Microsoft® Research

FacultySummit 2011

Cartagena, Colombia | May 18-20 | In partnership with COLCIENCIAS

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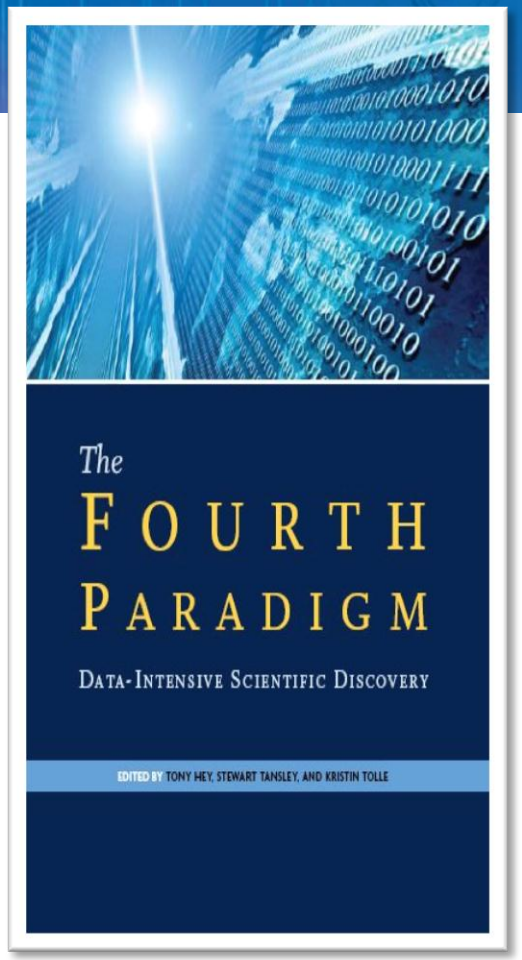
Visualizing Scientific Data

Derick Campbell
Director of Engineering, Microsoft Research Connections

The Fourth Paradigm

- A thousand years ago – **Experimental Science**
  - Description of natural phenomena
- Last few hundred years – **Theoretical Science**
  - Newton's Laws, Maxwell's Equations…
- Last few decades – **Computational Science**
  - Simulation of complex phenomena
- Today – **Data-Intensive Science**
  - Data sets from many sources…
  - Data captured by instruments
  - Data generated by simulations
  - Data generated by sensor networks



http://fourthparadigm.org

http://blogs.nature.com/fourthparadigm

Chauvet Cave art from southern France (32,000 years ago)

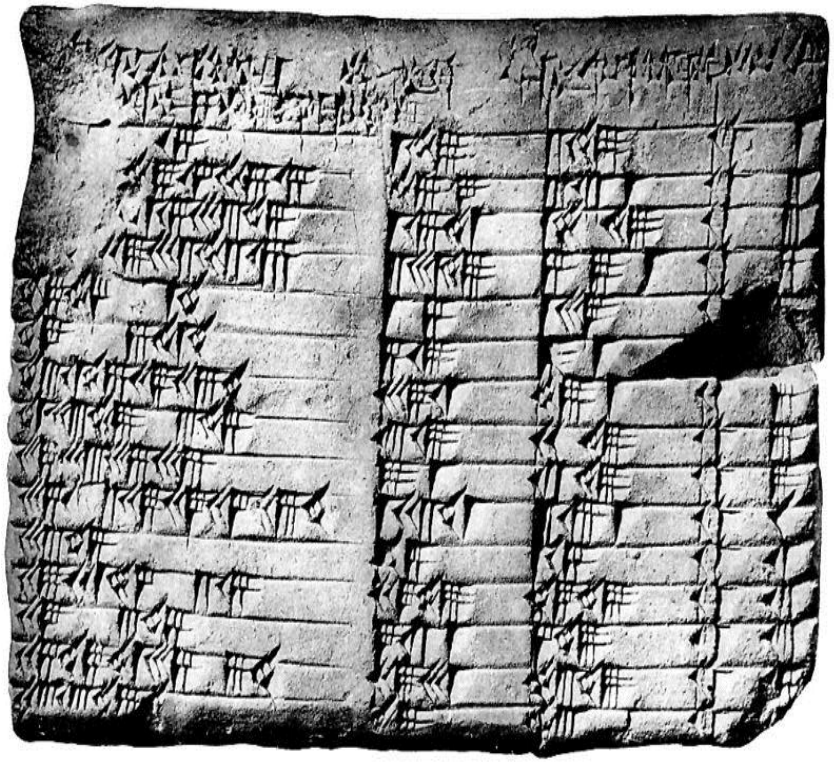
Contains the earliest known paintings.

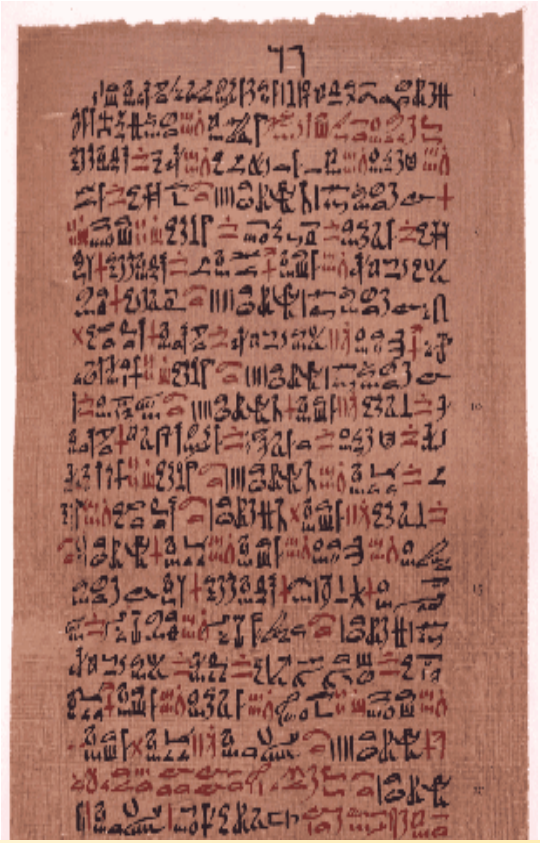
Stone tablet from northern Spain (14,000 years ago)

Contains the earliest known representation of a landscape.

Babylonian Clay Tablet - Plimpton 322 (1800 BC)

Early example of Babylonian mathematics.



