SMART LIGHTING ENGINEERING RESEARCH CENTER

Lighting Innovation for a Smarter Tomorrow

Energy, Power and People
Connections to the NYS Capital Region

Kenneth A. Connor

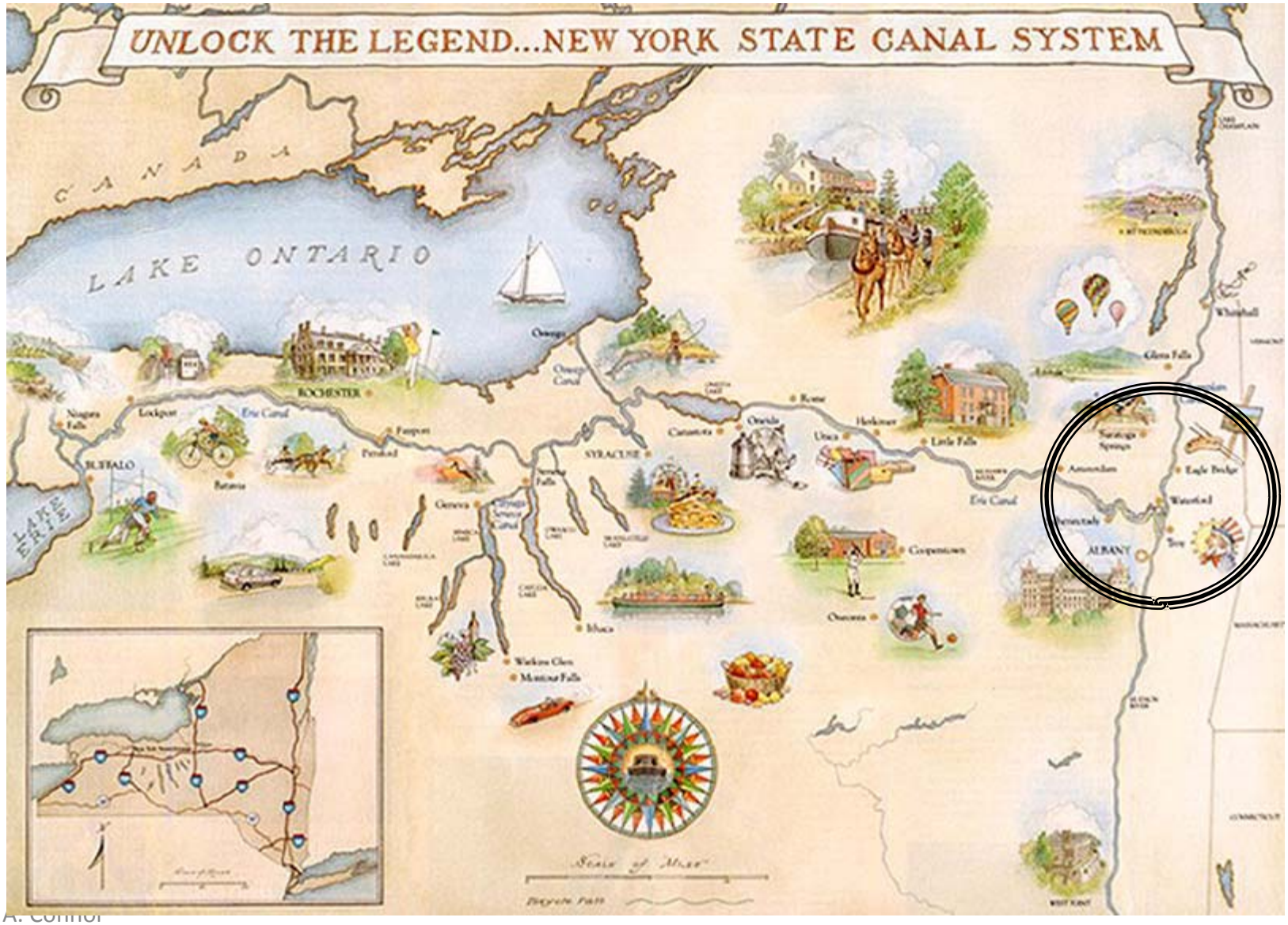
Education Director

Smart Lighting ERC

Goals

- Introduction and Overview
- Why are We Here?
- Three Giants of Technology
- Demos

Why Are We Here?



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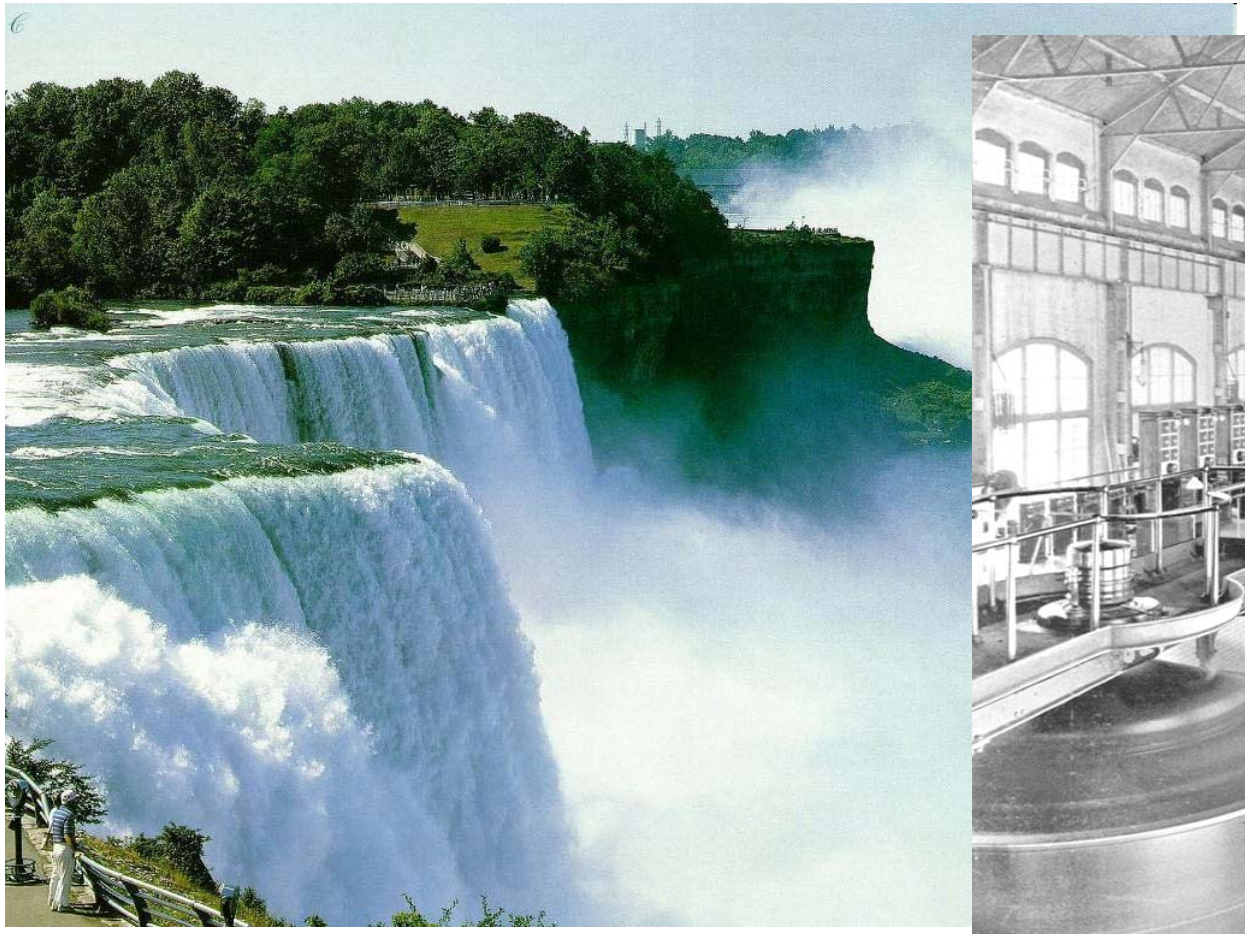
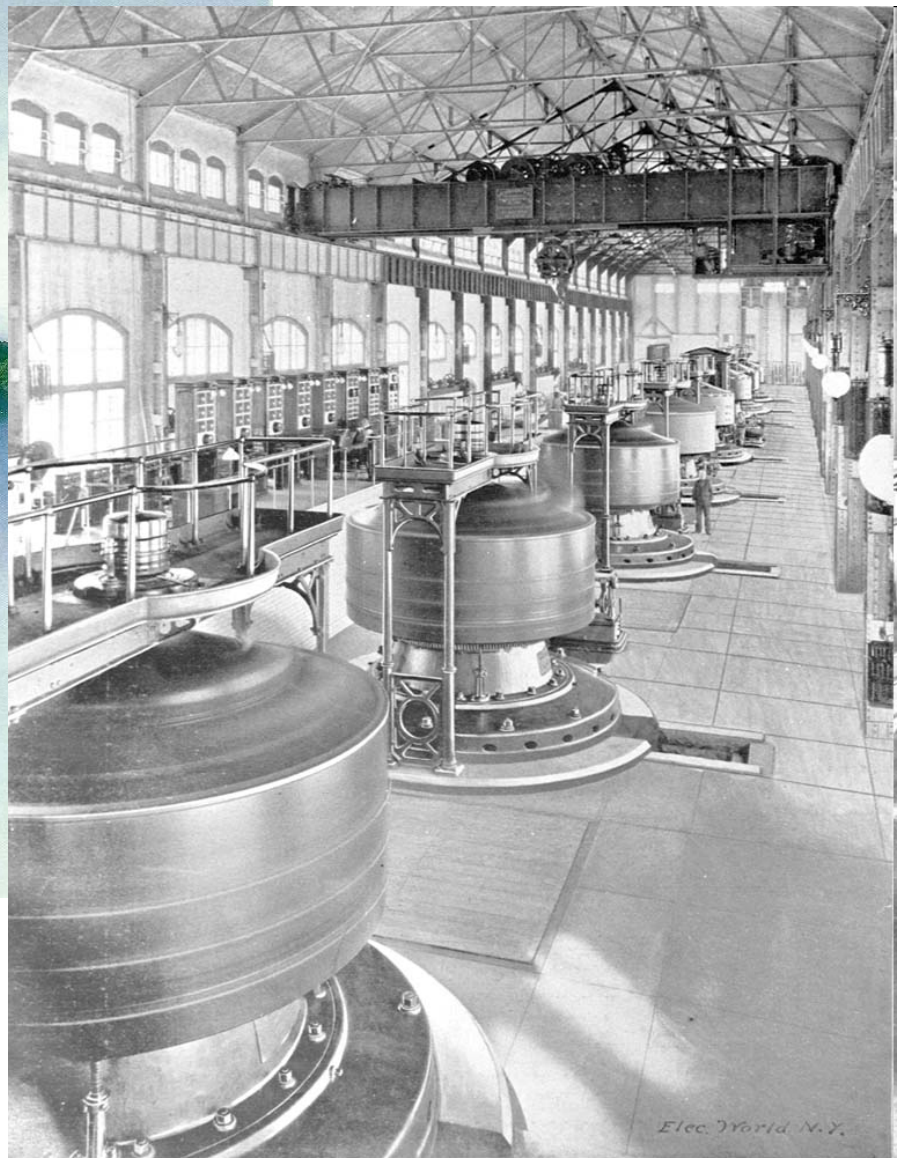


