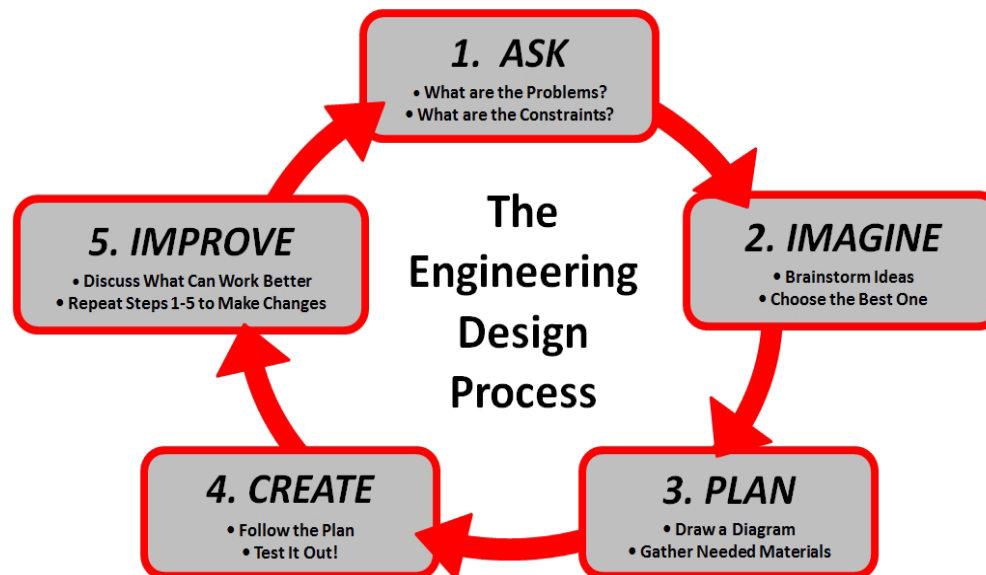
Find videos and images at <http://rubegoldberg.com/>, such as A-Trak & Tommy Trash - Tuna Melt [also at <https://vimeo.com/62846755> ] and [Tinkering with Monks](#) [Tinkering with monks: Chain Reaction Contraption from [The Tinkering Studio](#) on Vimeo.

[Pythagoras Switch](#) - Japanese Rube Goldberg machine



# THAT'S SO RUBE OF YOU!

And then students work (individually or in teams) to follow the engineering design process create their own Rube Goldberg style machine to solve a specified problem.

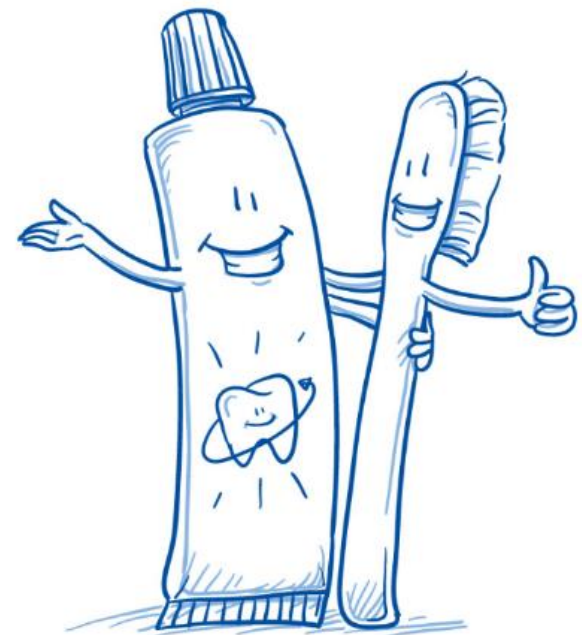


# THE CHALLENGE!

It's time for a challenge, it's time to start because robotics is both a science and art. And here is the challenge, here's what to do...put your notions in motion...it's all up to you!

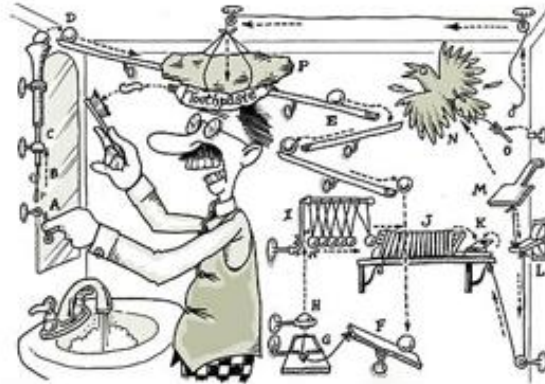
Can you?

**PUT TOOTHPASTE  
ON A TOOTHBRUSH**



# THAT'S SO RUBE OF YOU

## A PROBLEM SOLVING CONTEST!



In honor of the inaugural Rube Goldberg contest in 1987 we've got a simple question.

### How would you put toothpaste on a toothbrush?

Put your ideas in action and come up with a creative and crazy chain reaction! All entries must be completed by April 30<sup>th</sup>!

#### Entries will be judged on:

- Creativity
- Ingenuity
- Use of ALL simple machines [The [more simple](#) machines involved the higher the point score will be for judging]
- Design Quality

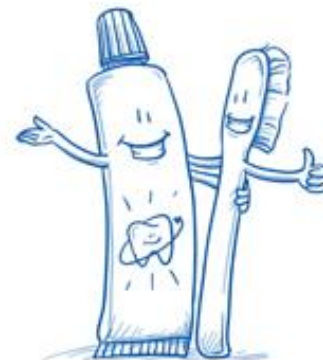
#### Prizes:

Grand Prize Overall: \$150 split between the winning team's members

Runner Up: \$100 split between the winning team's members

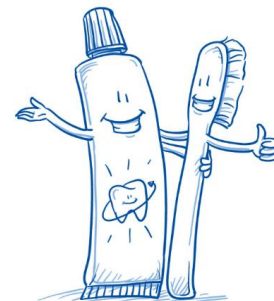
Third place: \$50 split between the winning team's members

**Note:** Individuals can submit their own entries



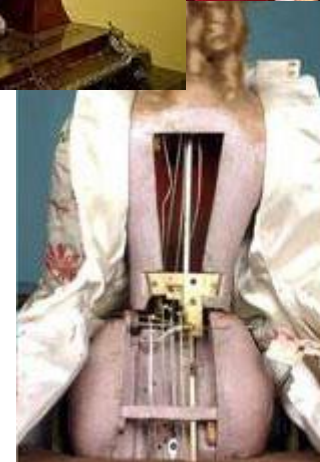
# WHAT OUR KIDS CREATED!