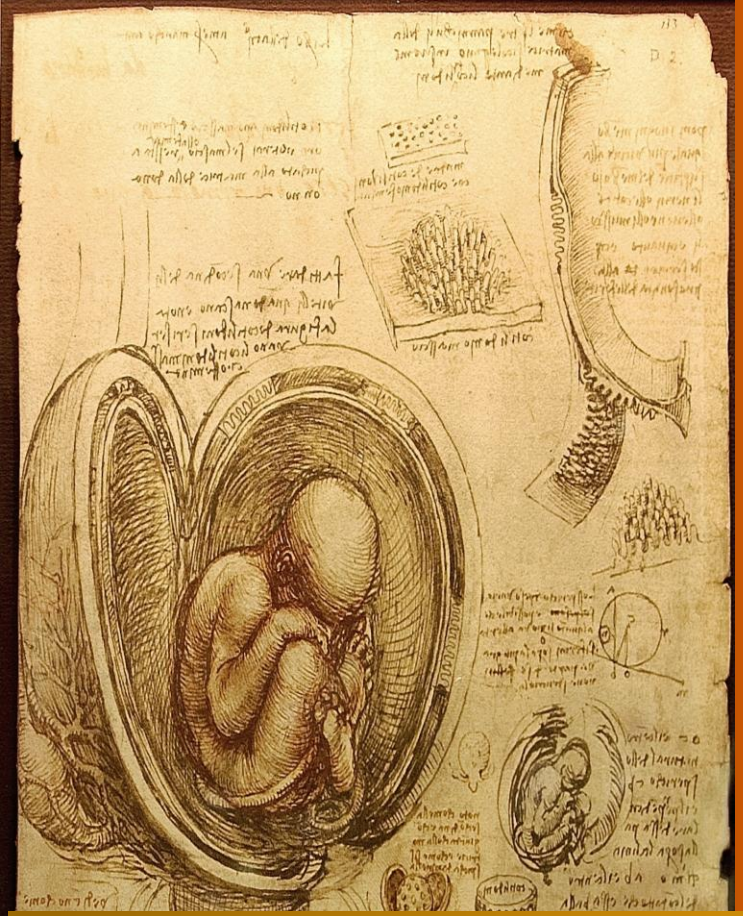


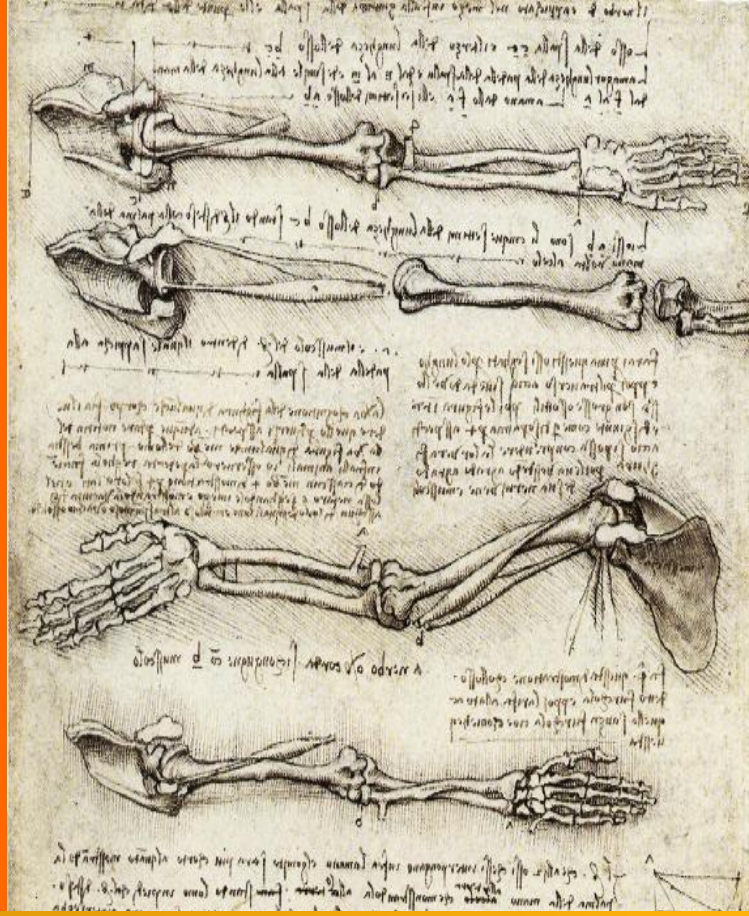
Ebers Papyrus (1500 BC)

Asthma prescription on Egyptian medical papyrus.

Cantino World Map (1502)

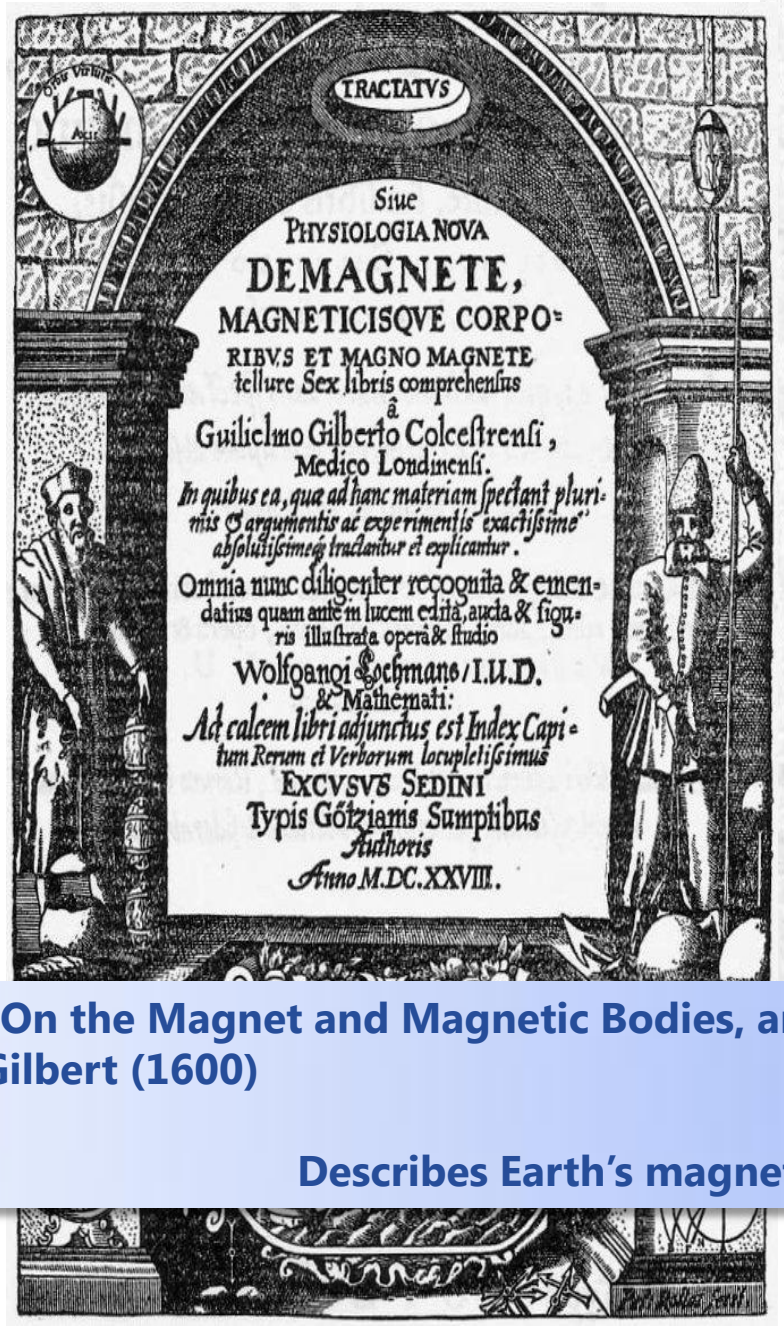
Earliest known map showing Portuguese discoveries of the east and west.