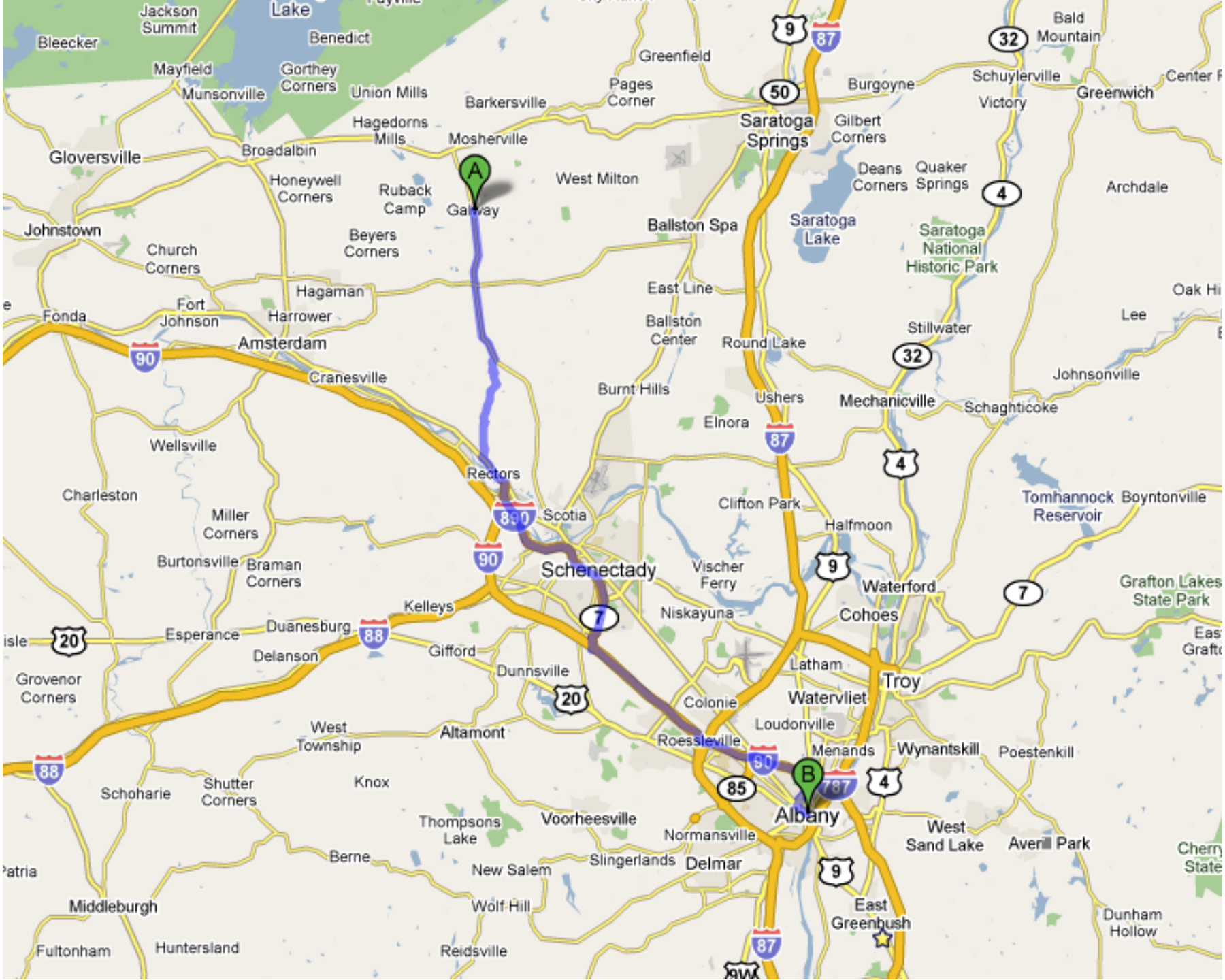


Three Giants of Technology

- Joseph Henry & the Dawn of the Information Age
  - A bit of his story
  - What did he do?
- Alan Dumont & Measurement
  - A bit of his story
  - What did he do?
- Ted Hoff & Making Everything Smart
  - A bit of his story
  - What did he do?
- Addendum

Joseph Henry

- http://maps.google.com look up Albany, NY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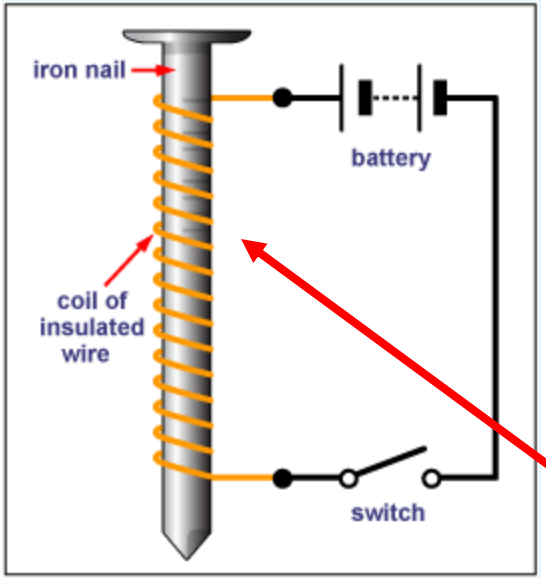
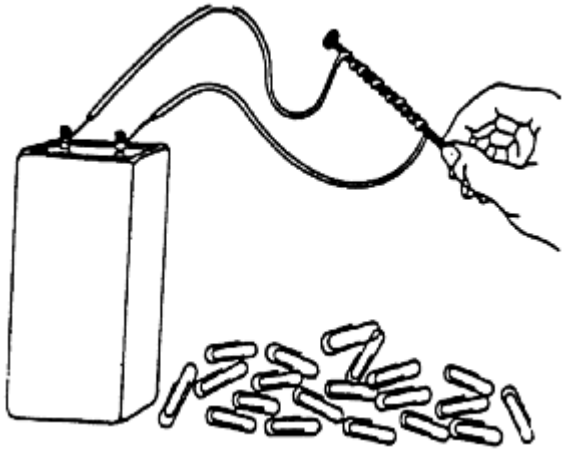
B
Jackson Summit
Lake
Bleecker
Benedict
Mayfield
Gorthey Corners
Munsonville
Union Mills
Greenfield
Pages Corner
Barkersville
Hagedorns Mills
Mosherville
Gloversville
Broadalbin
Honeywell Corners
Ruback Camp
Galway
West Milton
Saratoga Springs
Burgoyne
Gilbert Corners
Deans Corners
Quaker Springs
Victory
Schuylerville
Greenwich
Bald Mountain
Archdale
Johnstown
Church Corners
Beyers Corners
Ballston Spa
Saratoga Lake
Saratoga National Historic Park
East Line
Ballston Center
Round Lake
Stillwater
Fonda
Fort Johnson
Hagaman
Harrower
Amsterdam
Cranesville
Burnt Hills
Ushers
Mechanicville
Schaghticoke
Johnsonville
Lee
Elnora
Wellsville
Rectors
Charleston
Miller Corners
Scotia
Clifton Park
Halfmoon
Tomhannock Reservoir
Boyntonville
Burtonsville
Braman Corners
Schenectady
Vischer Ferry
Waterford
Cohoes
Grafton Lakes State Park
Kelleys
Niskayuna
Esperance
Duanesburg
Delanson
Gifford
Dunnsville
Latham
Troy
Grovenor Corners
Colonie
Watervliet
Loudonville
West Township
Altamont
Roessleville
Menands
Wynantskill
Poestenkill
Schoharie
Shutter Corners
Knox
Albany
Thompsons Lake
Voorheesville
Normansville
West Sand Lake
Averill Park
Berne
New Salem
Slingerlands
Delmar
Middleburgh
Wolf Hill
East Greenbush
Dunham Hollow
Fultonham
Huntersland
Reidsville

Joseph Henry



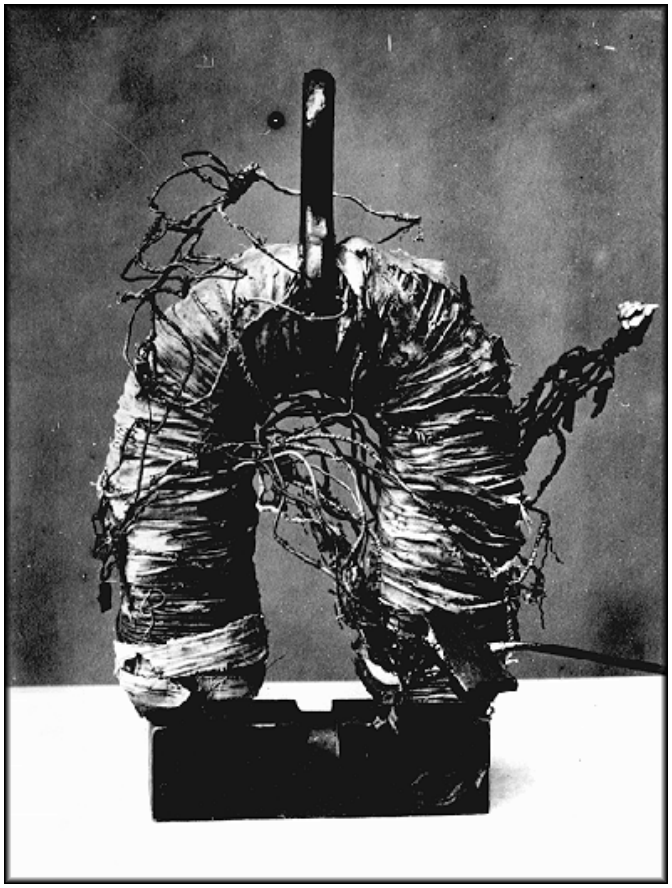


What is one of the keys to making a powerful electromagnet?

