From Stone to Silicon

Call in for audio:

888-299-4099
Verbal passcode: VR66137

*1 to ask a question
to cancel question

From Stone to Silicon

The 25 Most Important Innovations

Lawrence A. Husick
Co-Director, Wachman Center
Program on Teaching Innovation

innovation |ˌinəˈvā sh ən|*noun*

- the process of making changes, esp. by introducing valuable new methods, ideas, or products;

- the new method, idea or process, itself.

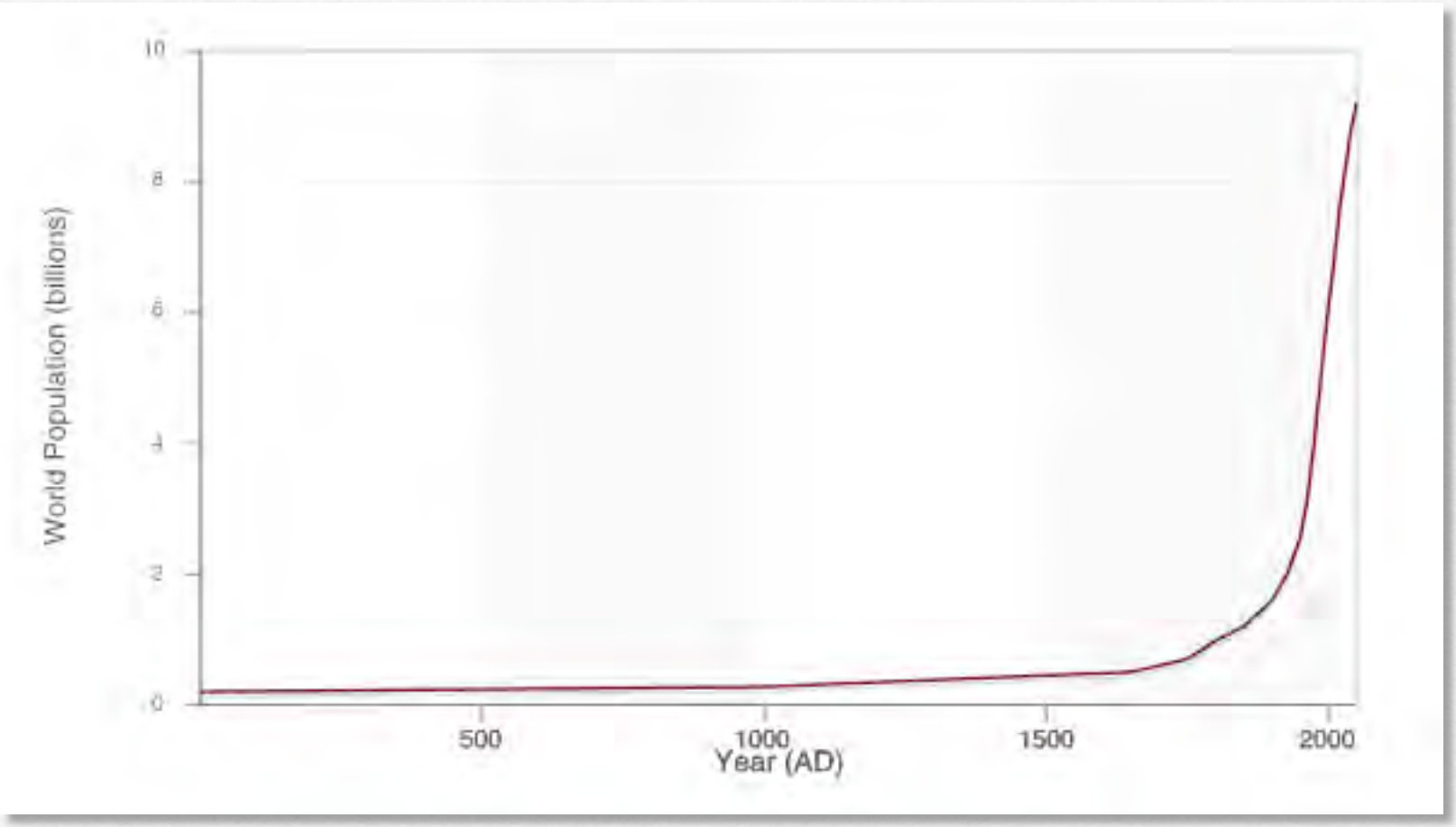
Not Just Tools and Toys

- Innovations may be *inventions*, but they may also be:
- Theories, beliefs, organizational methods, processes, discoveries…
- In short, new value-creation mechanisms.