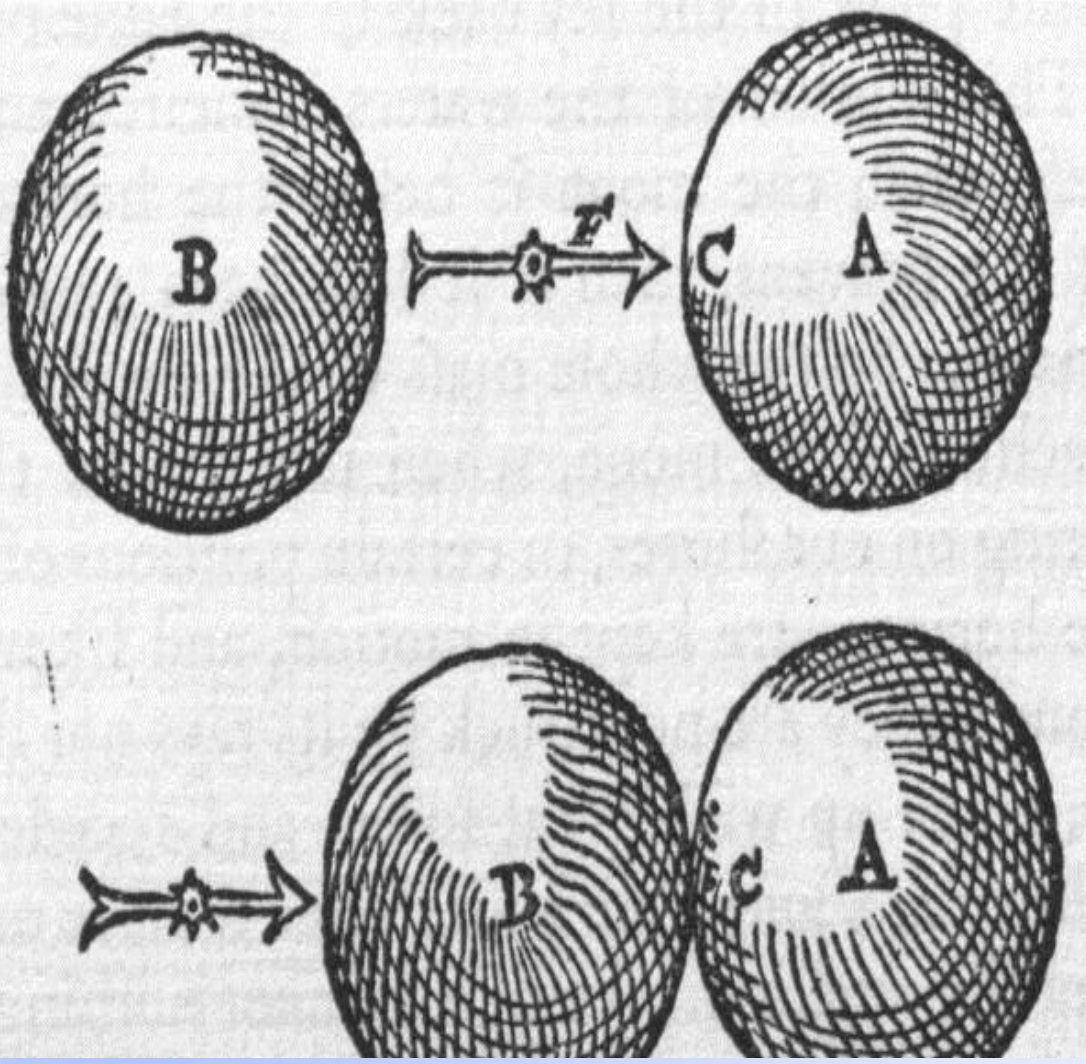




Leonardo da Vinci (1452-1519)

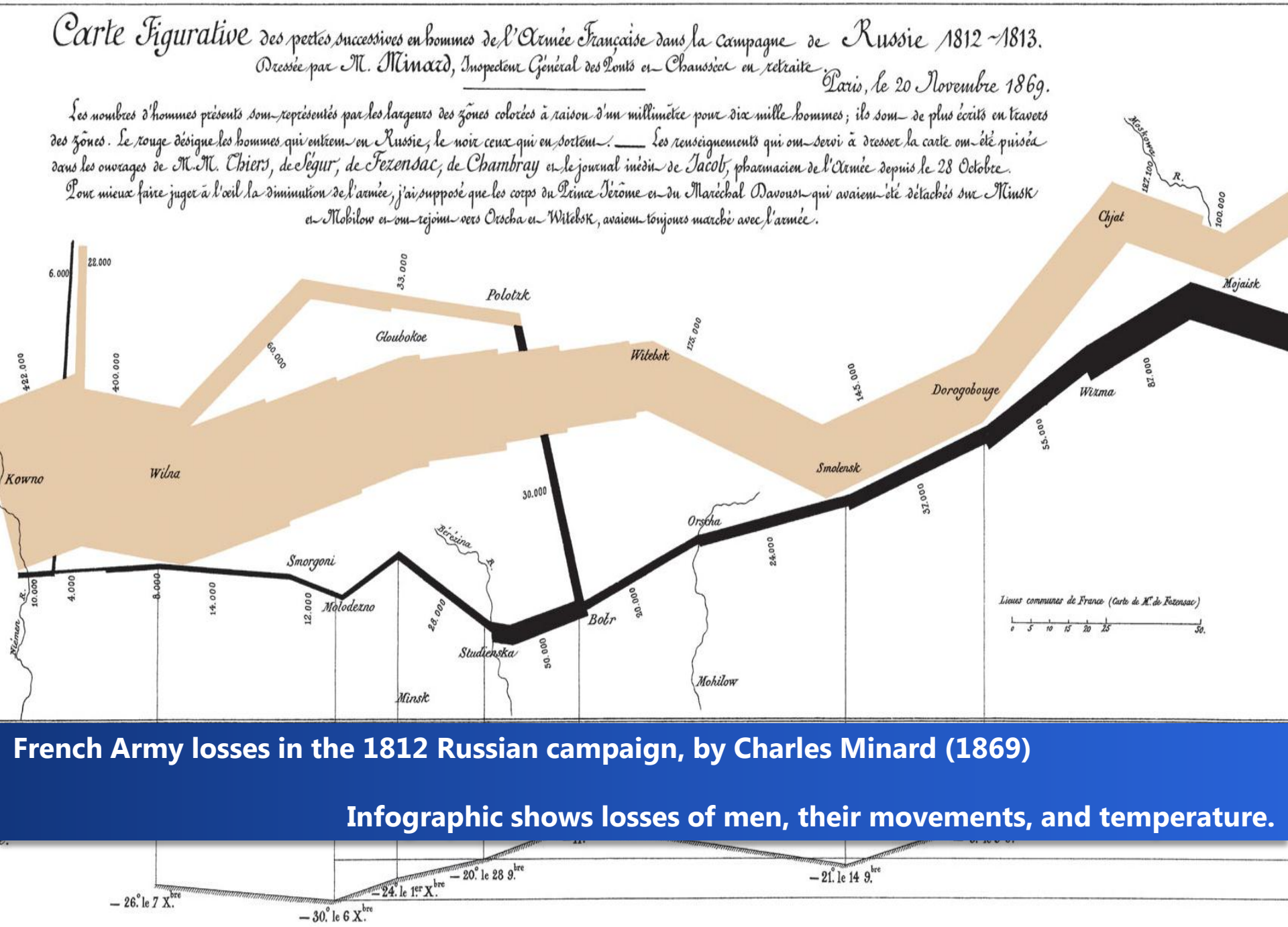
Leonardo's drawings in science and engineering are as impressive as his artistic work.





"On the Magnet and Magnetic Bodies, and on That Great Magnet the Earth" by William Gilbert (1600)

Describes Earth's magnetic field. Begins the modern science of geomagnetism.