<https://youtu.be/NyZ-fcZURtw>



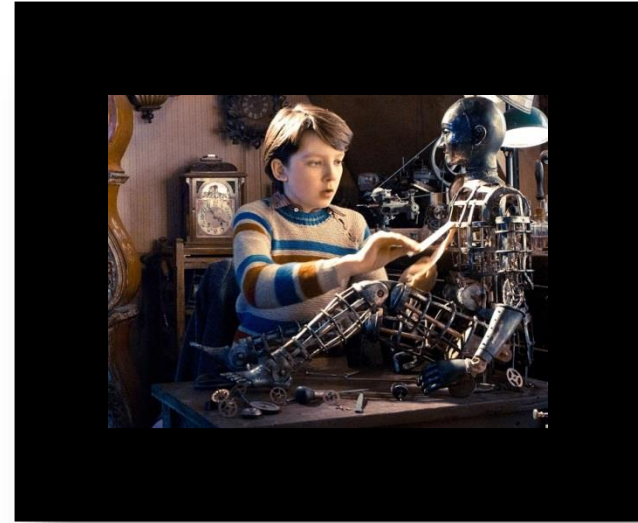
# KEEPS ON TICKING

Explore the history of automatons.



# THE ILLUSION OF LIFE

Discuss and discover how real life automatons inspired fictional stories and movies, and fictional stories and movies inspired change in the real world.



Charles F. Penniman, a retired museum employee, gently tended to the automaton.

# REAL WORLD AUTOMATA ARTISTS

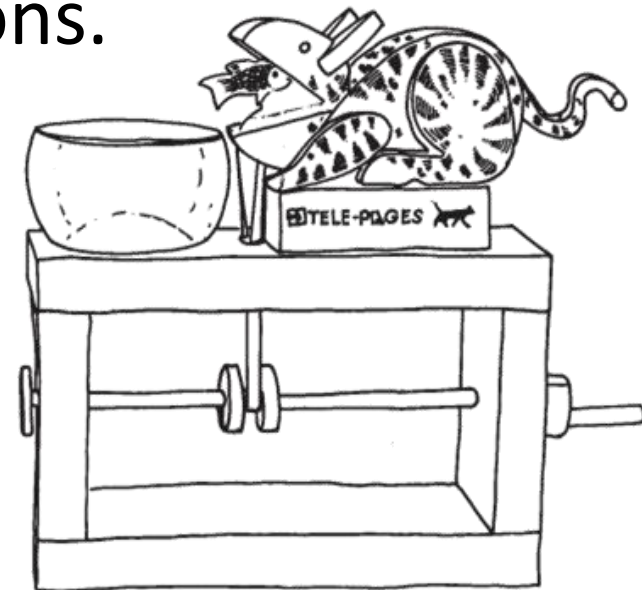
To get, and give students a view behind the scenes of creating automata, have them watch: Making the Don Quixote Automaton for the Cabaret Musical Theater with Keith Newstead -- Smart TV at

<https://www.youtube.com/watch?v=mnb9vPOf-0k>

Real World Artist: Peter Markey is an artist who often makes whimsical automata out of wood, utilizing cams and cam followers as his main source of movement. [www.focsle.org.uk/first/markey](http://www.focsle.org.uk/first/markey) & [www.cabaret.co.uk/artists/markey/htm](http://www.cabaret.co.uk/artists/markey/htm)

# CRAFTING AUTOMATA

- Automata, or kinetic sculpture, is quite simply art and science that moves.
- Students use the engineering design process and a new understanding of cams to design and create their own automatons.



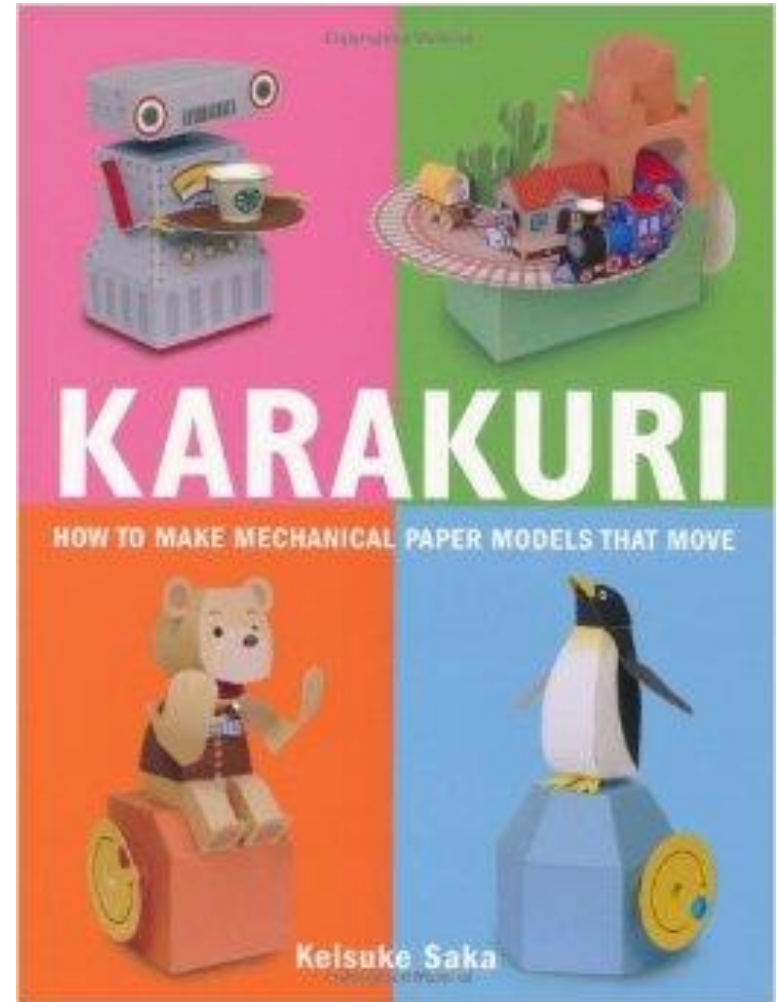


THERE ARE MANY AVAILABLE  
RESOURCES!