Methodology

- This is only one of many ways of looking at the history of innovation
- Rank = impact (good or bad) on human life x total number of lives affected
- There is no requirement that those whose lives are affected even know about the innovation, much less how it works!

Why the Bias to Newer Stuff?



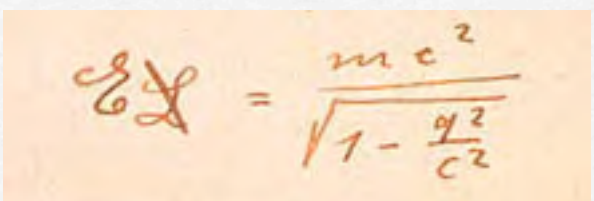
Disclaimer

- What follows is all opinion. It is neither right nor wrong. Your list may, and should differ in both content and order.
- What matters is that you think about your own list, and that you have reasoned arguments for the ways that it differs from this one.

The List

Innovation #25…

- Relativity and Quantum Mechanics (1912)

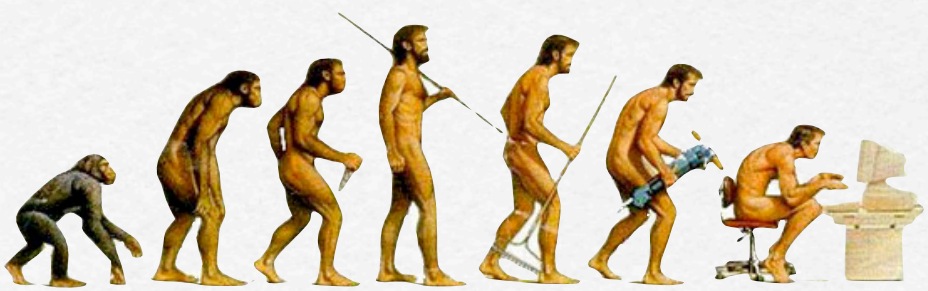


Innovation #24…

- Electromagnetism (1820)

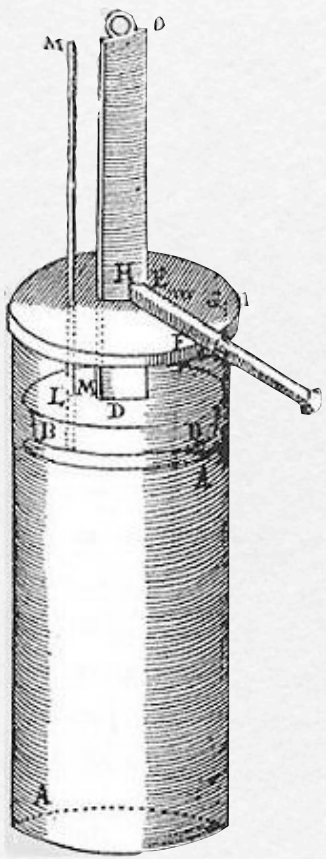
Innovation #23…

- Evolution and Natural Selection (1859)