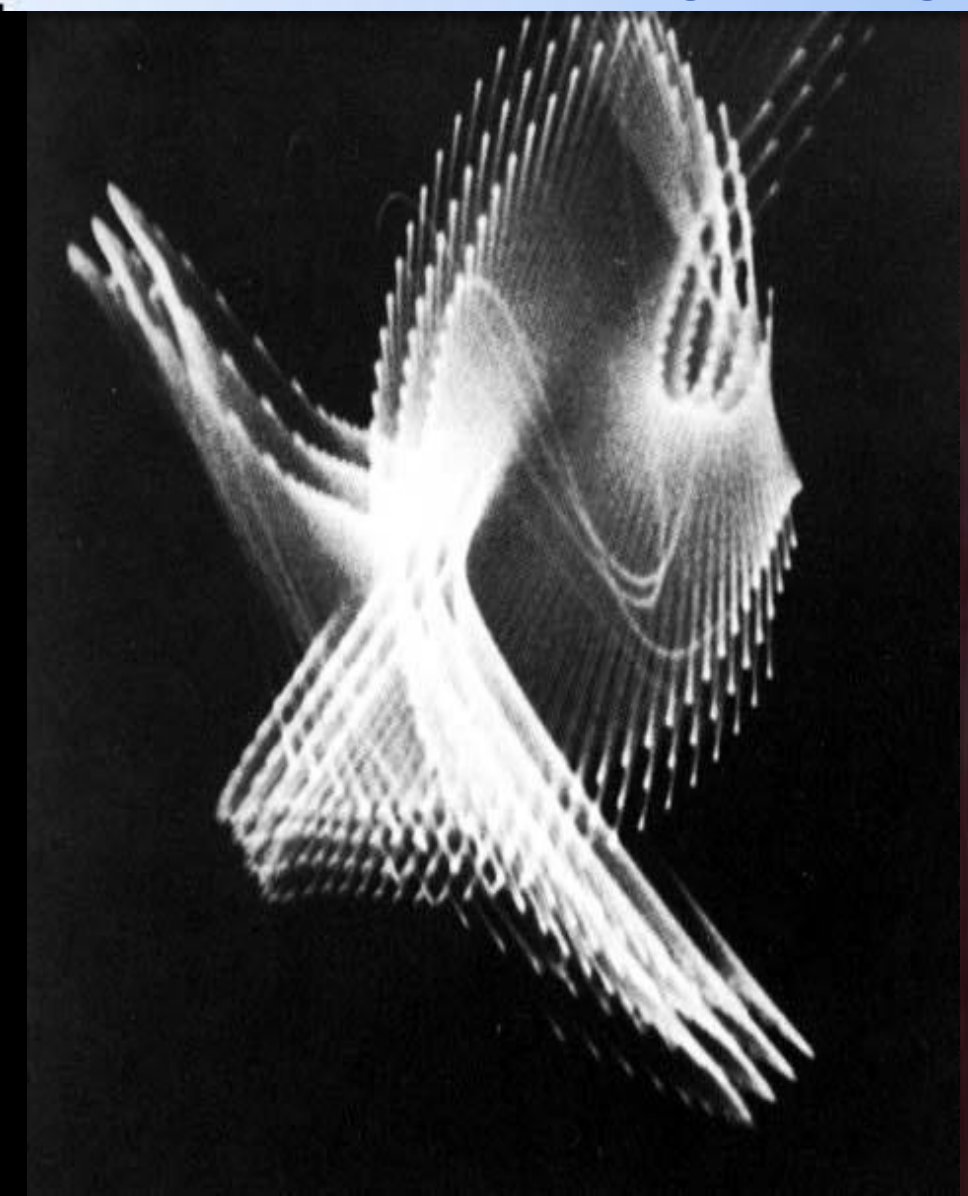


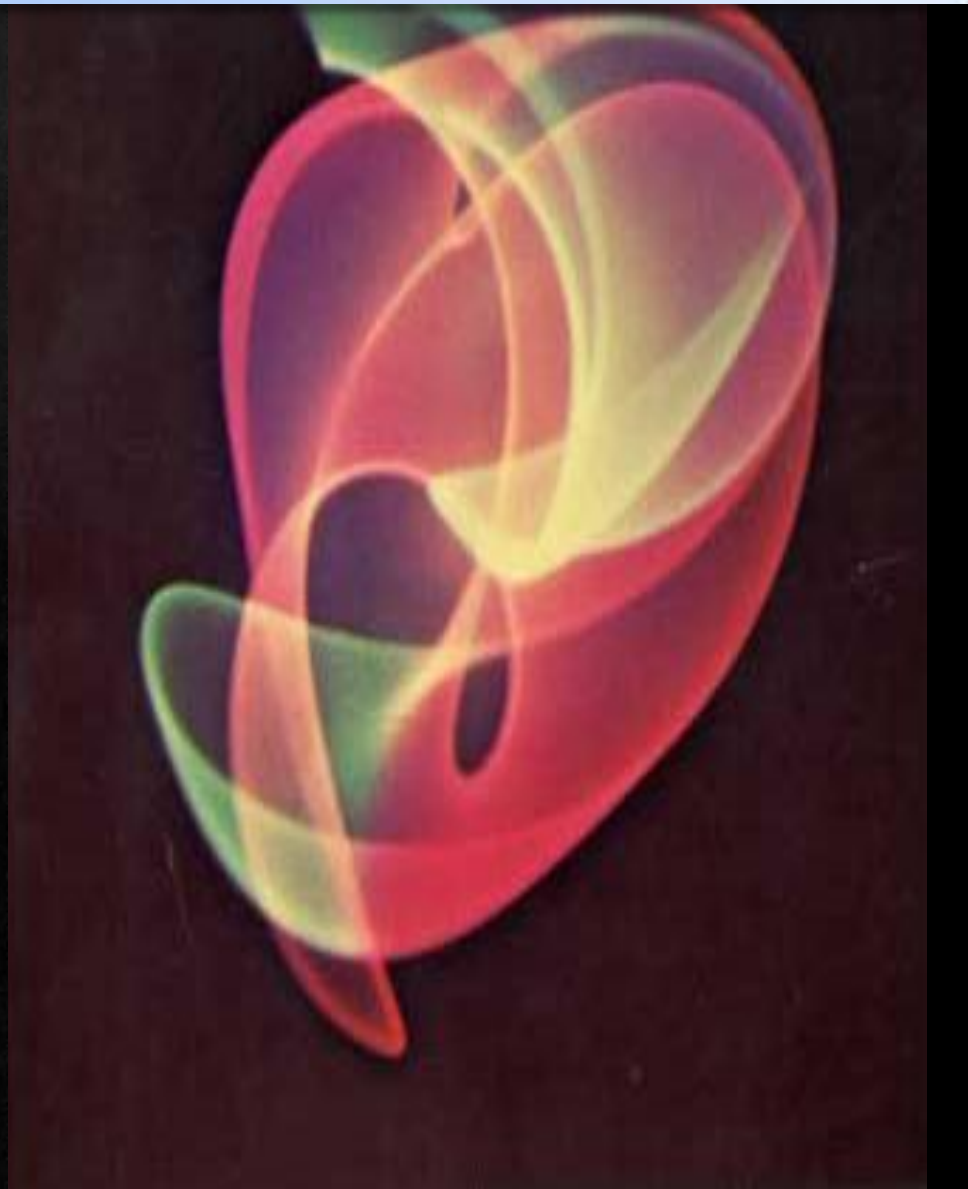
French Army losses in the 1812 Russian campaign, by Charles Minard (1869)

Infographic shows losses of men, their movements, and temperature.

Oscillons, by Ben Laposky (1950)

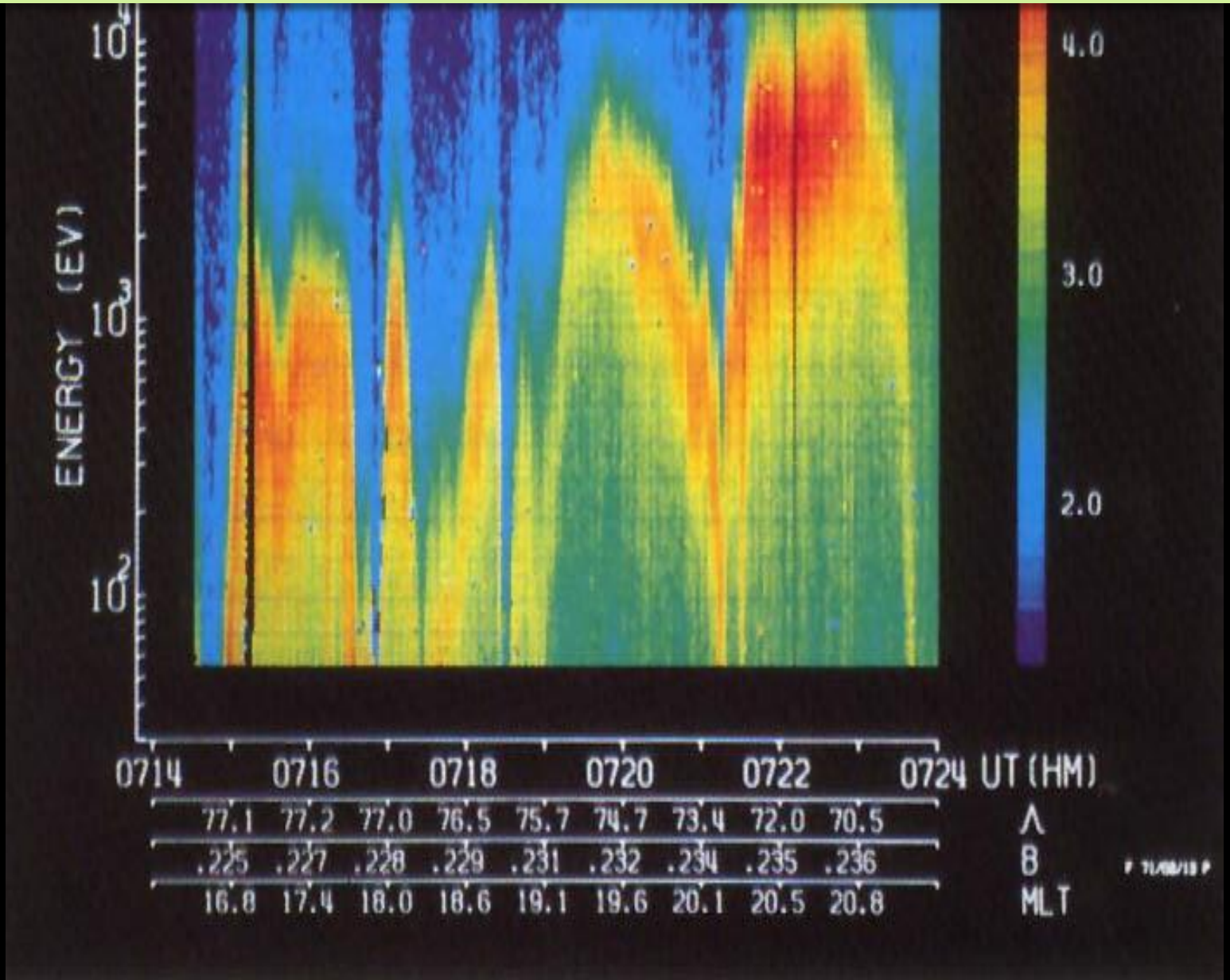
The first graphic images generated by an electronic (analog) machine.