# KARAKURI: HOW TO MAKE MECHANICAL PAPER MODELS THAT MOVE

This book is a resource we found very useful for all grade levels!





Hundreds of printable paper projects to make from beginner to advanced, also includes essential mechanisms!

Note: Site includes step-by-step instructions & videos

You can also order kits from their sister site:

<https://www.flying-pig.co.uk/>



# DEVELOPMENT OF A.I.

- Robots can do so much more than simply entertain or do boring jobs!
- People and machines have a few things in common.
  - Feedback
  - Communication
  - Control to make decisions and take action.



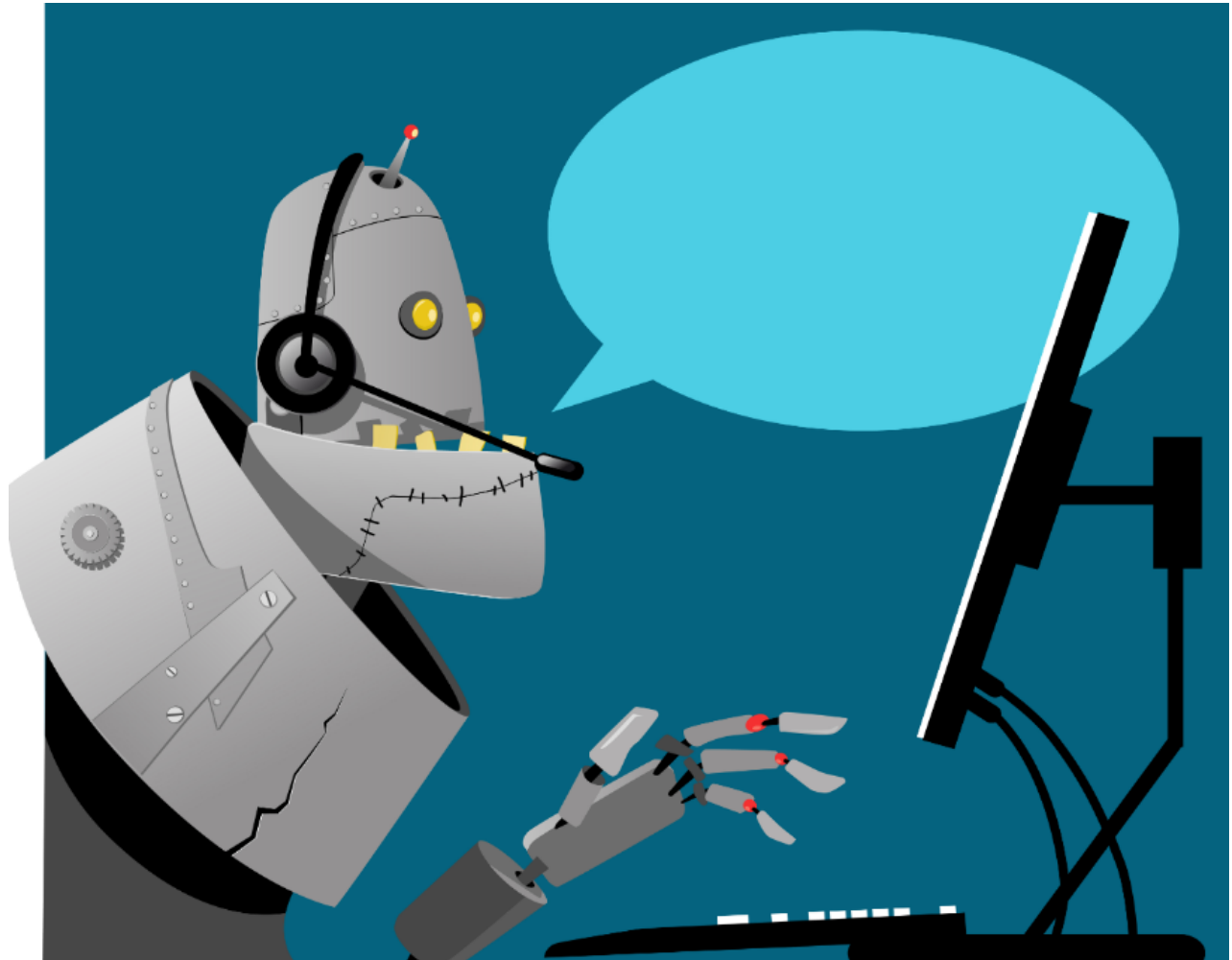
# MAN OR MACHINE?



In 1950, computer scientist Alan Turing came up with what he called, not surprisingly, the Turing test to see whether a machine was able to think like a human. It was a series of questions to test whether a computer can think like a human being.

# WHAT WAS A PASSING GRADE?

The computer had to fool people into thinking they were talking to a real live [human] person



# ONE RINGY DINGY! PRETENDING TO BE HUMAN?

Robot or human – who are you speaking to on that telemarketing call?

Let's listen to the audio recordings...Do You Think Samantha is Real? <http://newsfeed.time.com/2013/12/10/meet-therobot-telemarketer-who-denies-shes-a-robot/>

Option: Have students watch a news report about Samantha: <http://newday.blogs.cnn.com/2013/12/17/is-thatperson-youre-talking-to-a-human-or-a-robot/>

Watch: Artificially Intelligent Phone Operator. Meet Amelia.: <http://motherboard.vice.com/blog/theartificially-intelligent-call-center-operator>

And just for fun, and comparison. Lily Tomlin as Ernestine the Telephone Operator, "One Ringy 2 Dingy!" Have I reached the party to whom I am speaking?" Good Afternoon Mr. Veedul!

<https://www.youtube.com/watch?v=SvesMBkduQo>

We Don't Care:

[https://www.youtube.com/watch?v=CHgUN\\_95Uaw](https://www.youtube.com/watch?v=CHgUN_95Uaw)



# BUILDING TRUST

Remind students how we talked about how nervous humans can be around robots (and how humans make robots nervous.)