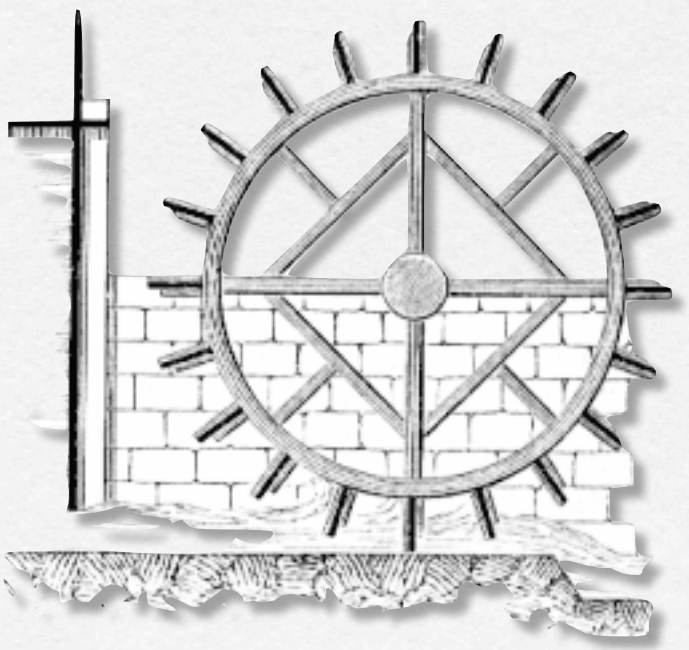
Innovation #22…

- Steam Power
  - Papin (1690)
  - Savery (1702)
  - Newcomen (1712)
  - Watt (1765)



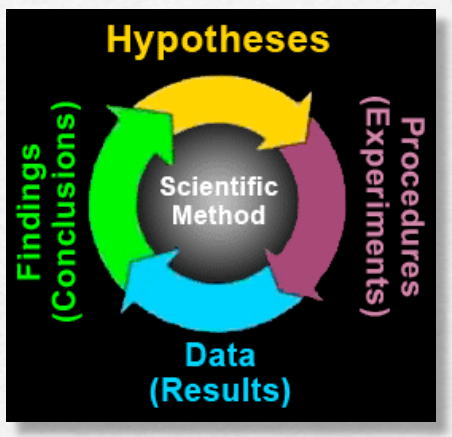
Innovation #21…

- Water Power (240 b.c.e.)



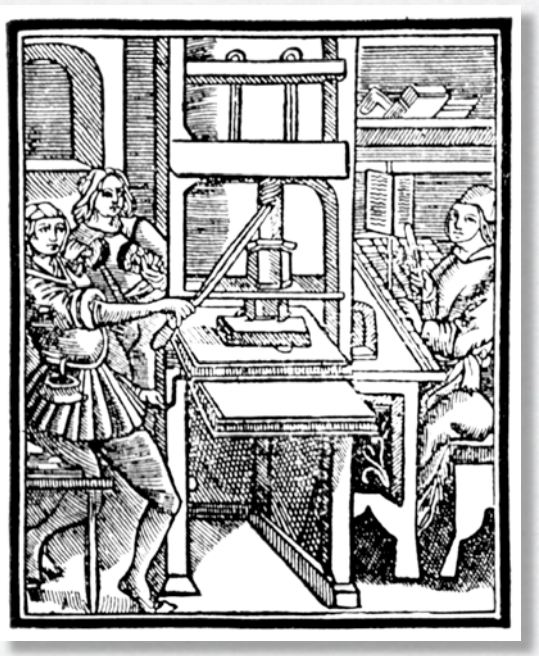
Innovation #20…

- Science (Natural Philosophy)
  - Study of Nature
  - Use of Scientific Method
  - Formal Systems
    (Mathematics, logic, statistics,
    calculus, place value, zero)



Innovation #19...

- Moveable Type Printing Press (1040)
- Gutenberg (1436)



Innovation #18…

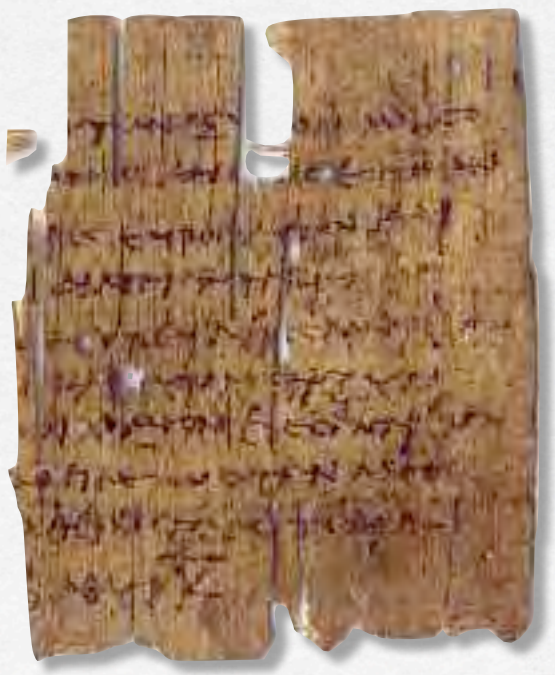
- Fossil Fuels
  - Coal (1,000 b.c.e.)
  - Natural Gas (1859 - first well - Ohio)
  - Petroleum (1859 - first well - Penna.)