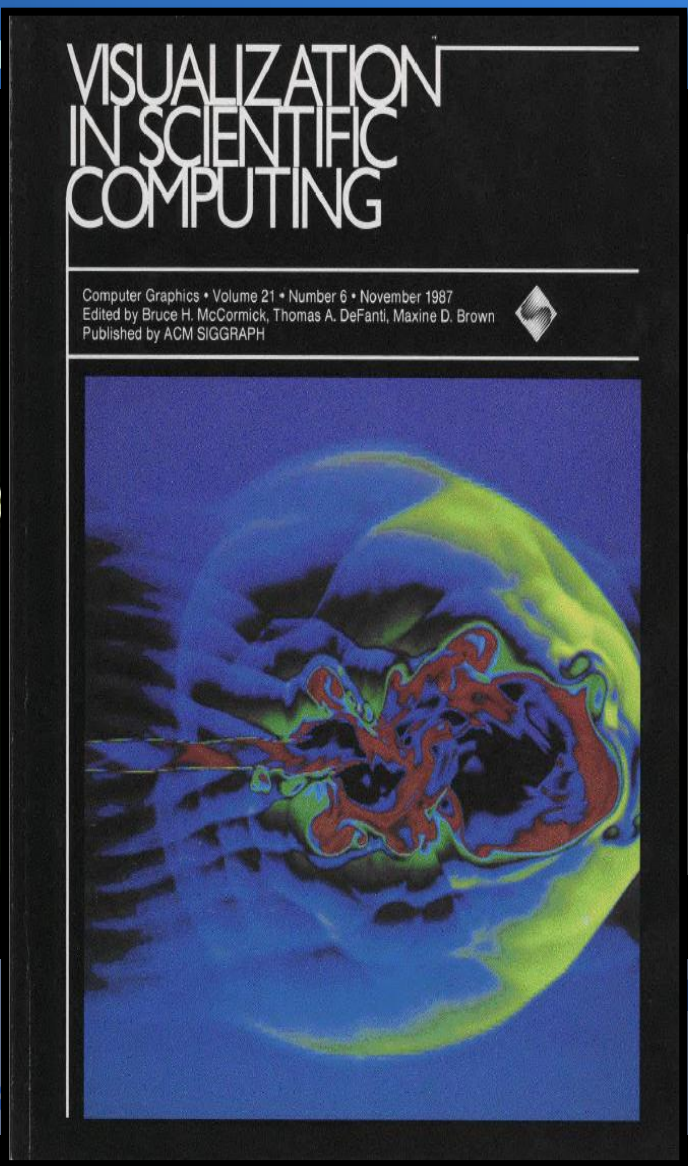
Energy Spectra of Spacecraft Plasma, Dr. Louis Frank (1969)

One of the earliest color visualizations done by computer.



Sorting out Sorting, Ron Baeker (1981)

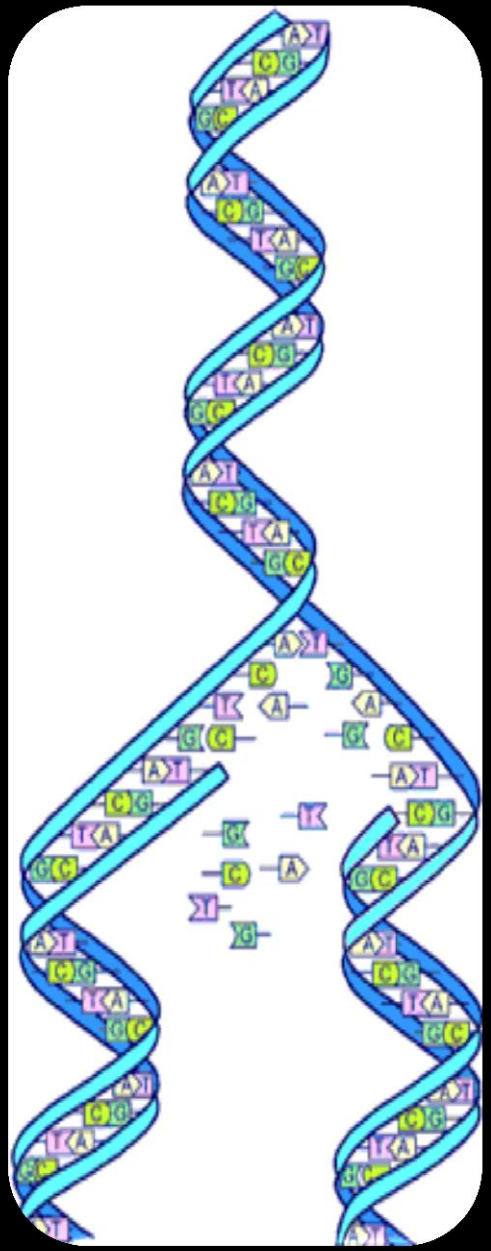
Visual demonstration of sort

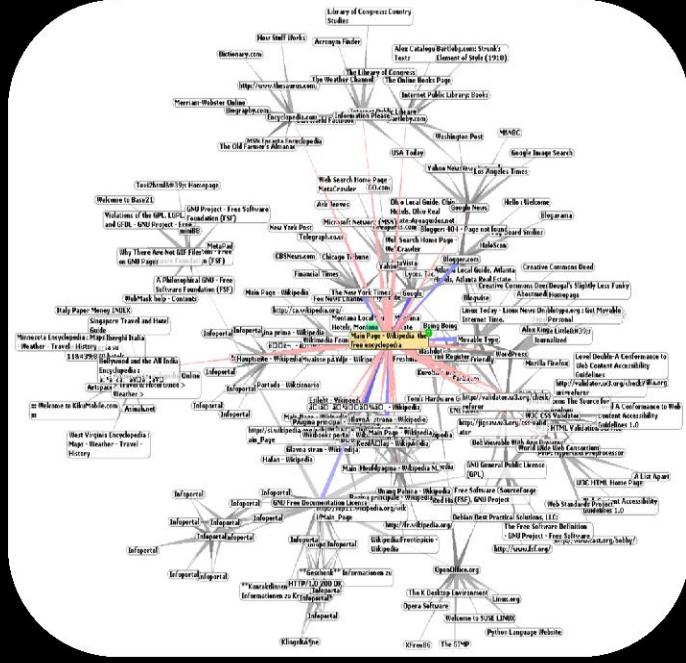


B

lume Visualization, Pixar (1987)