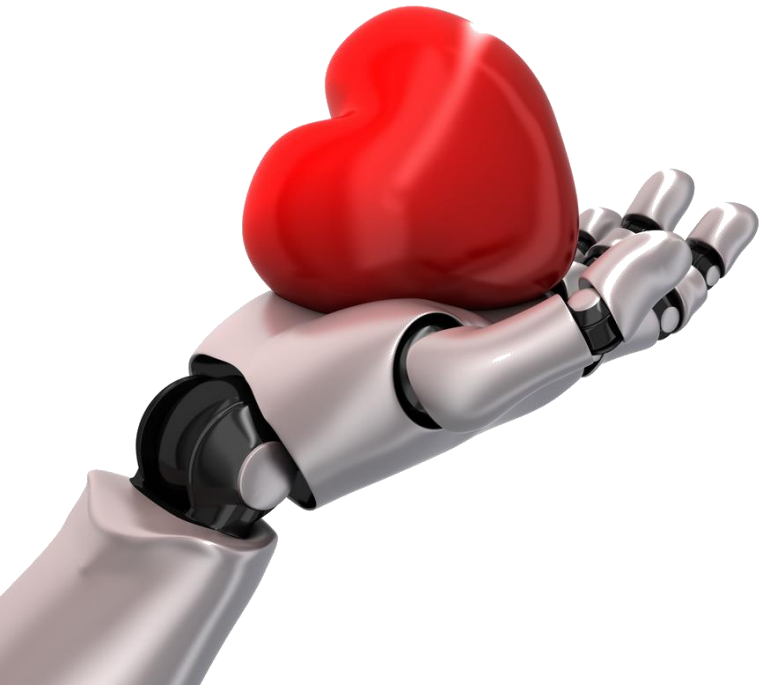
What's a way to convince humans that robots are safe? Roboticists have learned to create the illusion of trust.





# RELYING ON ILLUSION

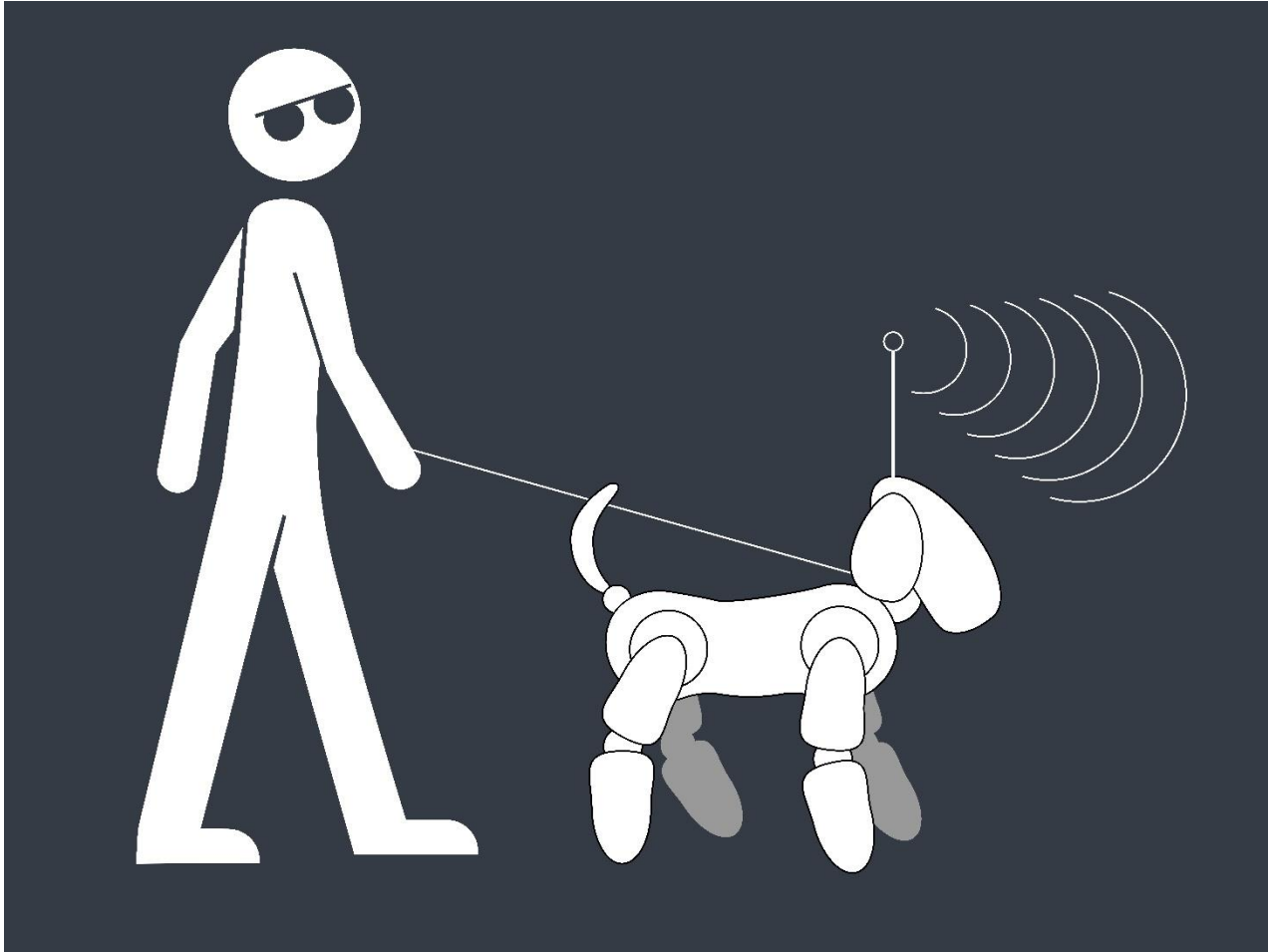
Explore with students the question, “If we don’t yet have the technological solutions to create computers indistinguishable from human life, does an illusion work as well?”





<https://www.youtube.com/watch?v=00ko3b6xcC8>

# FEEDBACK



In a fun 'blind trust' activity students work with a partner and use their body to illustrate the concept of feedback.