Innovation #17...

- Specialization of labor

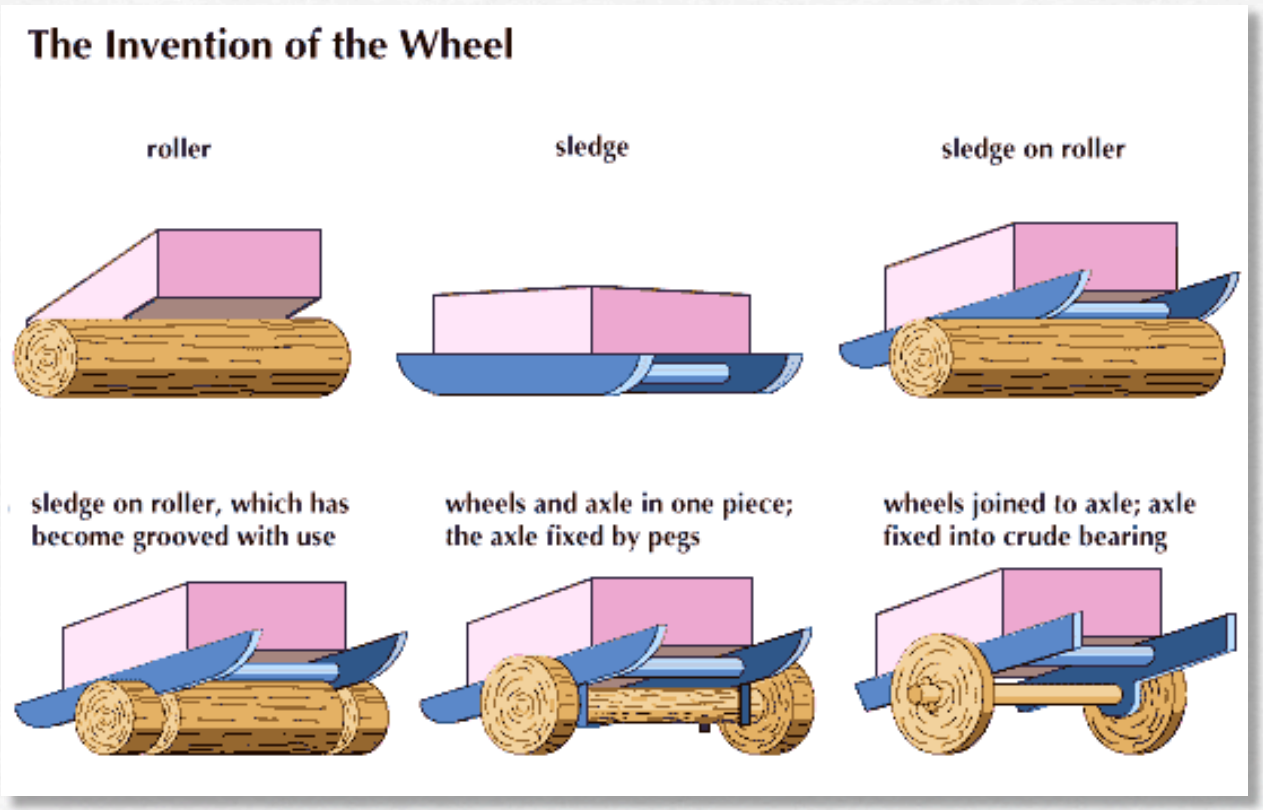
Innovation #16…

- Paper (105)
  - Bagdhad (793)
  - Al Andalus (1150)
  - Sicily (1154)
  - France (1189)
  - Wood pulp (16th Cent.)



Innovation #15…

- Wheel and Axle (3,200 b.c.e.)



Innovation #14…

- Formal Law Codes
  - Code of Hammurabi (1780 b.c.e.)
  - Book of the Dead (1800 b.c.e.)
  - Ten Commandments (922-722 b.c.e.)
  - Twelve Tables (449 b.c.e.)