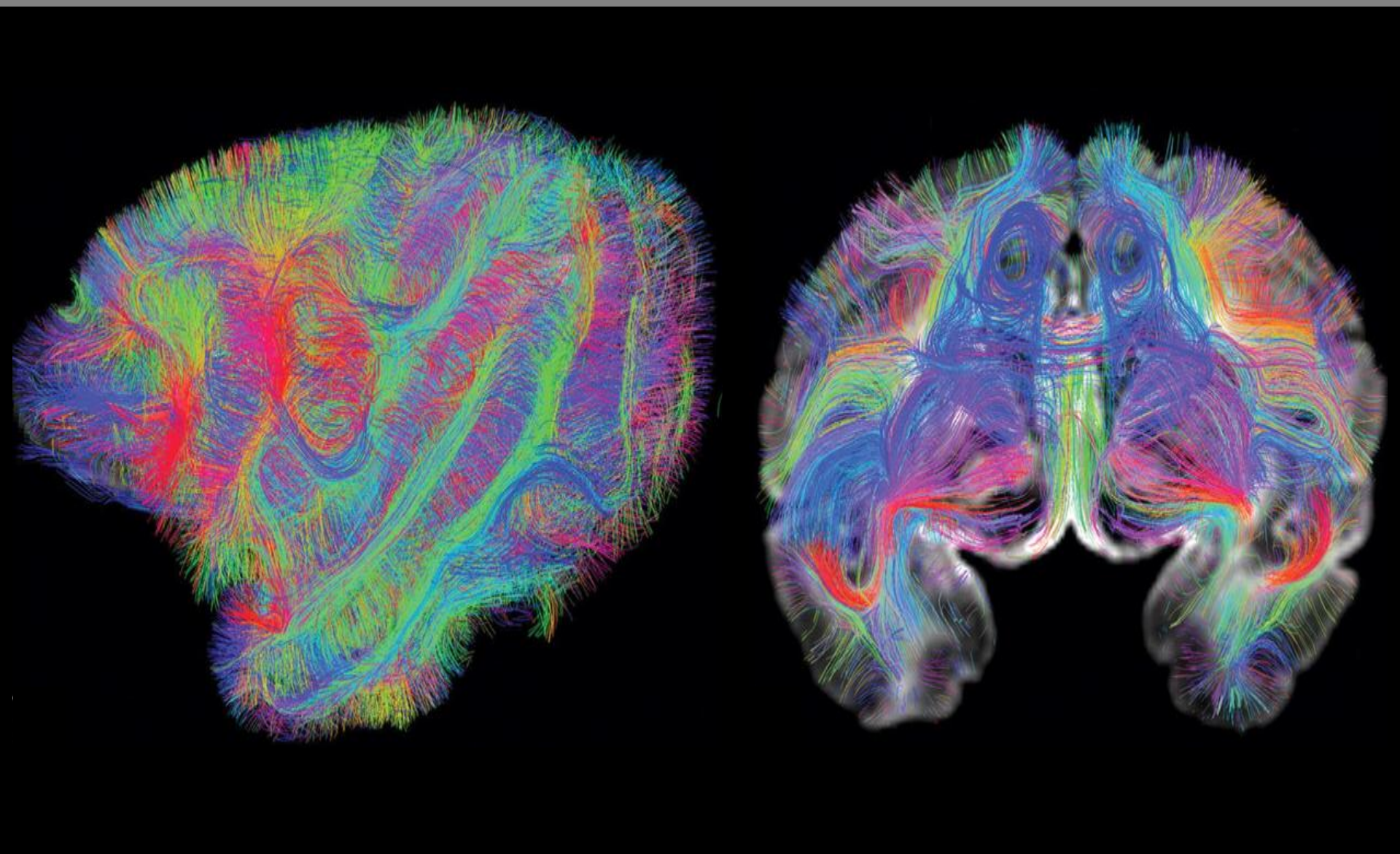
Pixar sold high-end computers.

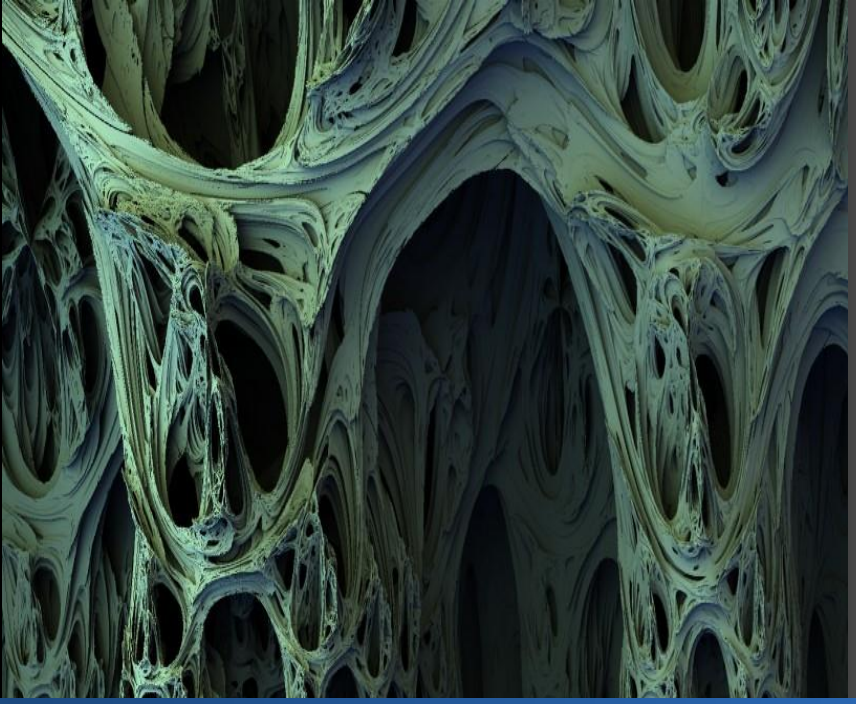




DSI Data Set of a Monkey Brain, by Schmahmann J D et al. (2007)

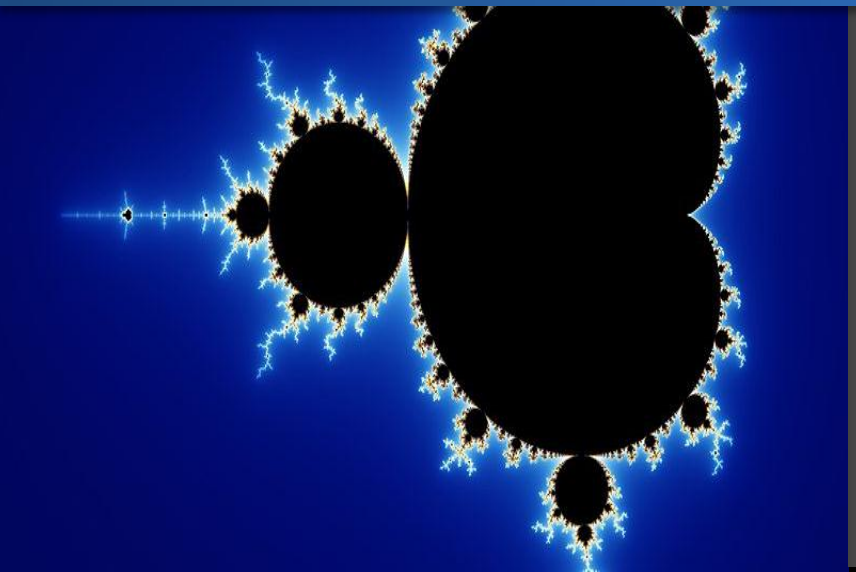
Fibre pathways shown through diffusion spectrum imaging.