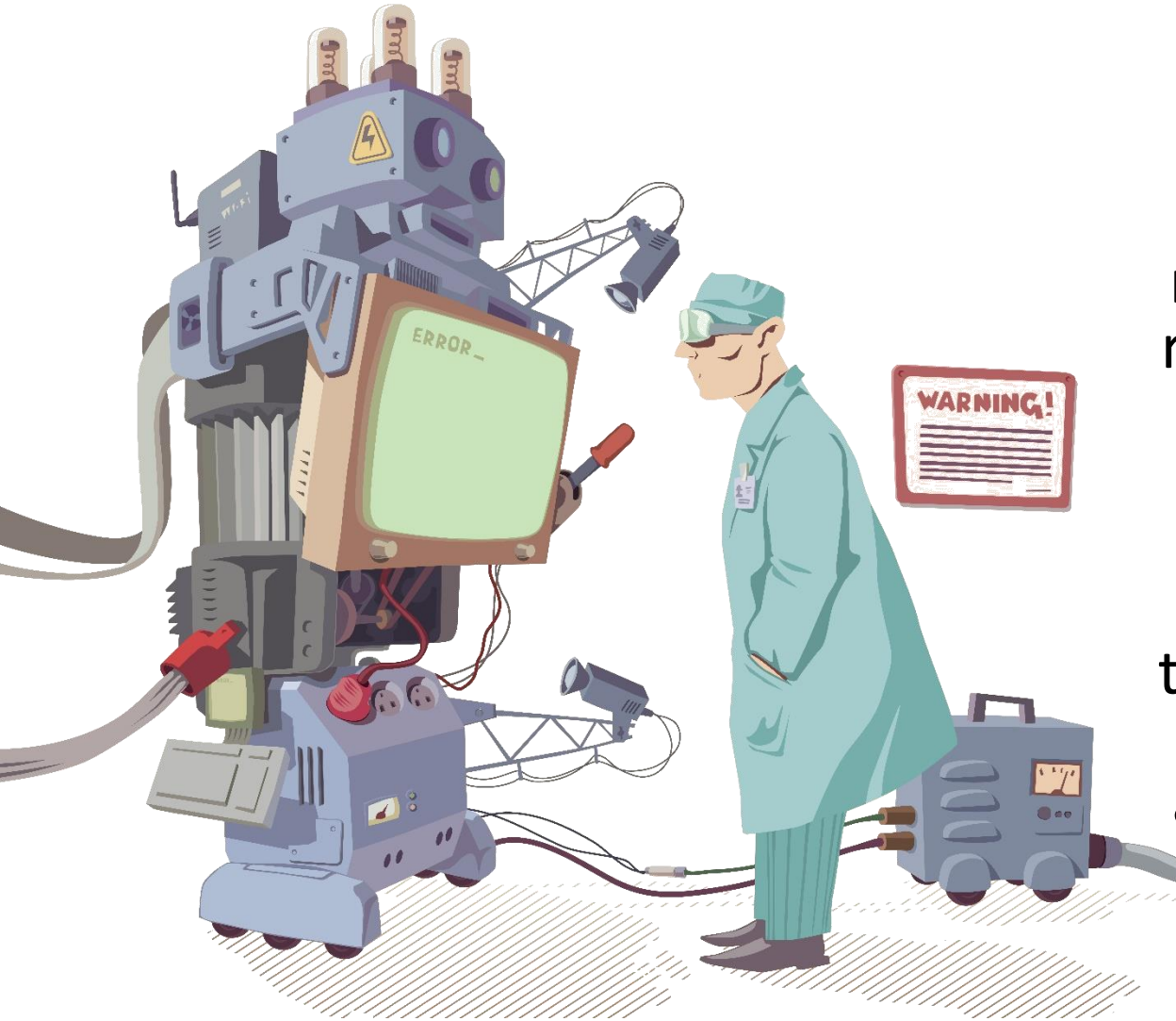
Your body uses the  
*feedback* principle to  
help you survive.  
How?

# CATCHING THE WIND

In order to better understand the way Edmund Lee's principal of "***feedback***" works students build their own self-correcting windmill.



# BIOLOGICAL SYSTEMS VS ARTIFICIAL INTELLIGENCE (A.I.)



In the 1950's, early robot scientists saw a way to teach their mechanical devices to react to feedback. This ability distinguishes real robots from automatons. Explore with students how there are two different ways roboticists approach this difficult task.

# WHICH IS BETTER?

- There is no right answer to the *Biological Systems* vs. *Artificial Intelligence* debate. Both approaches have advantages and disadvantages. It seems that modern robot scientists combine aspects of both approaches to dream of, design, and then build robots.
- Perhaps both approaches are necessary in order to unlock the complicated mystery of human thought.

# THE CLAW! IT MOVES!

Working robots have come a long way from the first assembly-line operators—robots that could perform tasks such as welding and painting with a movable arm and a grasping hand, but were otherwise fixed in place on a factory floor.

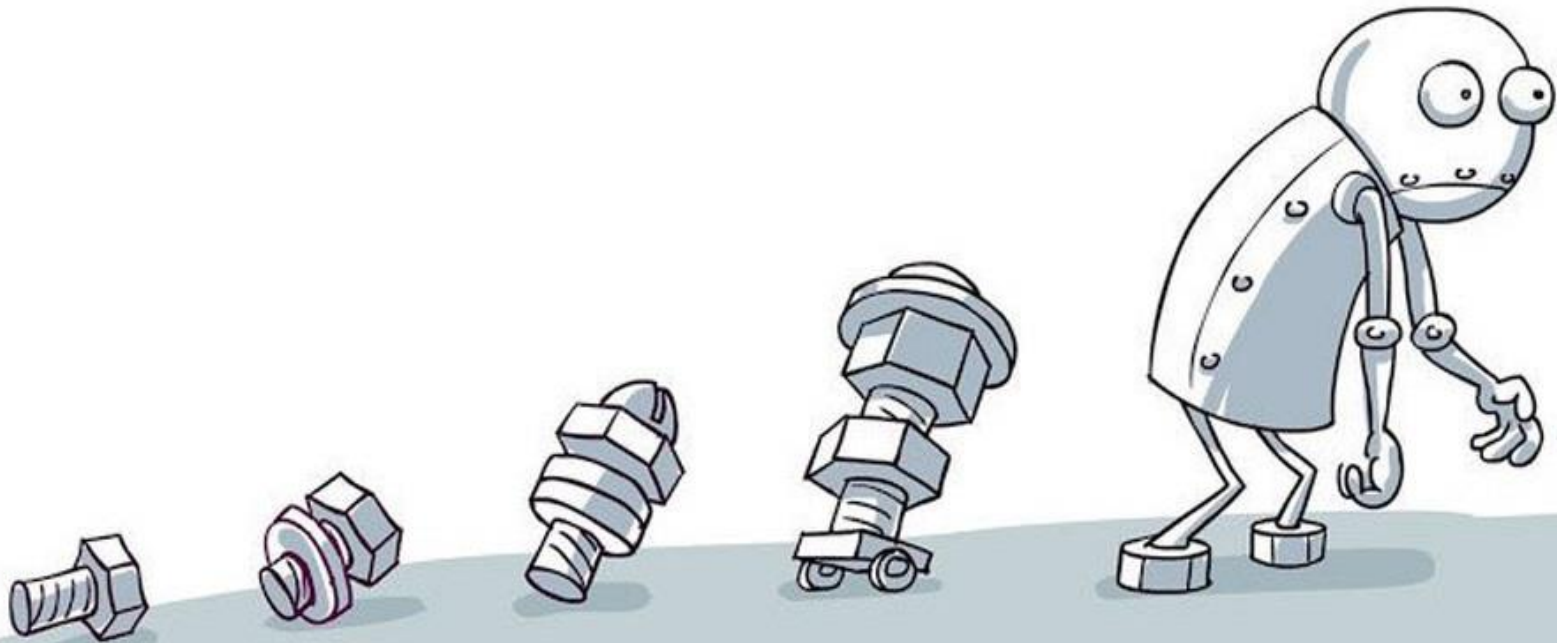
Students get to build their own moving claw!