Innovation #13...

- Money
  - Sumerian (3,000 b.c.e.)
  - Lydian Coins (700 b.c.e.)
  - Chinese Paper Money (618)
  - Fiat and Credit Currency

Innovation #12…

- God(s)/Religions (social institution)
  - Social cohesion (in and out group)
  - Gives priestly class super-authority
  - Shapes behavior
    - Prescriptive (thou shalt/not)
    - Motivational (promise of afterlife)

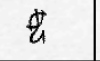
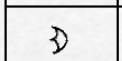
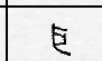
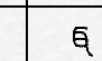
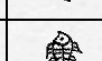
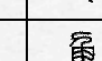
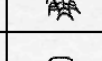
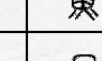
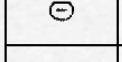
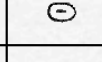
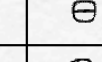
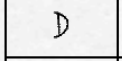
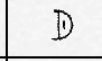
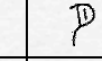
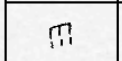
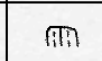
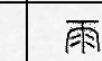
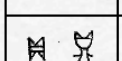
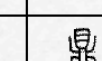
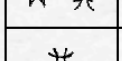
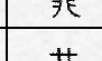
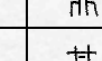
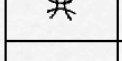
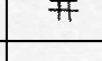
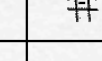
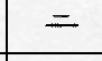
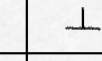
Innovation #12...

Dostoyevsky's Brothers Karamazov:

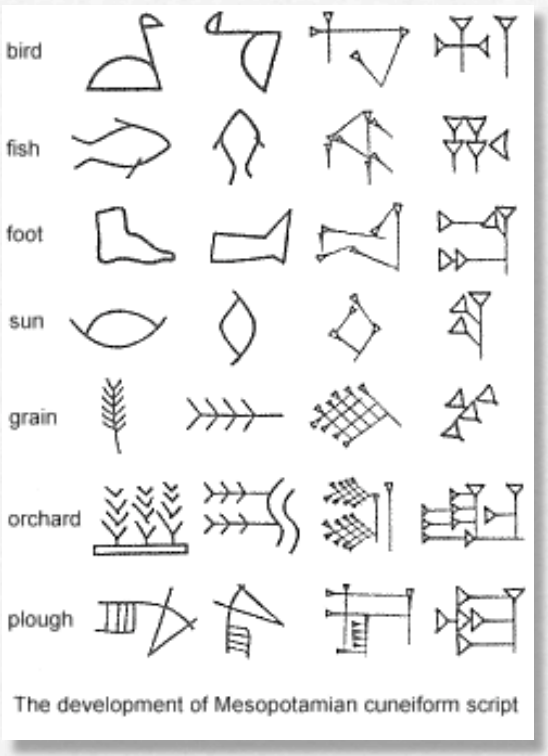
- "Damn it all, what wouldn't I do to the man who first invented God!"
- "There would have been no civilization if they hadn't invented God."
- "Wouldn't there have been, without God?"
- "No. And there would have been no brandy either."

Innovation #11…

From pictographs to…

	Oracle Bone	Greater Seal	Lesser Seal	Modern
man (rén)				人
woman (nǚ)				女
ear (ěr)				耳
fish (yú)				魚
sun (rì)				日
moon (yuè)				月
rain (yǔ)				雨
cauldron (dǐng)				鼎
well (jǐng)				井
above (shàng)				上
down (xià)				下

Chinese



Cuneiform

Innovation #11…

- Alphabetic Script (1,800 b.c.e.)

Innovation #11…

- Alphabetic Script (1,800 b.c.e.)

Innovation #10…

- Food Preservation (10,000 b.c.e.)
  - Drying, freeze drying
  - Salting, spicing
  - Fermenting
  - Dry Storage
  - Pickling
  - Heating, smoking

Innovation #9…

- Metallurgy
  - Copper, Silver, Gold (4,400 b.c.e.)
  - Bronze (alloy with tin) (4,000 b.c.e.)
    (3,300-1,200 b.c.e. is the Bronze Age)
  - Iron (2,500 b.c.e)
    (1,200-1,000 b.c.e. is the Iron Age)
  - Steel (alloy with carbon) (400 b.c.e.)