Insulation

Electromagnet

Joseph Henry

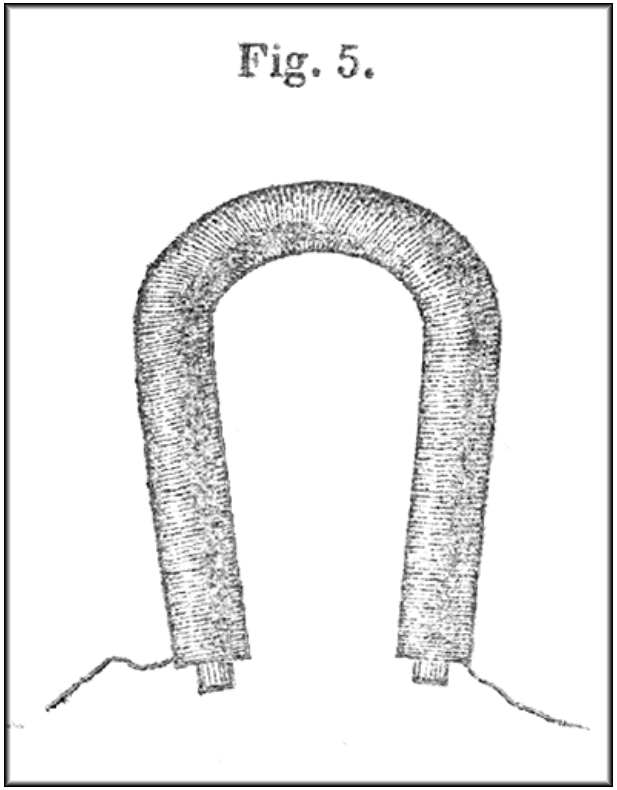


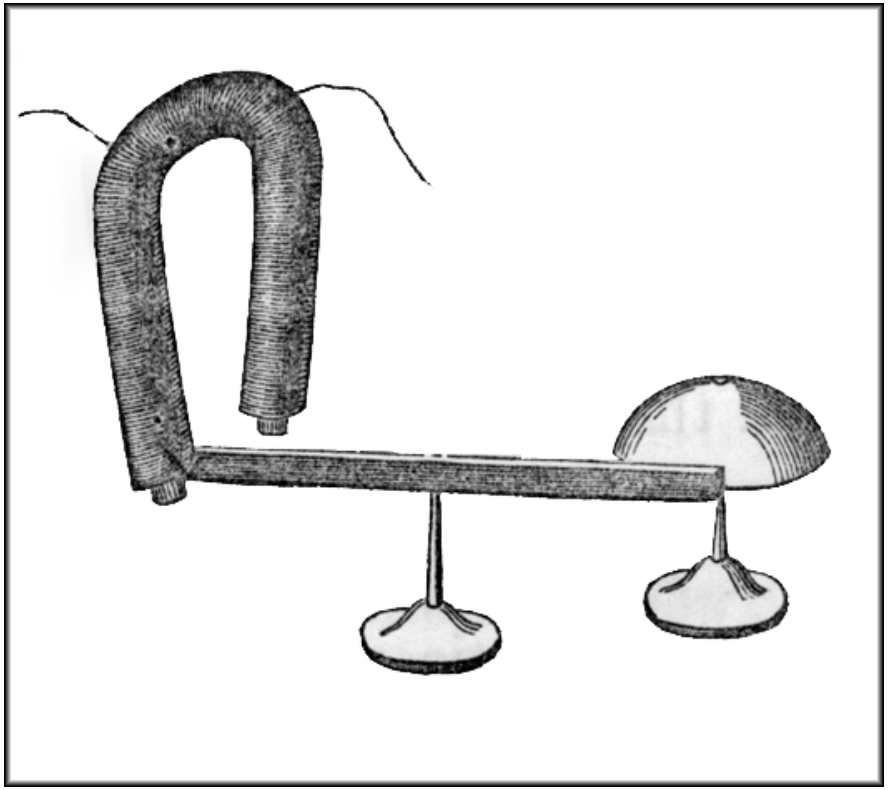
His key practical contribution to the electromagnet – how did he do it?

Joseph Henry

In 1820, Danish physicist Hans Christian Oersted had discovered that the flow of an electric current produced a magnetic field around the wire. This amazed scientists and many, including Henry and Faraday, began to experiment with magnetism. In 1829 Henry learned that William Sturgeon had built an electromagnet that could lift nine pounds. This was quite remarkable, but Henry believed he could create a magnet that was much stronger. ***The secret was to wrap more wire around the iron core, overlapping the levels. However, wire in that era was not insulated, so wrapping one level over another caused a short circuit. Henry got around the problem by the laborious process of insulating the copper wire by hand, using strips of his wife's silk petticoats.***

Joseph Henry



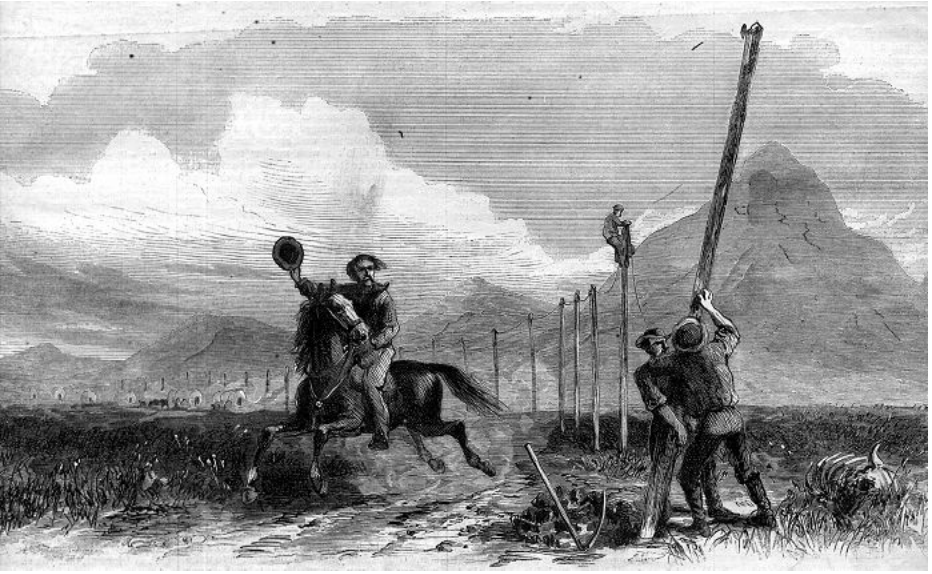


He recognized that the magnet could be the key part of a long distance signaling device – this became the telegraph

Joseph Henry

- Simple idea – properly insulate the wires so that many turns could be added to a magnet – which he called intensity magnets
- Saw the potential of the more powerful device as the beginning of long distance communication
- Also demonstrated that a motor could be made, although his did not turn
- His work made motors & generators and essentially all electric power equipment possible

Telegraph

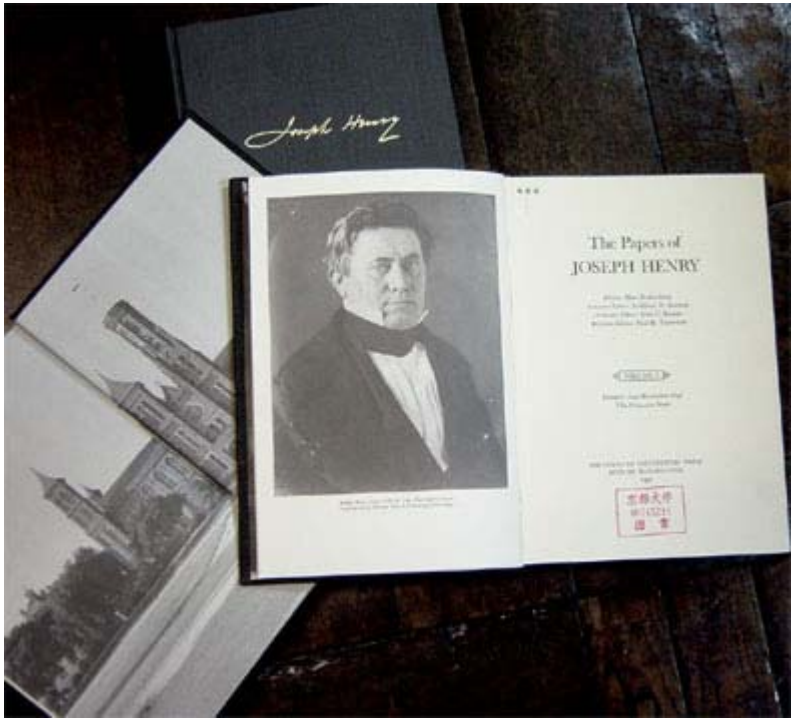


Send messages to people over very long distances

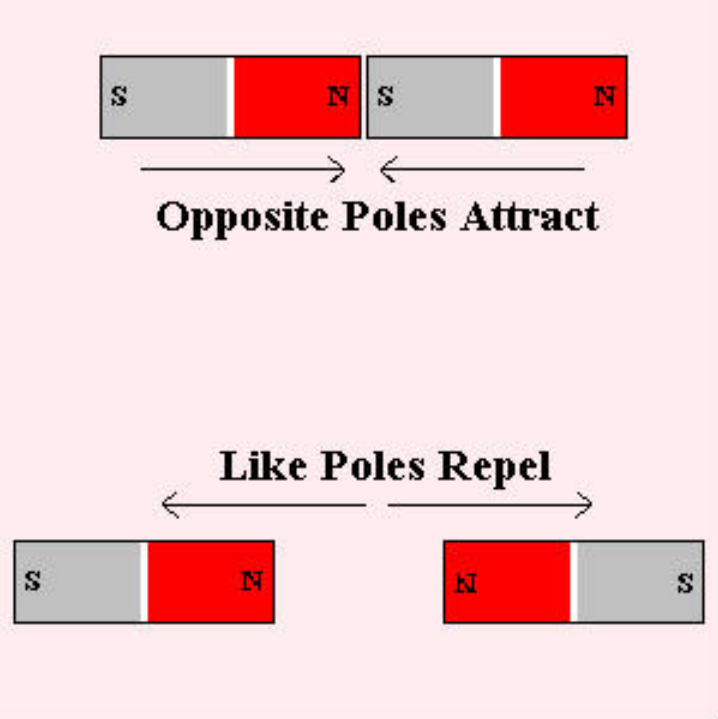
What can we do with a strong magnet?

Joseph Henry Inspired Demos

- Electromagnet with insulation
- Coin Flipper
- Coil Launcher
- Simple motor
- Cow Magnet
- Generator?