# ROBOTIC EVOLUTION?



Книжки и новости

WE'VE GOT TO HAND IT TO ROBOTS!



# THE QUEST TO MAKE ROBOTS EVER MORE HUMAN!

In a marriage of human form and modern technology have students build and modify their own animatronic hand!



- Cats in shark costumes [riding robots](#)?! Exactly
- Discuss just how far robots have come and how far they've spread...from cleaning your carpet to hanging on walls, and that dress in your closet that's just down the hall...



# AUTOMATA ORCHESTRA?

Based on a childhood fascination with his grandfather's player piano, 19 time Grammy Award winner Pat Metheny, commissioned and built The Orchestrion, a mechanically controlled mini-orchestra capable of responding to his touch on the guitar. Watch the trailer at <http://www.theorchestrionproject.com/>

# ARTISTS IN THE SHAKING

Then it's time to get to making an artsy little robot that's all about the shaking.



# SKITTER SKATTER ART

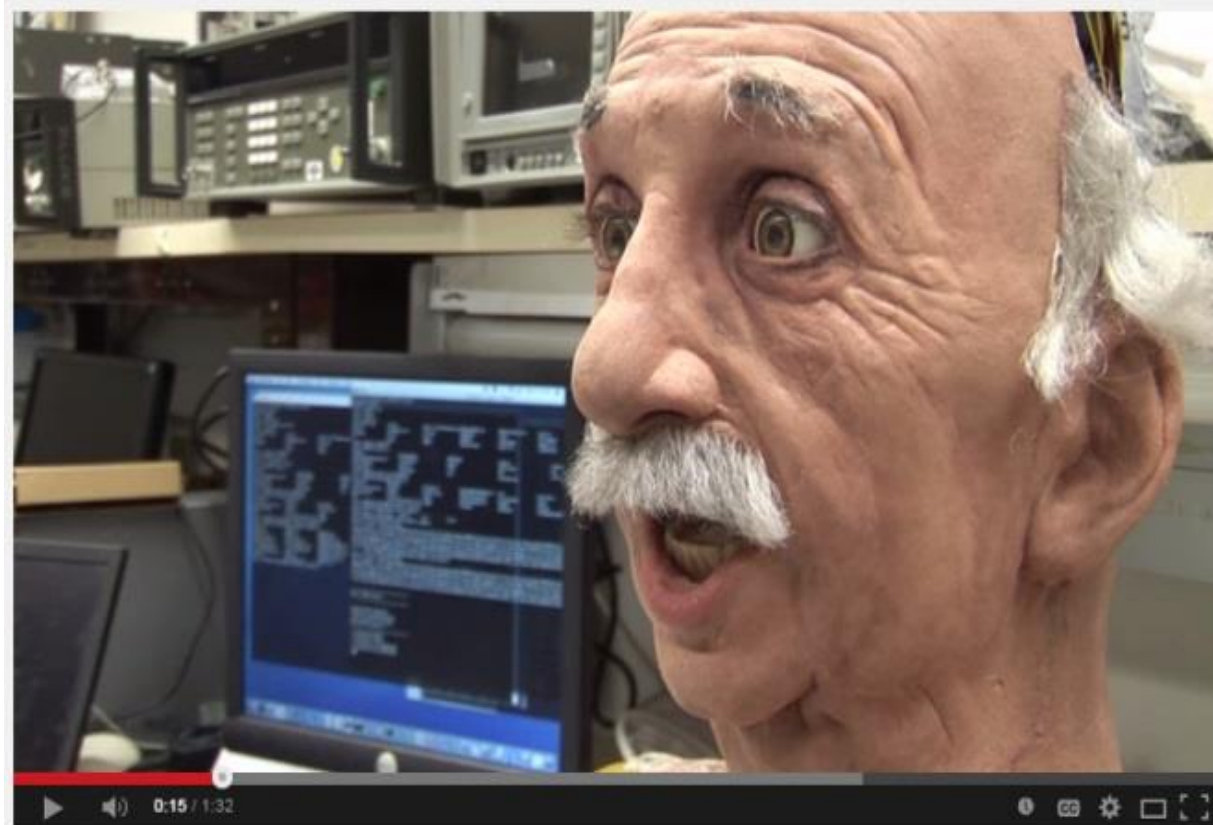
And with remaining time a little art would be sublime! And if it's scatter brained...well, the artbot can't be blamed!





# ROBOT SKIN

While robots have moved up, they've run into a valley, where they aren't quite real enough (you don't want to see that in an alley!) So it's time to figure out just what's up with robot skin and [Albert Einstein](#) is always a great place to begin.



Einstein Robot - UCSD Machine Perception Laboratory

# FALLING INTO THE UNCANNY VALLEY?



For example, which of the images below seems off, or “uncanny”? The animated and slightly cartoonish Anna from Frozen, the realistic girl from Polar Express, or the hyper-realistic painting (yes, painting!) of Morgan Freeman?



# RUBBERY FRUBBERY ROBOT SKIN



- What's tough but soft, sensitive but strong?
- Able to withstand the hardest of knocks, but also able to sense the faintest of touches?
- Why, robot skin of course!
- And now it's time to make our own. Some silver skin that's all home grown.