Innovation #9…

Asia Minor Staff Headpiece

Copper Age

Innovation #9…

Mask of Agamemnon

Late Bronze Age

Innovation #9…

Korean Dagger
Early Iron Age

Innovation #8…

- Ceramics and Pottery
  - Clay vessels for cooking (prehistory)
  - Earliest fired clay pots (10,500 b.c.e.)
  - Earthenware, stoneware, porcelain

Innovation #8…

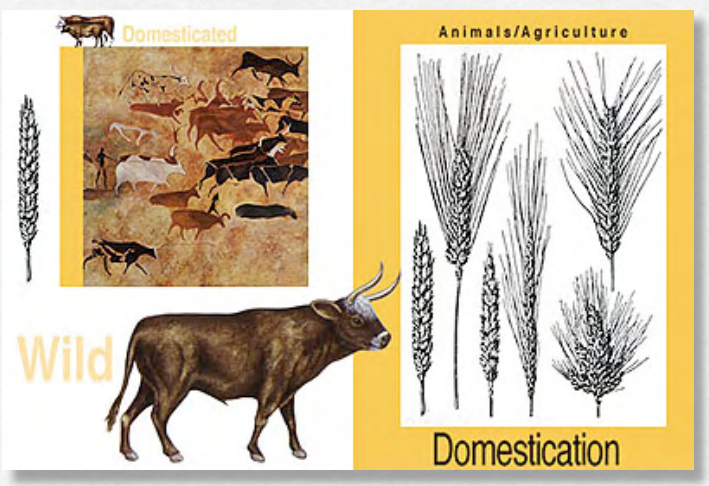
Syria, 6,600 b.c.e.

Innovation #7…

- Farming
  - Domestication of animals (15,000 b.c.e.)
  - Domestication of plants (10,000 b.c.e.)
  - Hydraulic agriculture (5,000 b.c.e.)
  - Plow (scratch 6,000 b.c.e./heavy 100 b.c.e)
  - Crop rotation (700)
  - Chemical fertilizer (1660)
  - Nitrate fertilizer synthesis (1913)
  - Green revolution (1961)

Innovation #7a…

- Domestication of Animals
  - Dog (15,000 b.c.e.)
  - Sheep (11,000 b.c.e.)
  - Goat (10,000 b.c.e.)
  - Pig (9,000 b.c.e.)
  - Cow (8,000 b.c.e.)
  - Chicken (6,000 b.c.e)
  - Horse (5,000 b.c.e.)



Innovation #7b…

- Domestication of Plants
  - Bottle Gourd (10,000 b.c.e.)
  - Wheat (9,800 b.c.e.)
  - Barley, Peas, chickpeas, beans, flax, bitter vetch (8,500 b.c.e.)
  - Sesame, eggplant (7,000 b.c.e.)
  - Cotton, rice (4,000 b.c.e.)

Innovation #6…

- Clothing (500,000-100,000 b.c.e.)
  - Sewing needles (30,000 b.c.e.)
  - Cloth (3,400 b.c.e.)

Innovation #6…

- Typical stone age dress

Innovation #6…

- Typical stone age dress

Innovation #6…

- Actual stone age dress (20,000 b.c.e.)

Innovation #6…

- Actual copper age dress for Alpine Europe (3,300 b.c.e.)

Innovation #5…

- Symbolic Communication (32,000 b.c.e.)

Lascaux, France

Innovation #5…

- Symbolic Communication (3,300 b.c.e.)