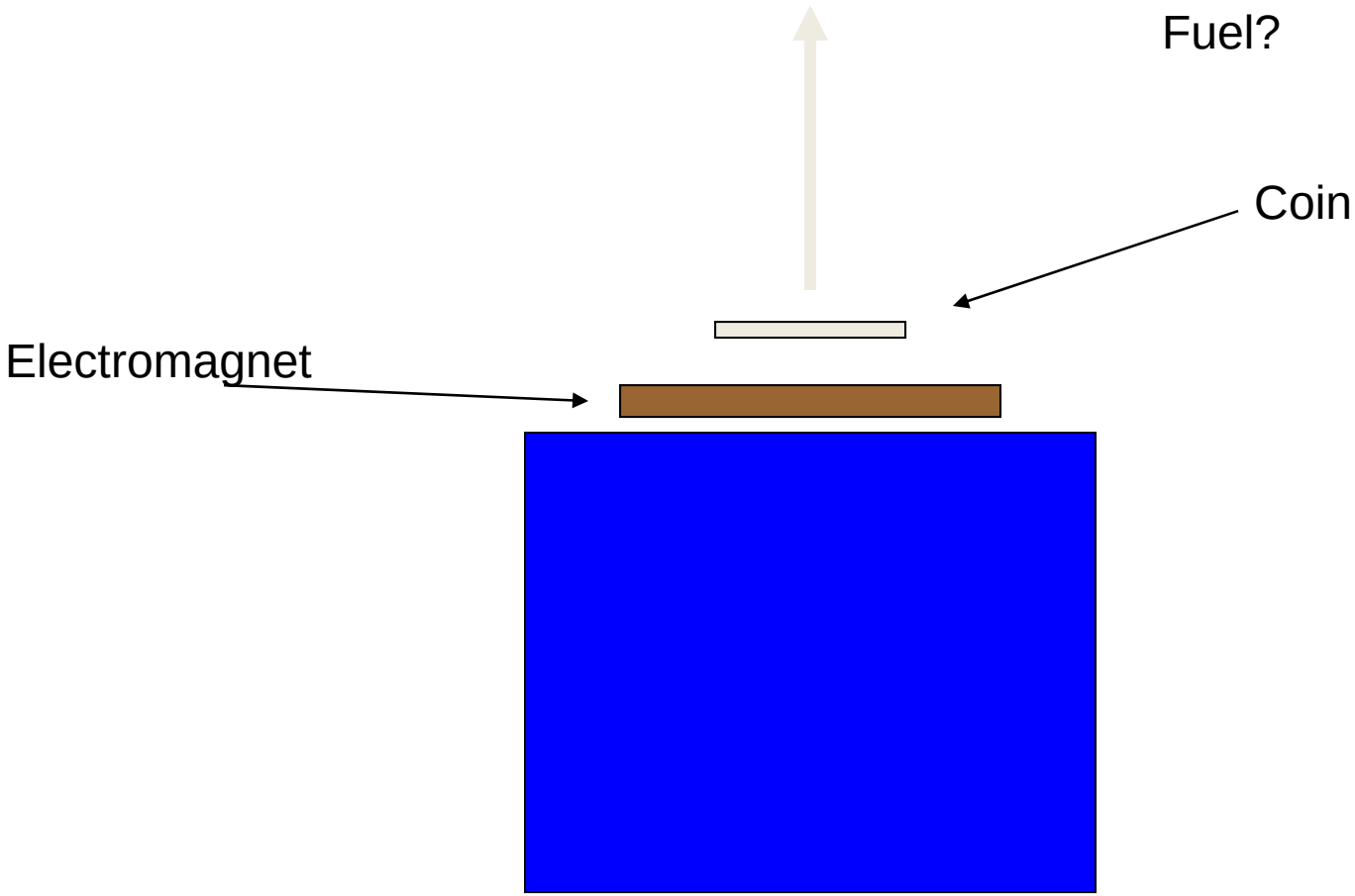
North and South Poles



Magnets also attract metal (iron or steel)

Coin Flipper

Launch Rockets Without Rocket Fuel?



Alan Dumont

-- Inside --
Rear View

1938 DuMont Model 180

America's First Commercial Electronic TV Set

Alan Dumont

- January 29, 1901 born in Brooklyn, NY
- In 1911 had polio – spent a lot of time reading
- BSEE at RPI 1924
- 1931 Started his company which ultimately marketed oscilloscopes, televisions and became one of the first TV networks
- Died November 14, 1965

Alan Dumont

1939 Du Mont Model 183 - 14" Screen

1948 Du Mont -- RA103 Console

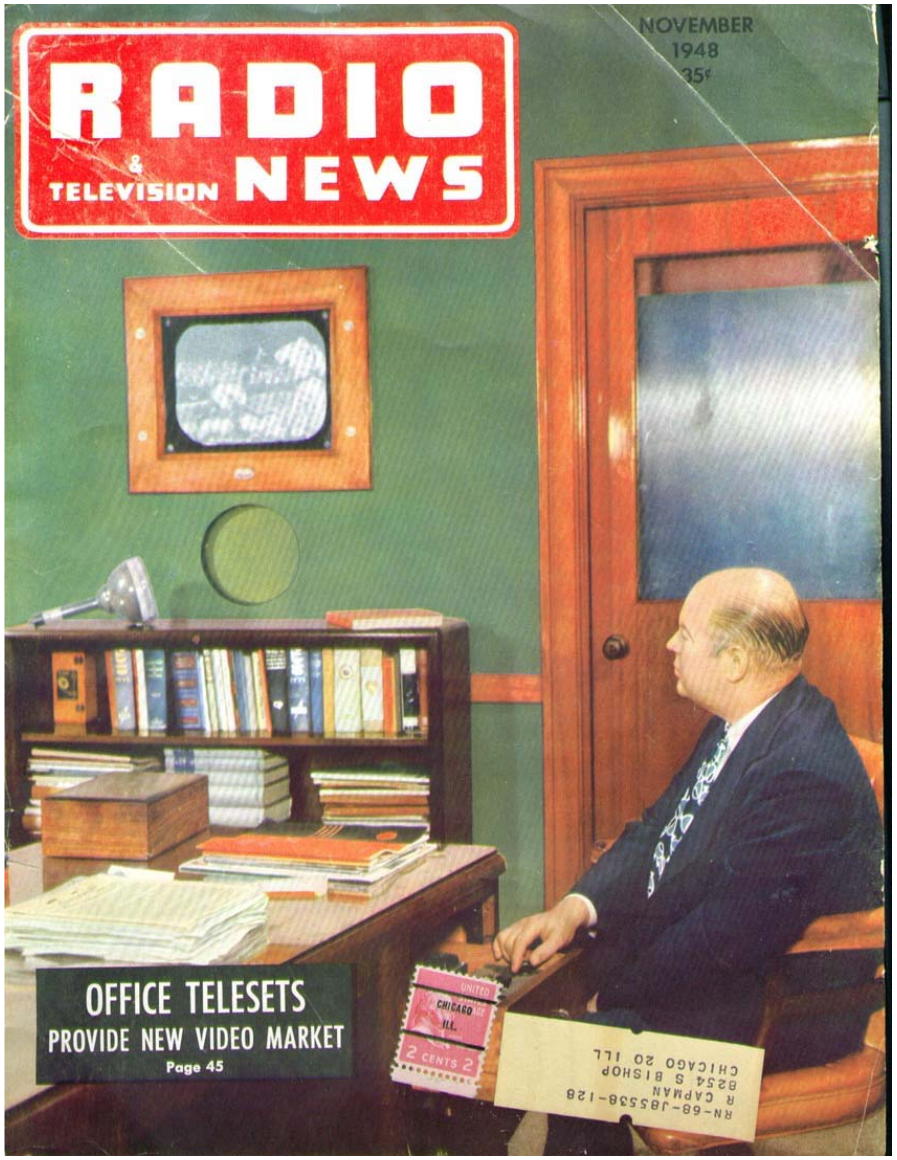
© 2002 TVhistory.TV (Dunedin)

http://www.tvhistory.tv/

Alan Dumont

- Developed the first practical CRT (previous versions lasted only 10s of hours)
- First company to market home TV receiver in 1938
- Dumont network until 1956 – It could not compete with radio networks (poorly funded)
- Broadcast Jackie Gleason, first sporting events, but shows were bought by big 3 networks
- Dumont was one of broadcastings first millionaires

Alan Dumont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1948
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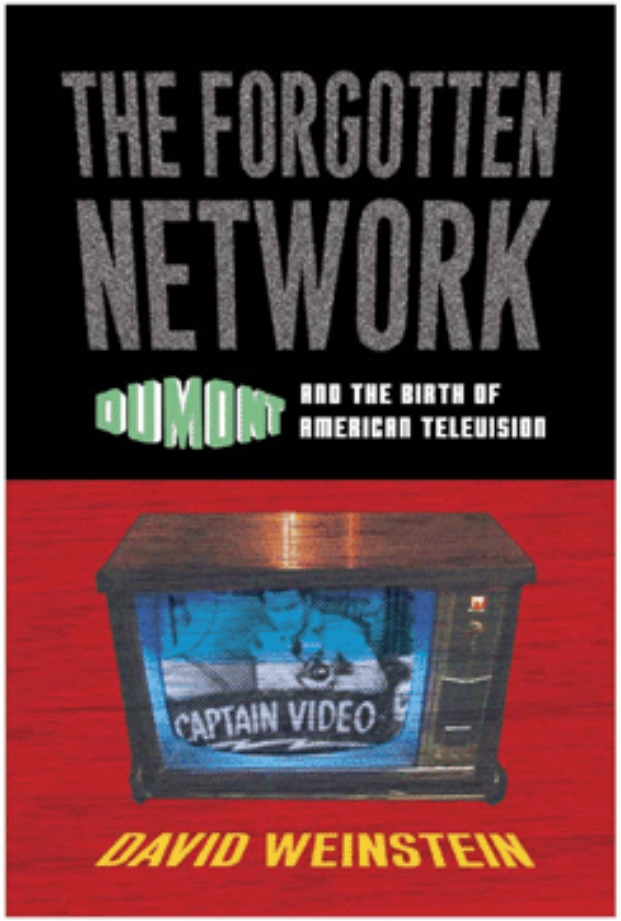
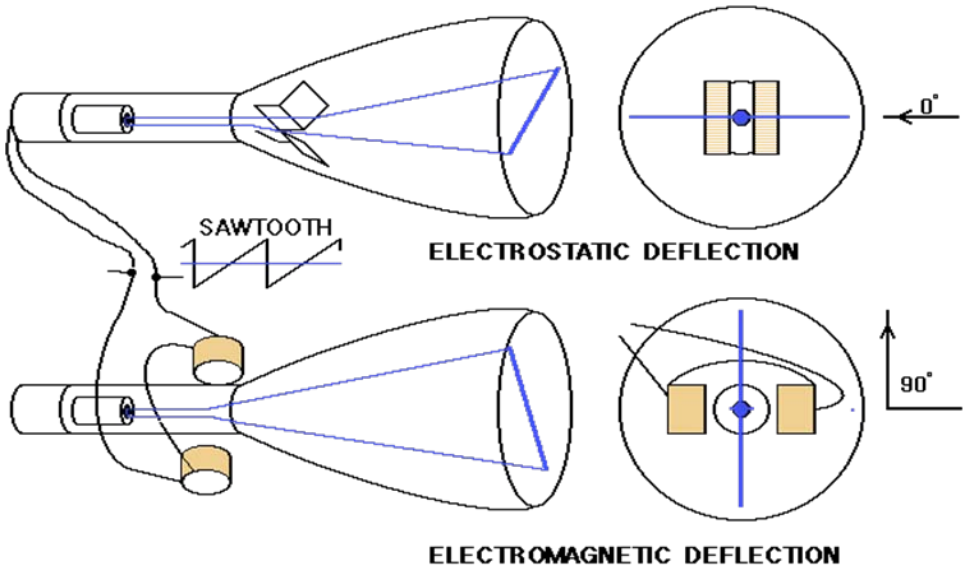
RADIO
& TELEVISION NEWS
OFFICE TELESETS
PROVIDE NEW VIDEO MARKET
Page 45