# HOW TO TRAIN YOUR ROBOT

- It's time to learn to speak 'Robot,' a fun new lingo that says a lot. (It's nice to be a polyglot!)
- And find out what happens when your 'robot' obeys (literally) every single thing you say!



# WE LIKE TO MOVE IT MOVE IT

- Just like humans and other living things, robots need energy to move and “think.” So where does it come from?
- It’s time to shed some light on just what makes robots tick and see if we can figure out a place where that light will stick.
- Connect some circuits and throw the light...turn the dark into a starry night.





# THROWIES!

LED throwies are cheery glow-dots (a.k.a. magnetic, closed circuits that stay lit for weeks!) students can make in seconds from simple components and they stick to any ferromagnetic surface. But that's just the beginning.

There's a very helpful and informative video that takes you step by step through the throwie construction process here:

<http://makezine.com/projects/extreme-led-throwies/>

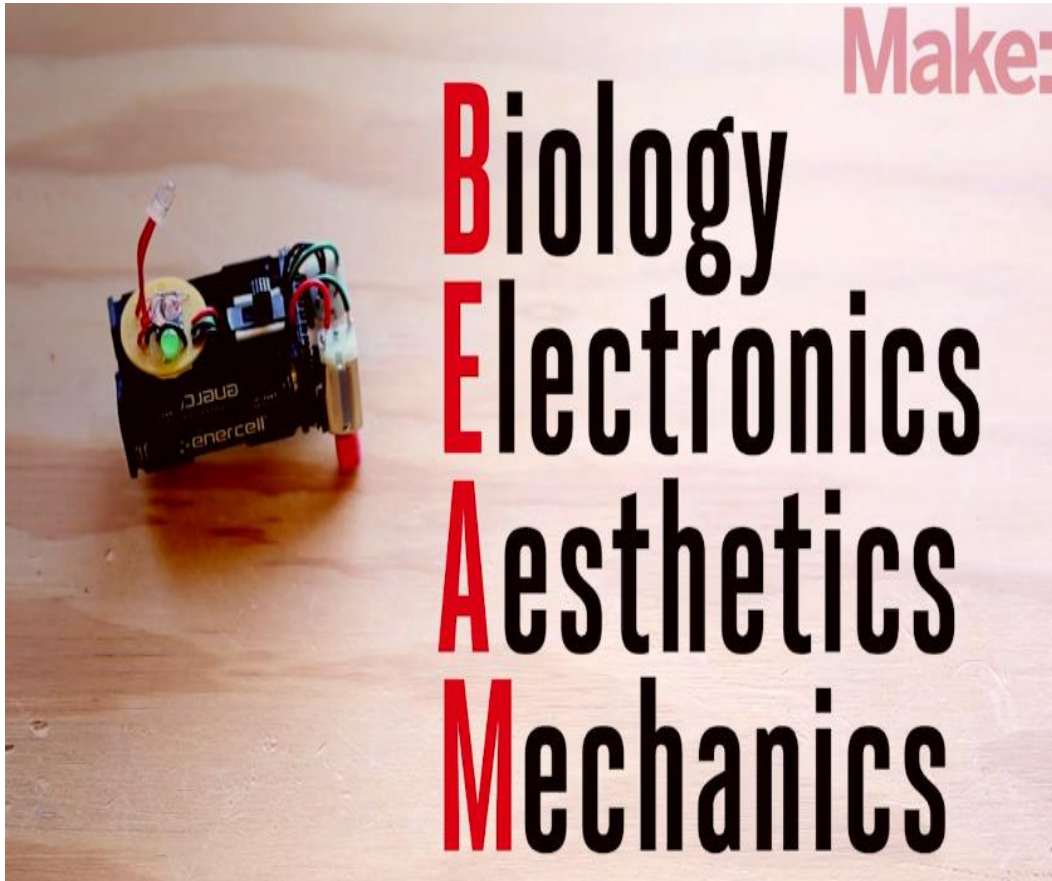


# Energized by the Sun

Any way you trace it back, the sun has always got your back!



# BEAMing You Up!



Did you know the sun can give some good vibrations and that Scotty isn't the only one that can BEAM you up! Find out how brainless robots can act pretty smart, and then we'll get our very own swarm to start.



*Via: i09.com*

See an interesting short explanatory video of the tendency and project: <https://www.youtube.com/watch?v=0uqsRGFLM20>  
View fascinating images and some gorgeous footage of birds exhibiting swarming behavior here: <http://io9.com/you-wont-believe-the-patterns-created-by-flocks-of-bir-1469575403>

# Rock, Paper, Scissors,...Swarm!

And with time that  
remains...play a game of  
Rock, Paper, Scissors,  
Swarm that will have kids  
giggling up a storm!



# Making the Bots

It's time make some bots! Lots and lots and lots and lots, swarming flocks of vibrobots!



# BEAM-Type Solar Wobblebot

And then it's time to get the sun in on the wibbling wobbling fun!



# ANIMARI: A NEW FORM OF LIFE?

- And to finish it up, we look where we going...which really we have no way of knowing, but it's fun to discover and ponder and see if we can guess what's going to be...
- And one of the guys who thinks he might know is a man named Theo, who makes herds that grow.
- A man who takes 'nature' and makes something new.
- And here is the question, can you do it too?

Watch the incredible video Theo Jansen's Strandbeests - Wallace & Gromit's World of Invention Episode 1 Preview - BBC One here: <https://www.youtube.com/watch?v=HSKyHmjyrkA>





# REPLACING THE WHEEL

"The walls between art and engineering exist only in our minds."