Egypt

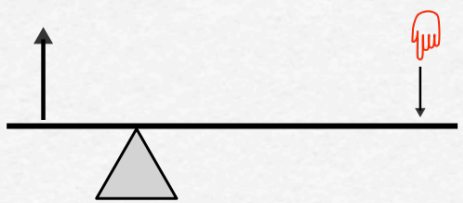
Innovation #5…

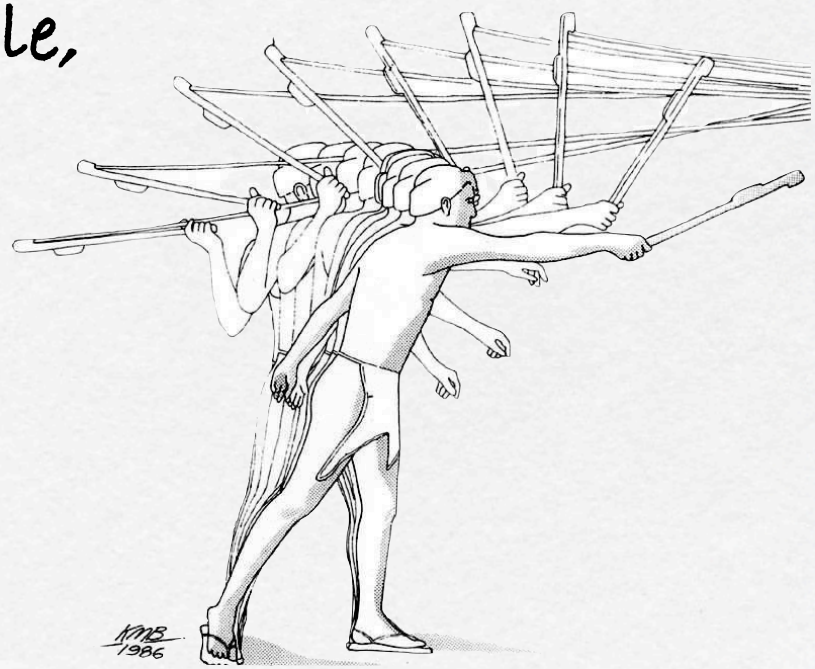
- Symbolic Communication (3,000 b.c.e.)

Sumer

Innovation #4…

- Lever Simple Machine
  - Plow, hammer, paddle, atlatl, bow





"Πα βω και χαριστιωνι ταν γαν κινησω πασαν." ("Give me a place to stand and with a lever I will move the whole world.")

Innovation #3…

- Inclined Plane Simple Machine
  - Blades, wedges, ramps, chutes, slides, screws

Olduwan Chopper Cores
(1.9 million years old)

Innovation #3…

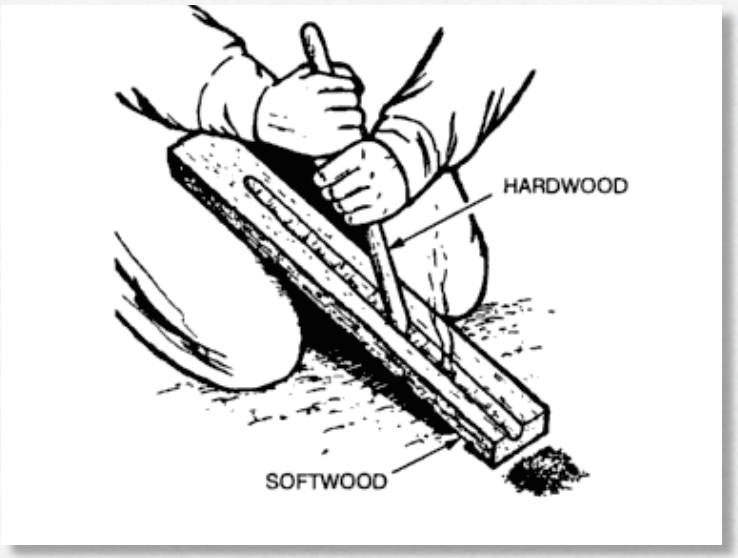
- Inclined Plane Simple Machine
  - Blades, wedges, ramps, chutes, slides, screws