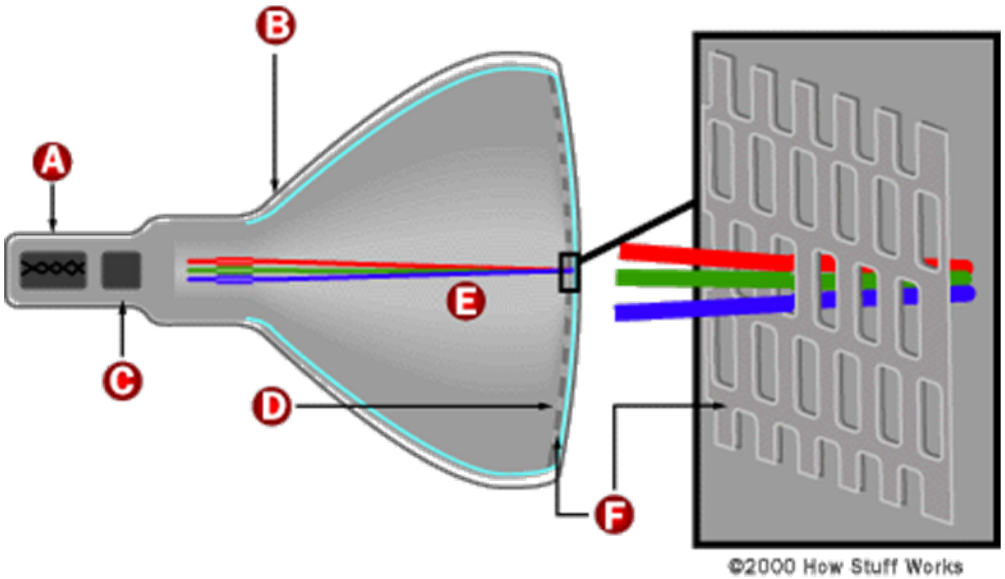

THE FORGOTTEN NETWORK
DUMONT AND THE BIRTH OF AMERICAN TELEVISION
CAPTAIN VIDEO
DAVID WEINSTEIN

Displays: CRT



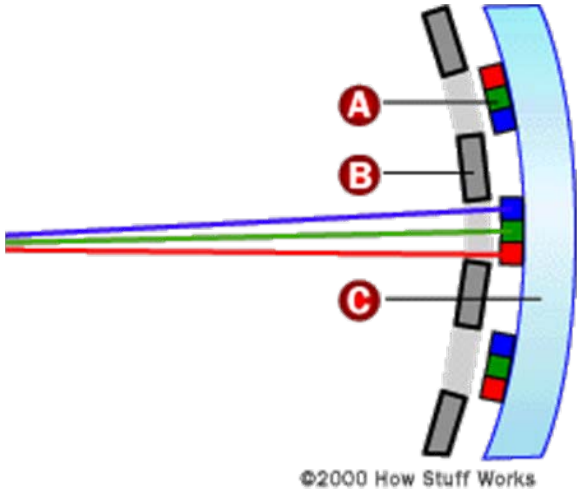
- In a CRT, an electron beam excites the phosphor
- The beam is directed to a spot on the surface using sweep plates

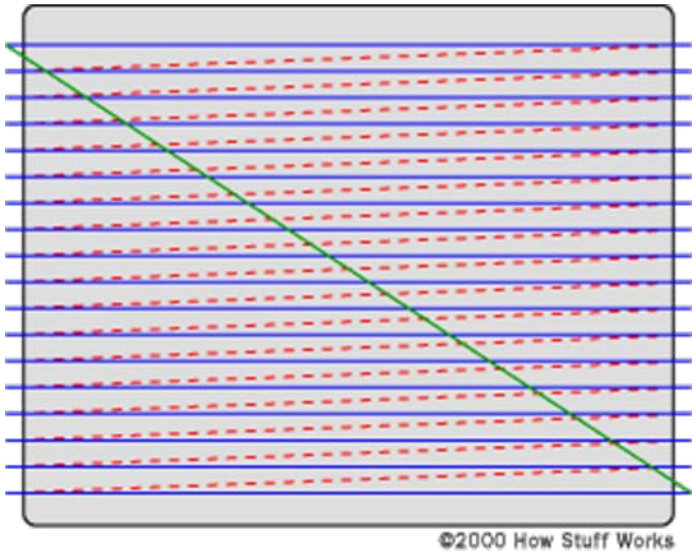
Displays: CRT



- Three separate electron guns are required to produce a color picture

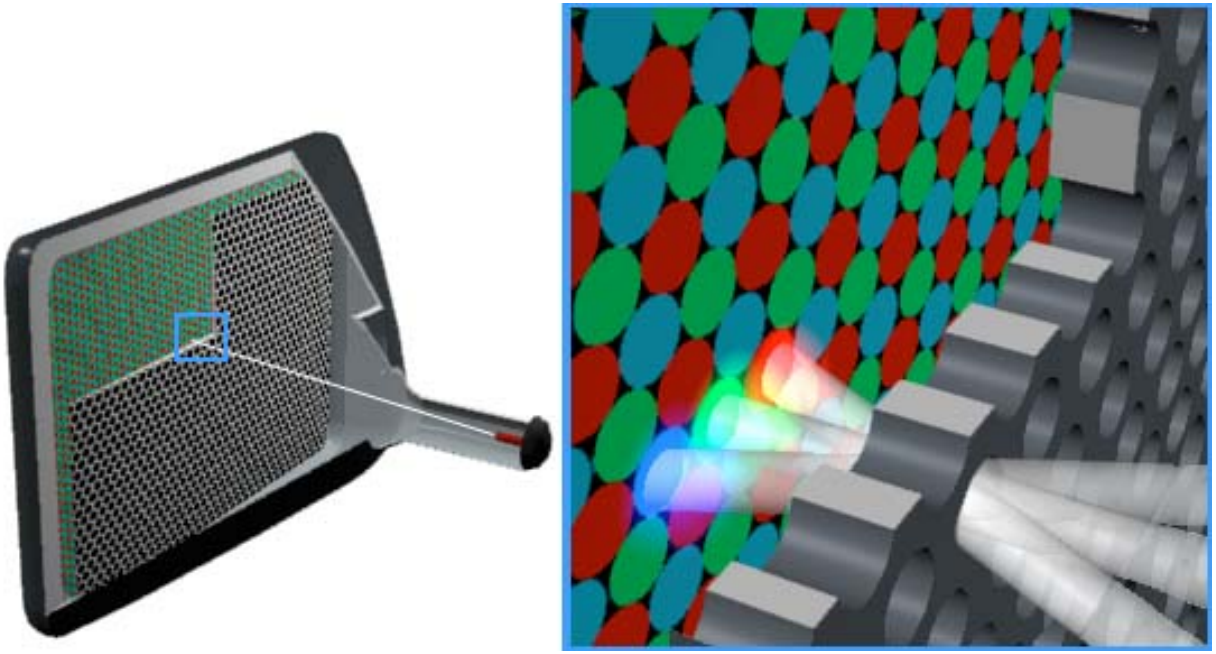
Displays: CRT





- At the left is the layout of the mask and phosphors
- At the right is the scanning sequence

Displays: CRT



- A large variety of configurations are used by manufacturers
- Look carefully at the screen of your TV

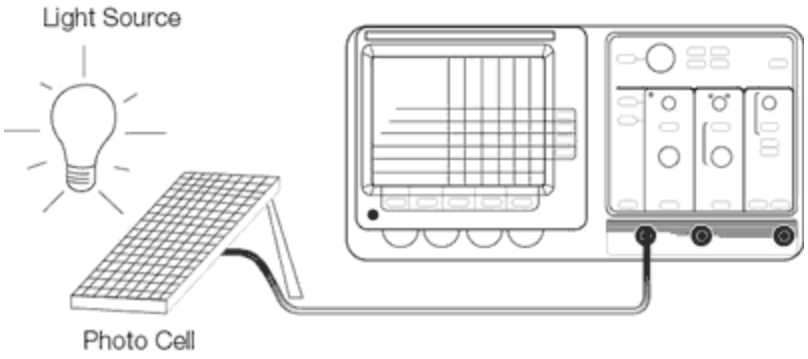
150 Inches
GIZMODO

Alan Dumont

- Inventor of the practical CRT which led to the oscilloscope.
- Dumont dominated the ‘scope market for many years.

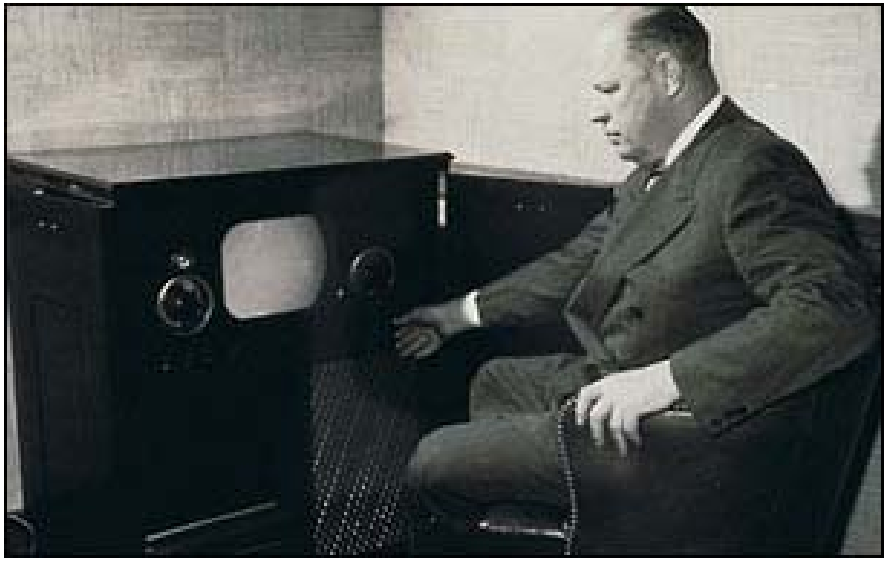
Alan Dumont

- What does a ‘scope permit us to do?
- Monitor the electrical signals in a power system or any other electrical system
- Scope Simulation http://www.virtual-oscilloscope.com/simulation.html

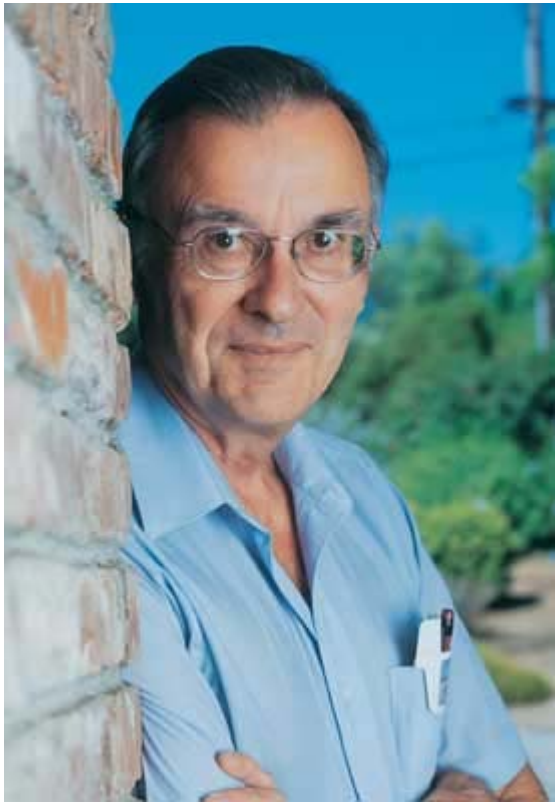


Alan Dumont Inspired Demos

- CRT examples
- Making measurements ← Your job.