3D Mandelbulb, by Daniel White (2009)

A 3D version of the 2D Mandelbrot set discovered 30 years earlier



Visualizing Friendships, by Paul Butler (2010)

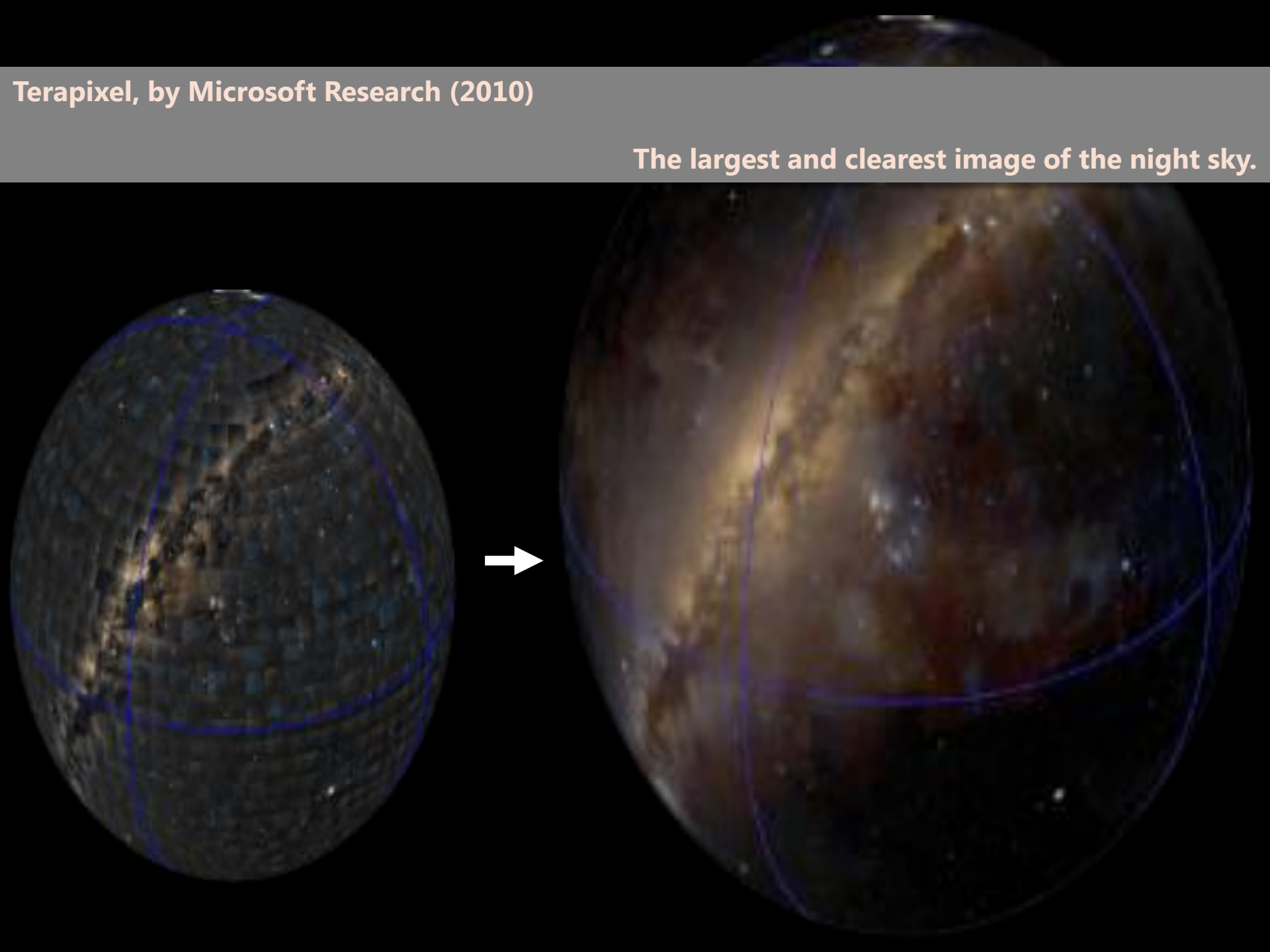
A social graph of 500 million friendships.

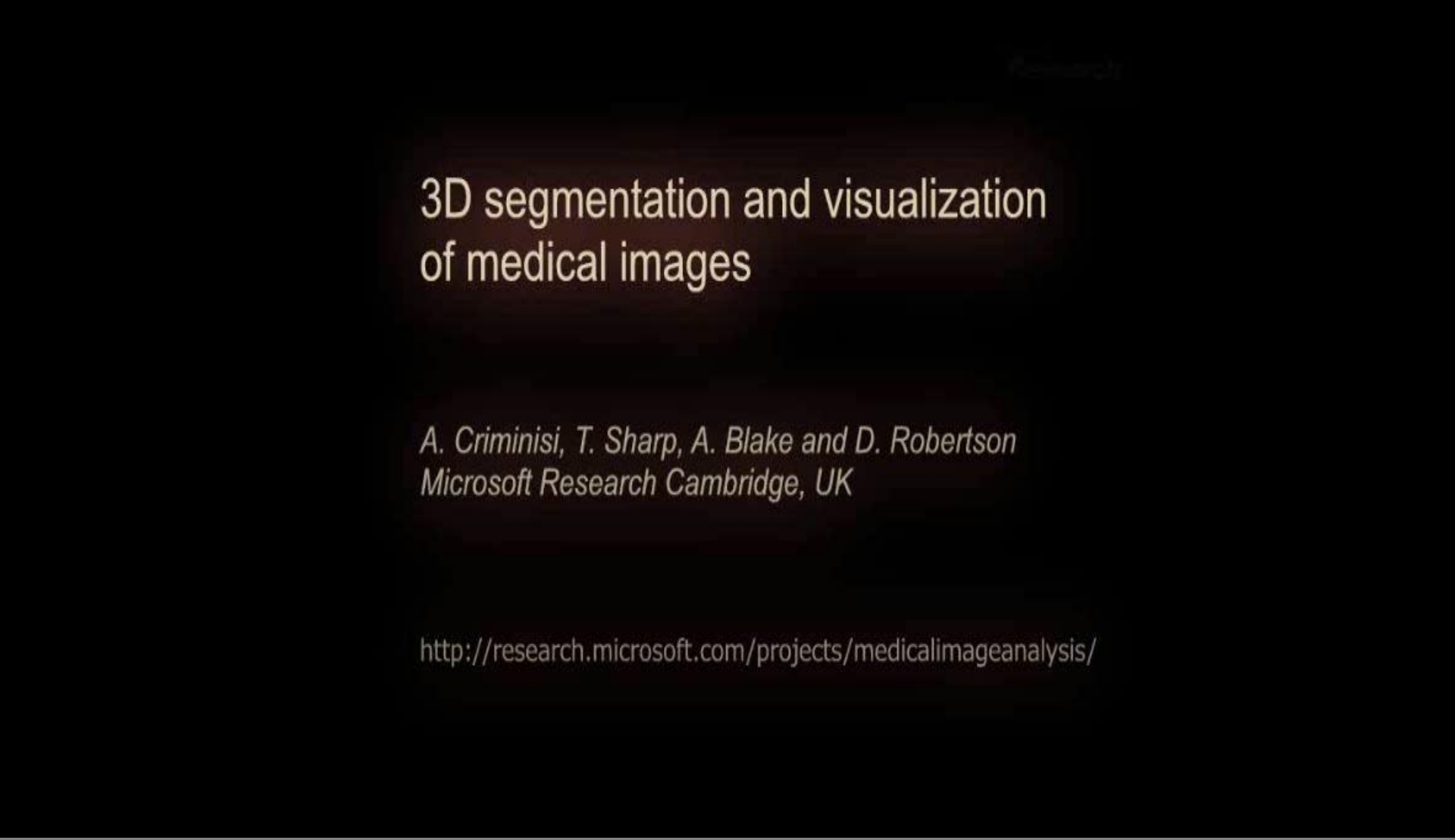
BlogHer 2010: Influential Twitter Users, by Marc Smith (2010)

Social network graph created with Excel and NodeXL.

Terapixel, by Microsoft Research (2010)

The largest and clearest image of the night sky.