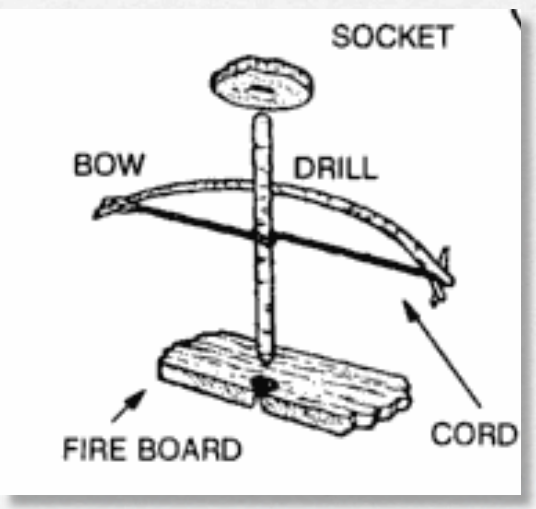
Innovation #2…

- Taming of Fire
  - Preservation of found fire
  - Fire starting technologies

Innovation #2…

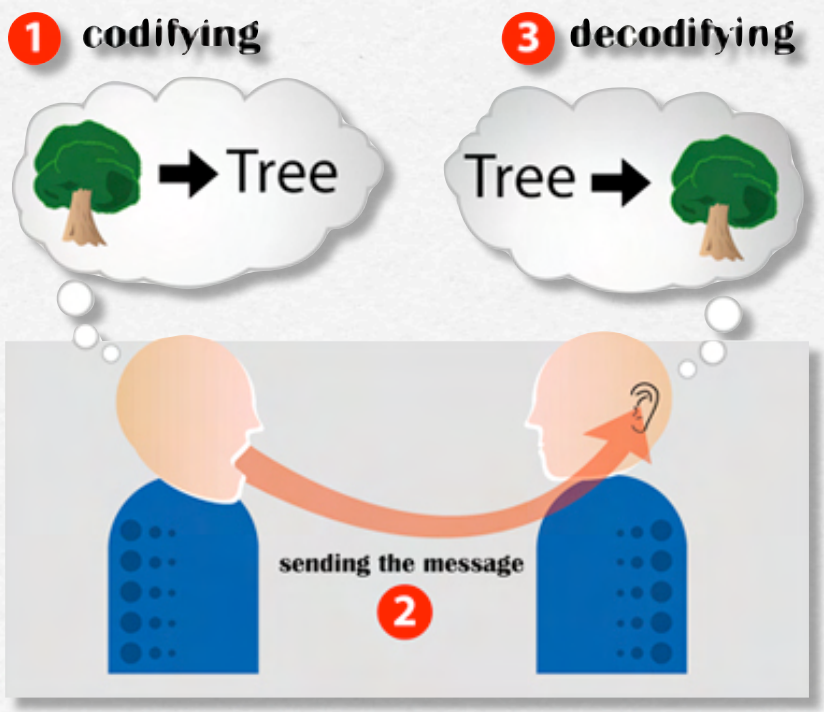
- Taming of Fire
  - Fire Plow
  - Fire Drill
  - Smudge bundle





Innovation #1…

- Spoken Language (semantic, syntactic)
  (Unknown, but approx. 100,000 b.c.e.)



And, last, but not least…

Innovation #0…

- Intentional Pedagogy
  - Transmission of culture;
  - Generalized knowledge

Innovation #0…

- "The systematic use of teaching to ensure the learning of skills and the acquisition of knowledge by others is evidently a peculiarity of the human species." --

Barnett, S.A., Teaching Considered as Behavior, in Comparative Psychology: A Handbook, Greenberg, G. And M. Haraway, Taylor & Francis, 1998, p. 203

Innovation #0…

- "Humans are remarkable among animals for the way in which they teach their young." --

Marton, F. Et al., Learning and Awareness, Erlbaum Assoc., Mahwah, NJ 1997, p. 166.

Did not make the list…

- Theories of disease/innoculations/ antibiotics
- Air conditioning
- Powered flight
- Sanitary sewers, public water systems
- Magnetic compass
- Internal combustion engine
- Optical devices (eyeglasses, telescope, microscope)
- Guns and gunpowder
- Plastics
- Transistor/Computers
- WD-40 and Duct Tape
- Systems of Knowledge Organization
- Clocks, Calendars, Almanacs
- Democracy
- Stirrup
- Hay
- The Internet
- City
- Atomic Bomb
- Anesthesia
- Female Contraceptive
- Spectroscope
- Distillation
- Free Will
- Ecological View (Blue Marble)
- Thermos Bottle
- Double Entry Accounting
- Compound Interest
- Mirror
- The Idea of the Idea

But…

- The most important innovation of all time is…

But…

- The most important innovation of all time is…

From Stone to Silicon

The 25 (or so) Most Important Innovations

Lawrence A. Husick
Co-Director, Wachman Center
Program on Teaching Innovation