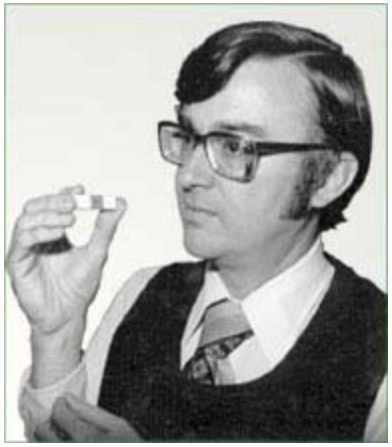


Ted Hoff

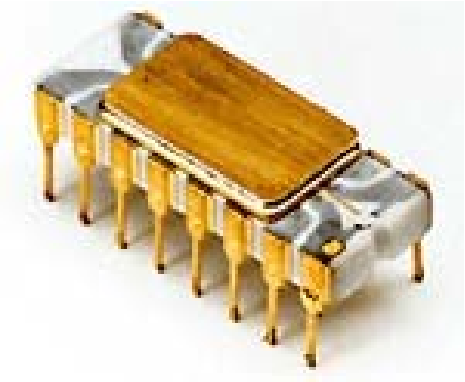


"Ted" Hoff's career as an engineer began long before he invented the microprocessor at Intel. At age 15, he won a trip to Washington, D.C., and a $400 scholarship from the Westinghouse Science Talent Search. As a sophomore at Rensselaer Polytechnic Institute in Troy, N.Y., he won points (and patents) for designing two circuits for the General Railway Signal Co., where he worked summers and college holidays as a lab tech. One circuit detected trains through the audio frequencies transmitted along the railway track. Another absorbed energy to protect against lightning.

Marcian E. (Ted) Hoff



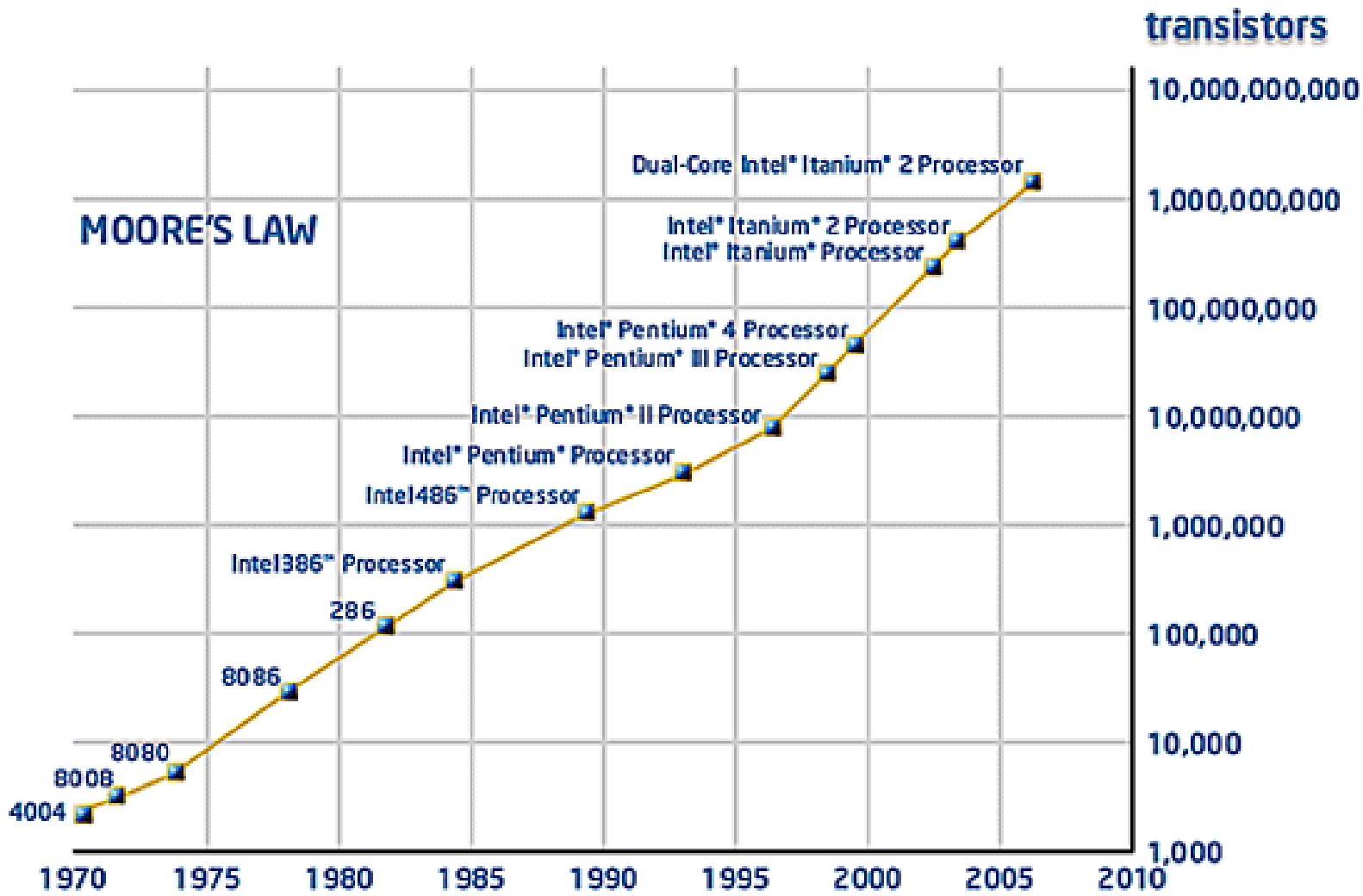
- 1937 Born in Rochester NY
- 1958 EE Degree from RPI
- 1962 PhD from Stanford
- 1971 Invented the Microprocessor (Intel 4004)



Ted Hoff

- In 1968 he joined the fledgling Intel Corporation (he was employee number 12) where he was the first to recognize that Intel's new silicon technology might make a single-chip central processor possible if a sufficiently simple architecture could be developed. Hoff developed such an architecture with just over 2,000 transistors.
- He invented the first electronic circuit that combined complicated computer functions on a single silicon chip, earning him recognition as the "father of the microprocessor." This single chip had as much computing power as the first electronic computer, ENIAC, which in 1946 filled a room. The microprocessor created a revolution in computing

How Many Transistors in a Processor?



Embedded in a Shoe!
The microprocessor embedded in this adidas running shoe calculates the pressure between the runner's foot and the ground five million times per second and continuously changes the cushioning to match an adjustable comfort level. The computer controls a motor that lengthens and shortens a cable attached to a plastic cushioning element. *(Image courtesy of adidas-Salomon AG.)*