–Theo Jansen

- 5,000 years after the creation of the wheel he has created 'a new invention...better than the wheel.' Watch his TED talk here.  
[http://www.ted.com/talks/theo\\_jansen\\_creates\\_new\\_creatures?language=en](http://www.ted.com/talks/theo_jansen_creates_new_creatures?language=en)
- Explore more (shockingly lifelike) video, photos, and history at <http://www.strandbeest.com/> and <https://www.youtube.com/watch?v=MYGJ9jrbpvg>

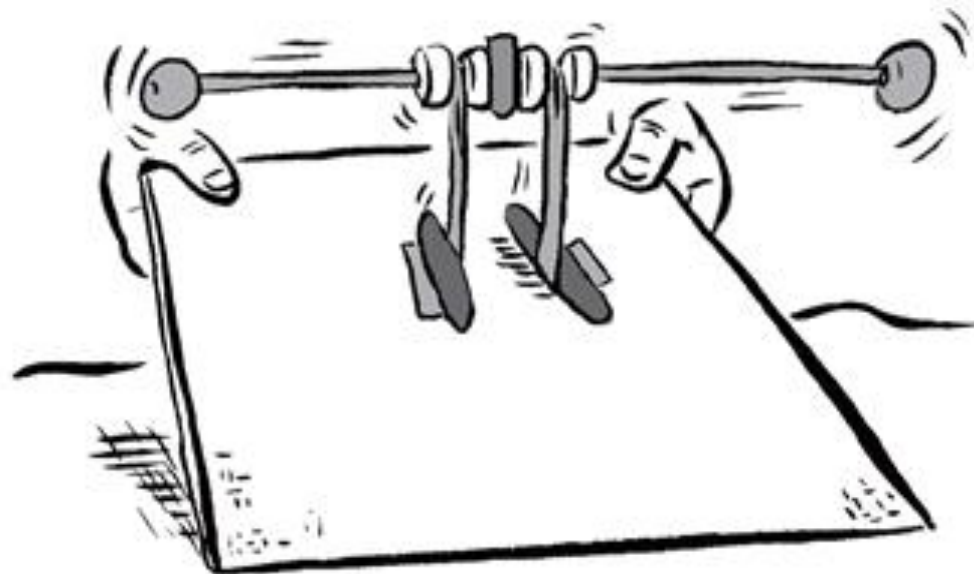
# KINETIC CREATURES

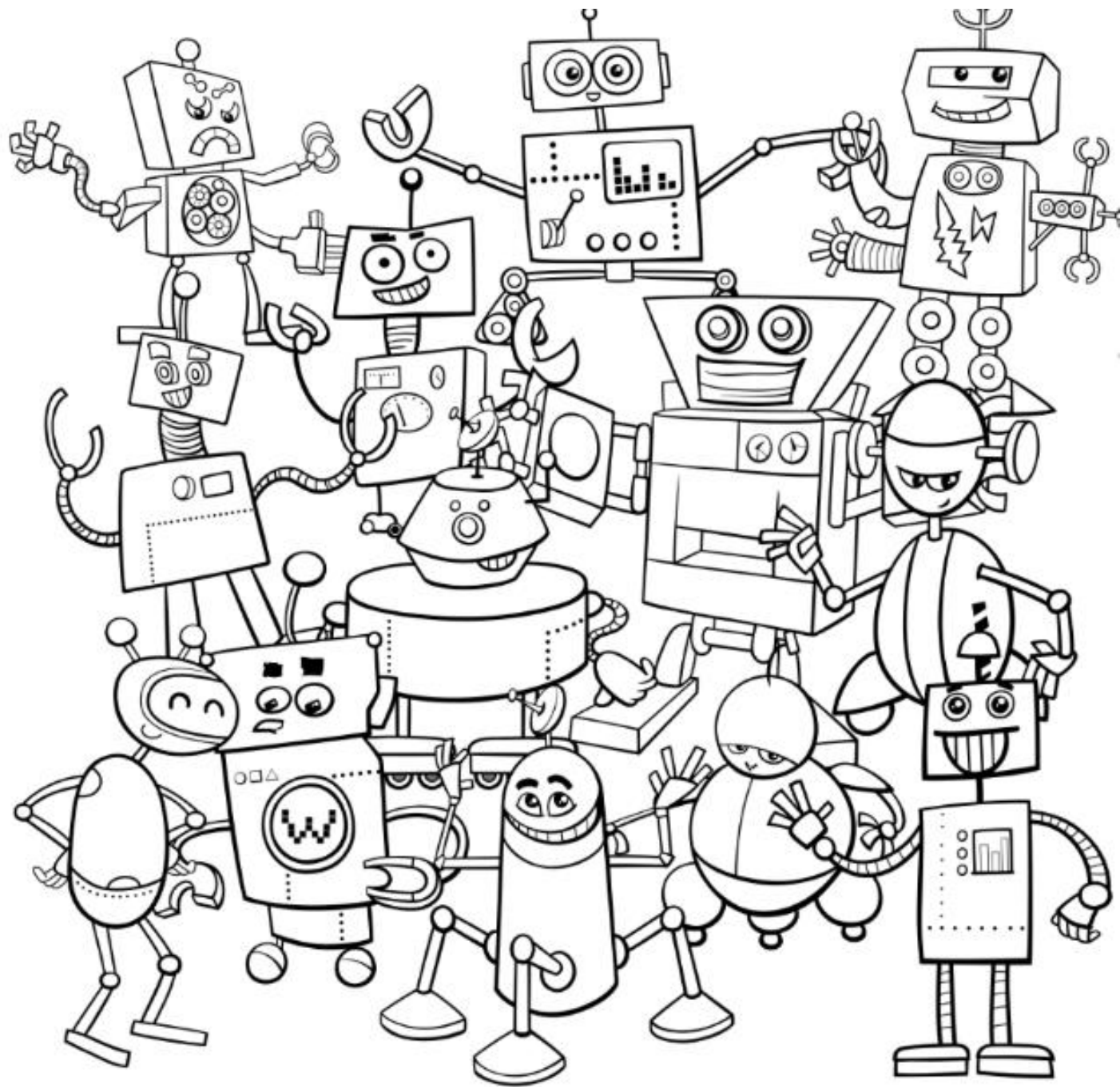
- Others have followed Theo, they think he's inspired, and built themselves creatures, of paper and wire.
- Then put them in motion like those that wander the edge of the ocean.



# PASSIVE DYNAMIC MINI WALKER

- We'll take the laws of Newton and give them a twist and hope that gravity will give an assist...and now that's enough of us talking.
- It's time for some robots to get started [walking](#).





# TODAY'S AGENDA

- 8:00-12:00
  - Introductions of attendees
  - Introduction of curriculum structure & basis in standards
  - Make samples of simple machines
  - Build chain reactions through activities with Popsicle sticks, Mousetrap, and with Keva Contraptions.
  - Begin work on construction of automata
- 12:00-1:00-Lunch
- 1:00-3:15
  - Continue discussion of curriculum
  - Continue to build & test automata
  - Demonstration on how to make 'robot skin'
  - Make animatronic hand
  - Construct 'throwies,' artbots & vibrobots
  - Test variety of robot kits
  - Question and Answer Session