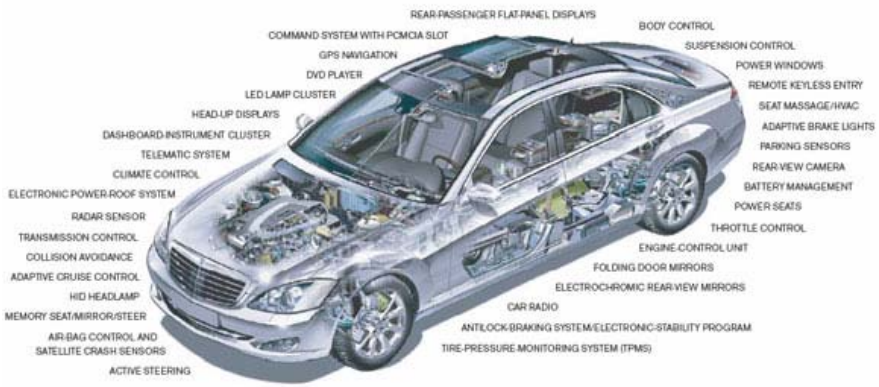
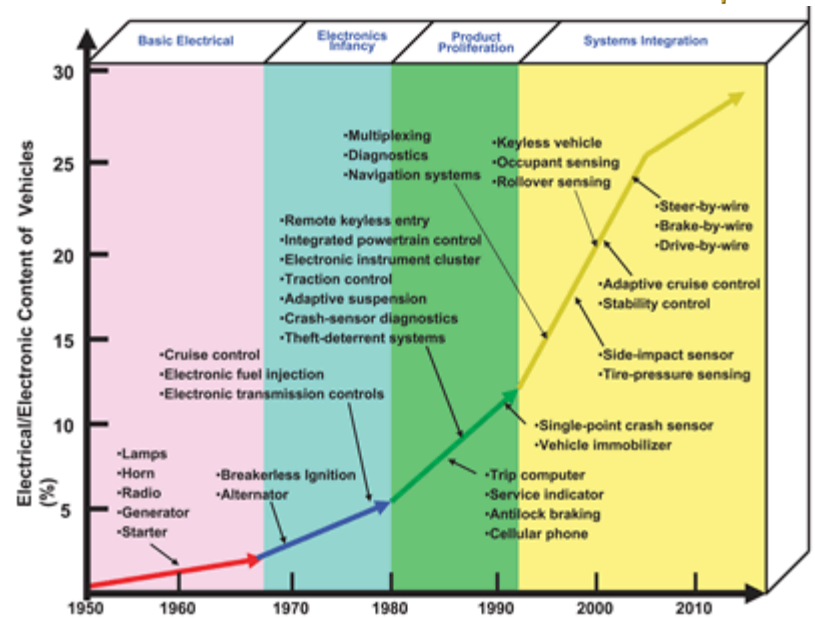
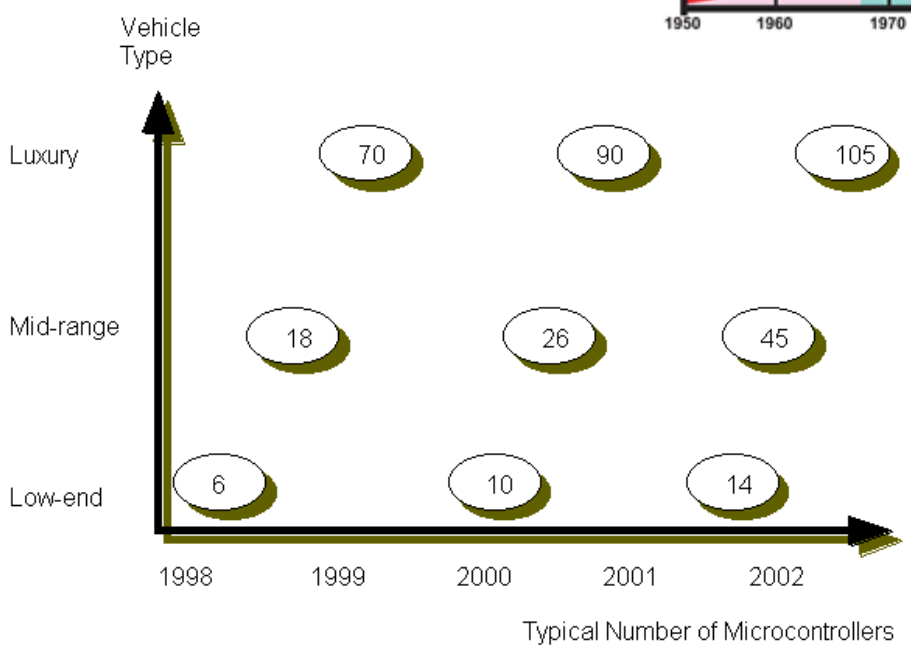
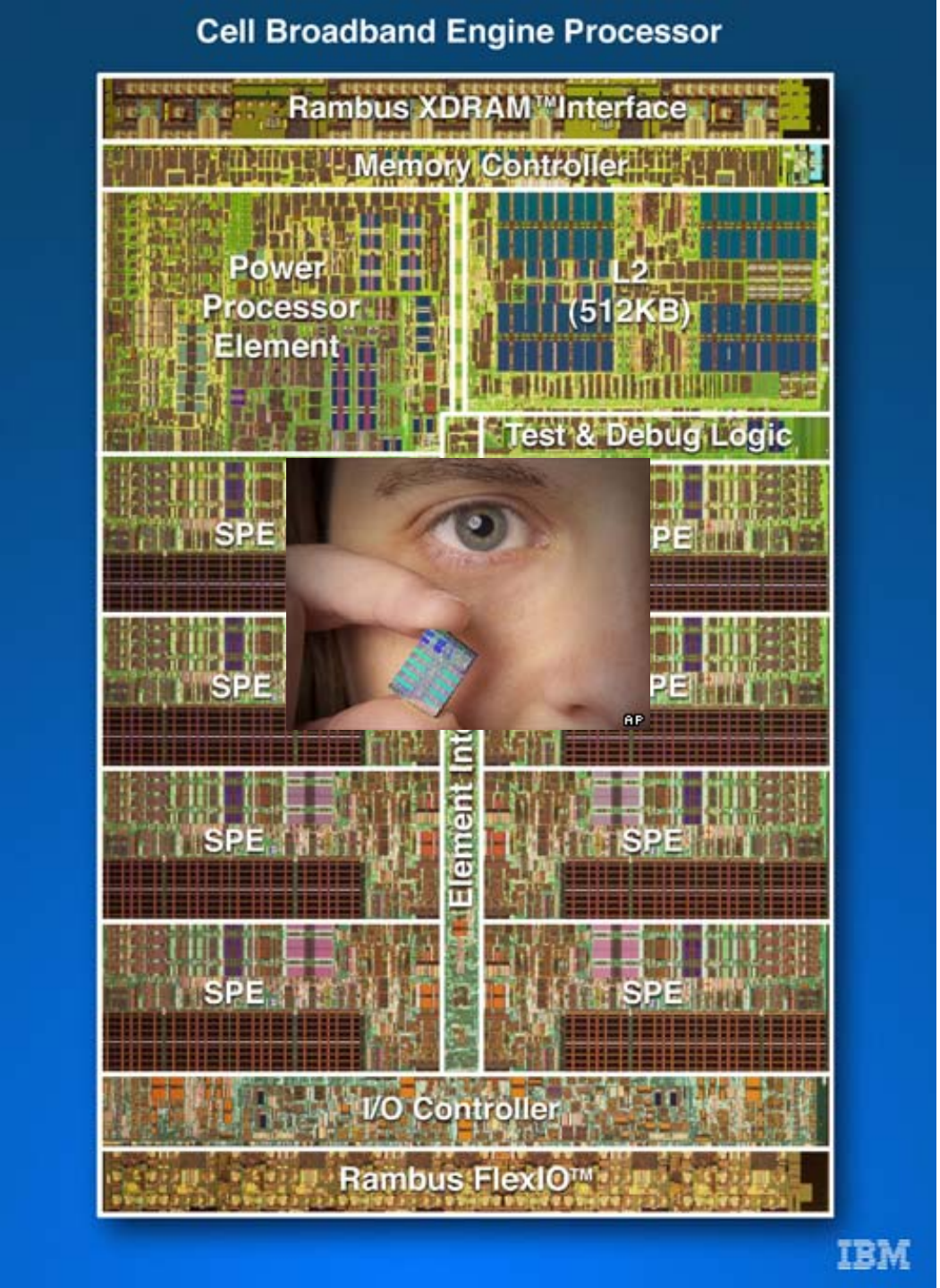


Figure 1 Electronic complexity in cars is increasing. New Mercedes S-Class cars employ at least 70 networked ECUs (electronic control units); 10 years ago, most cars had three ECUs (photo courtesy of DaimlerChrylser; source: Gartner Research, November 2005).







What is the Cell Processor & What is it used for?

http://www.gamasutra.com/features/20060713/turley_01.shtml

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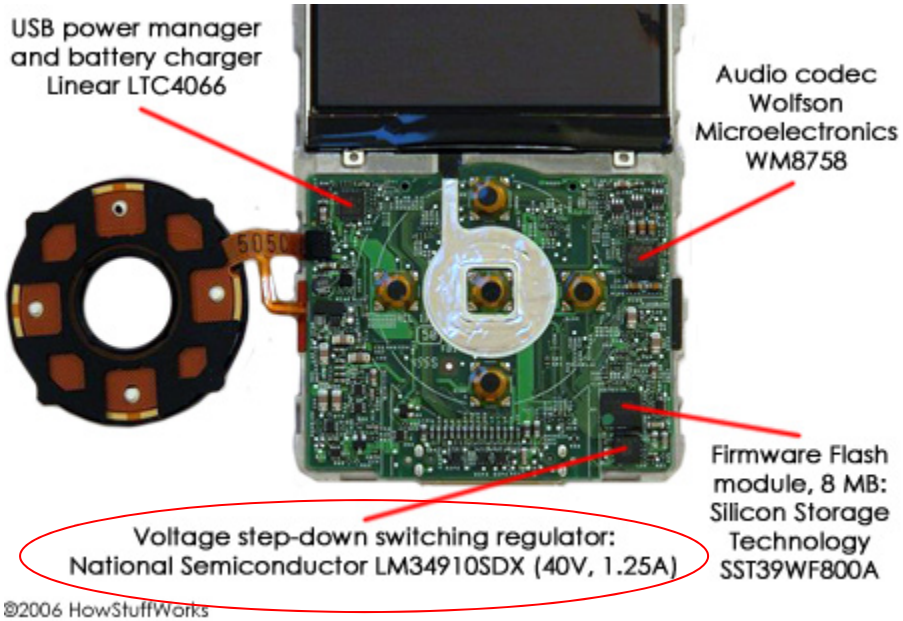
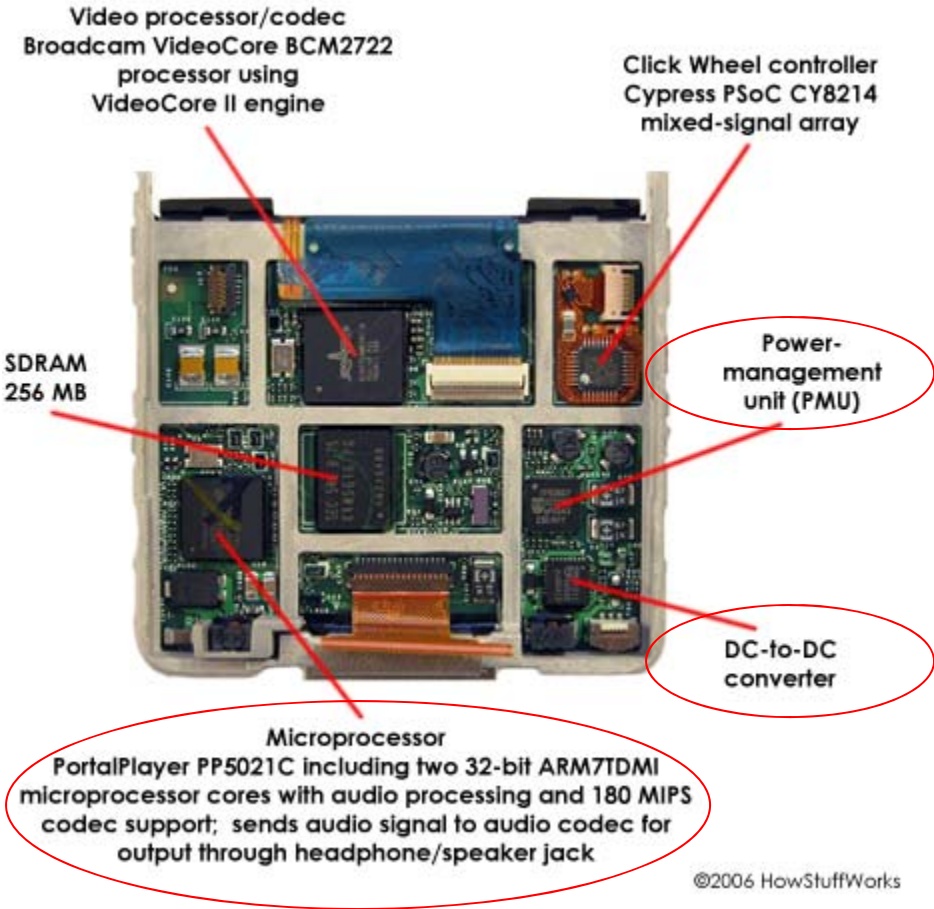
Design and specifications are subject to change without notice.

Ted Hoff Inspired Demos

- Some mysterious/funny devices
- Machines can talk

What is this?

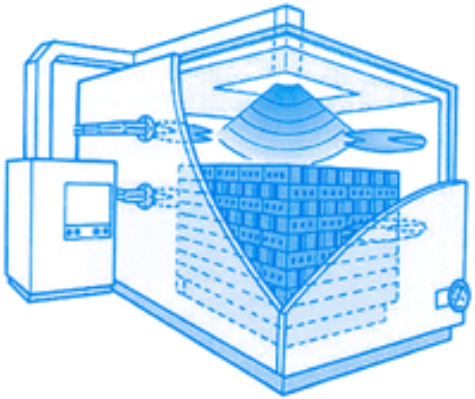




What do the Three Have in Common?

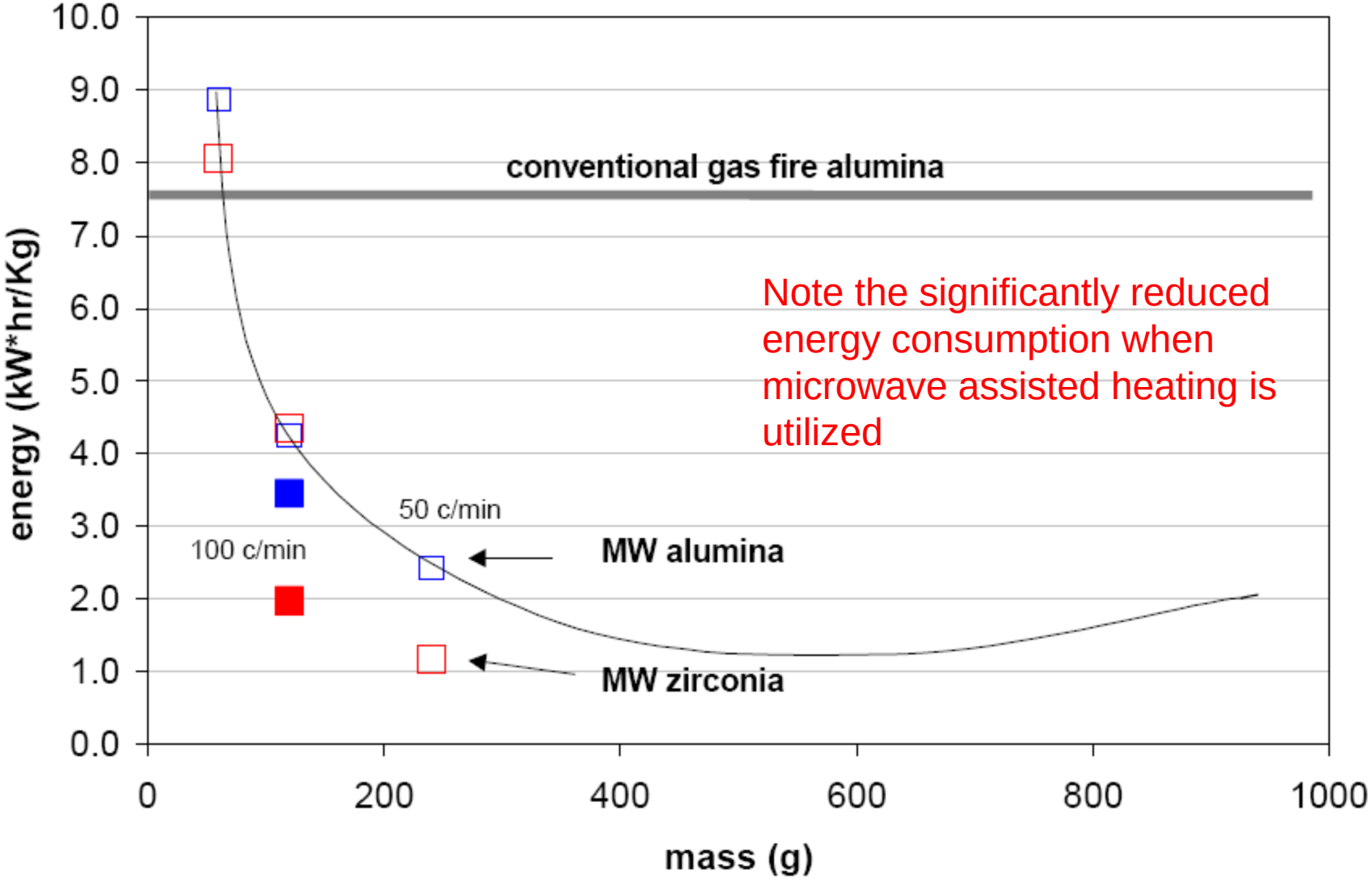
- From New York
- Educated in Capital District
- Very Bright
- Could find Creative Ideas to Help Advance the State of Some Device or Concept
- &?

They were/are all men

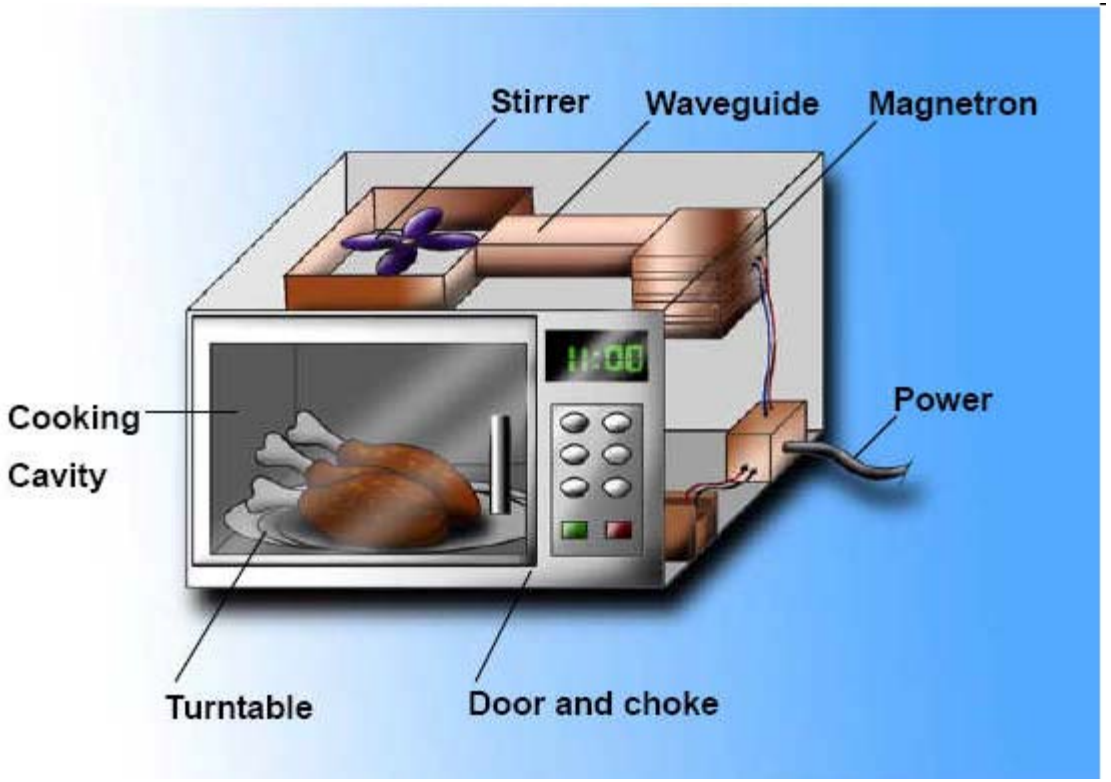


Microwave Assisted Furnace

Energy Consumption



Microwave Oven Demo



What can we do with these?

Online References

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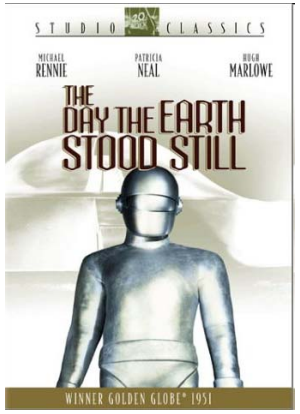
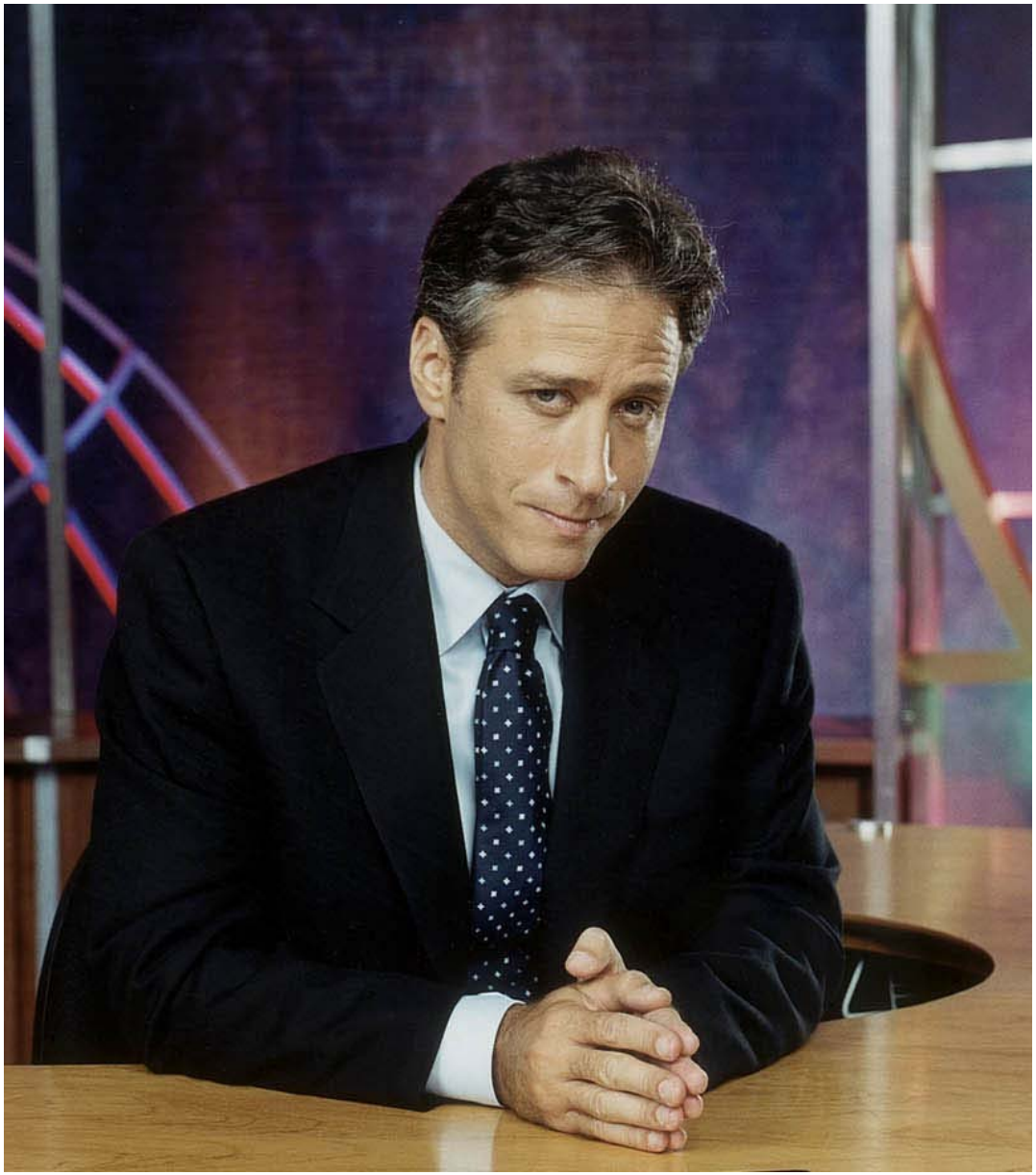
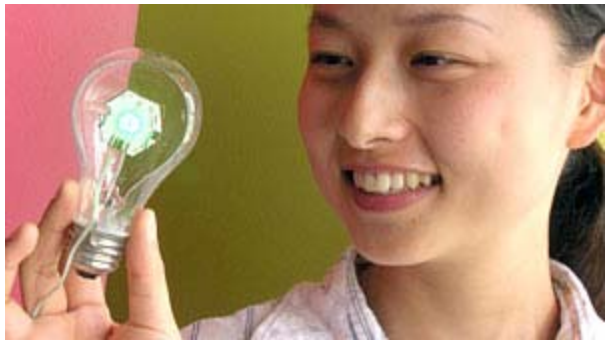
Other Demos

- Strange Light Device – A Remote?

- Strange Musical Instrument



Questions?



More to Come