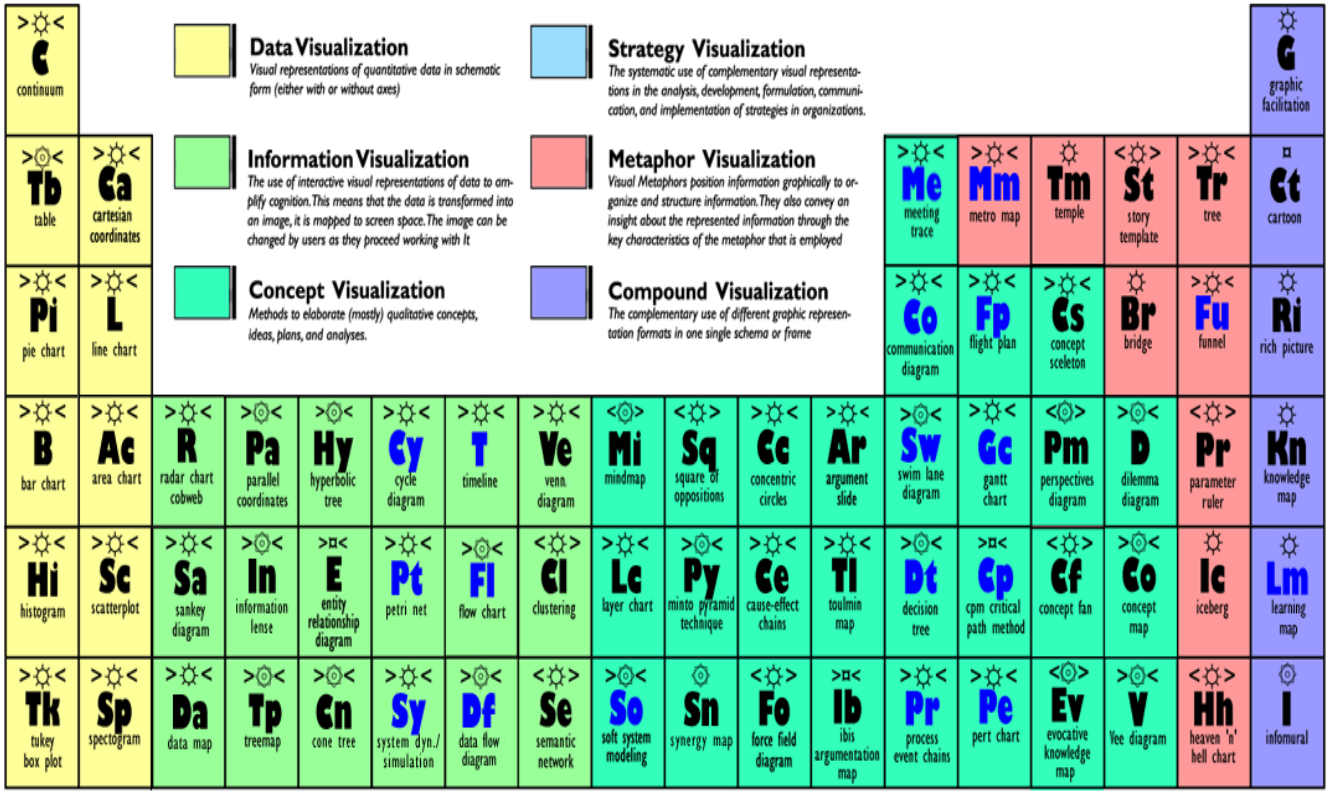




Medical Image Analysis, by Microsoft Research Cambridge (2011)

Interactive segmentation and identification of patient scans.

A PERIODIC TABLE OF VISUALIZATION METHODS



Cy **Process Visualization**

Hy **Structure Visualization**

☼ **Overview**

¤ **Detail**

⊙ **Detail AND Overview**

< > **Divergent thinking**

> < **Convergent thinking**

Note: Depending on your location and connection speed it can take some time to load a pop-up picture.

version 1.5

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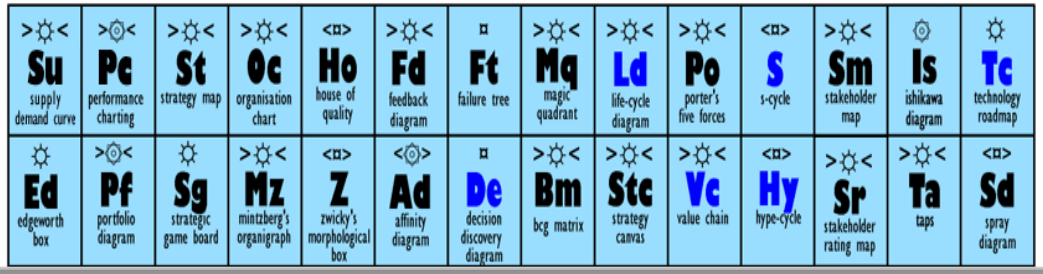
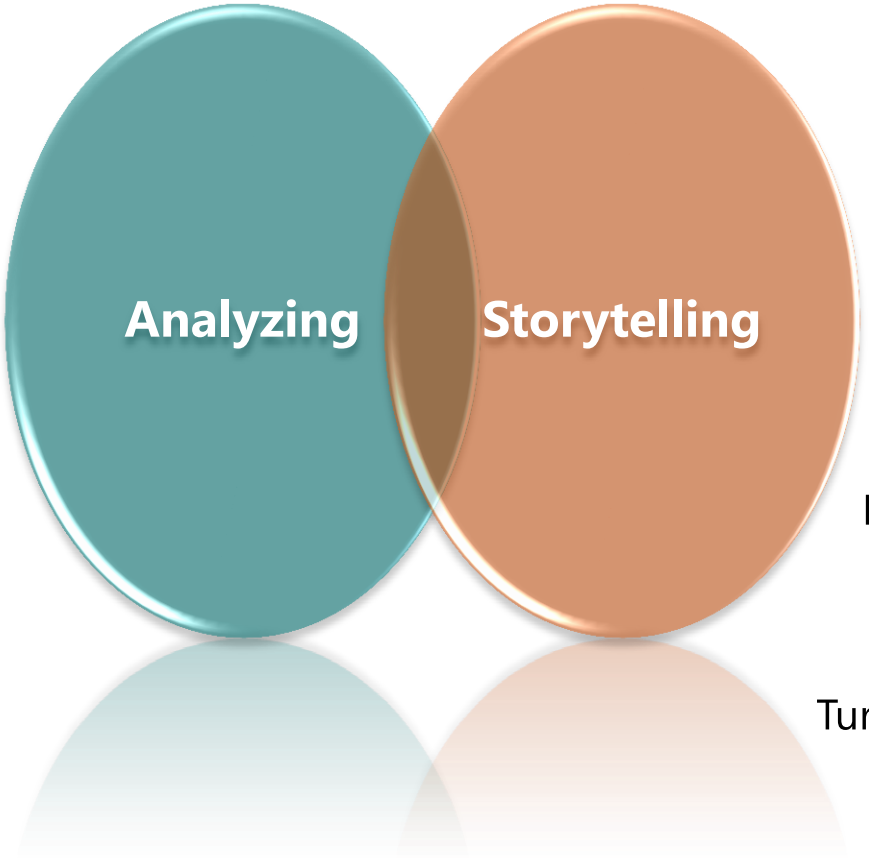


Individual research and analysis

Turns data and information into **my** knowledge



Publishing and sharing

Teaching and learning

Turns data and information into **our** knowledge

Microsoft Research visualizations in the near future…

Rich Interactive Narratives

This is a preview of the Rich Interactive Narratives technology created by Microsoft® Research. The narratives are best experienced in full-screen mode with an internet connection speed of 2 Mbps or higher.

MICROSOFT RESEARCH TECHFEST 2011

Jump in and explore 17 of Microsoft Research's most exciting projects on display during TechFest 2011. This Rich Interactive Narrative enables you to delve more deeply into the research through the eyes and ears of the researcher—all made possible by the use of Microsoft Research technologies.

ChronoZoom: History in its broadest possible context

Challenge: The exploration of Big History, with smooth transition from billions of years down to individual nanoseconds.

This is what Walter Alvarez, Professor of Earth and Planetary Science at University of Berkeley set out to do. And he did it, with the help of Microsoft Research and the Live Labs team.

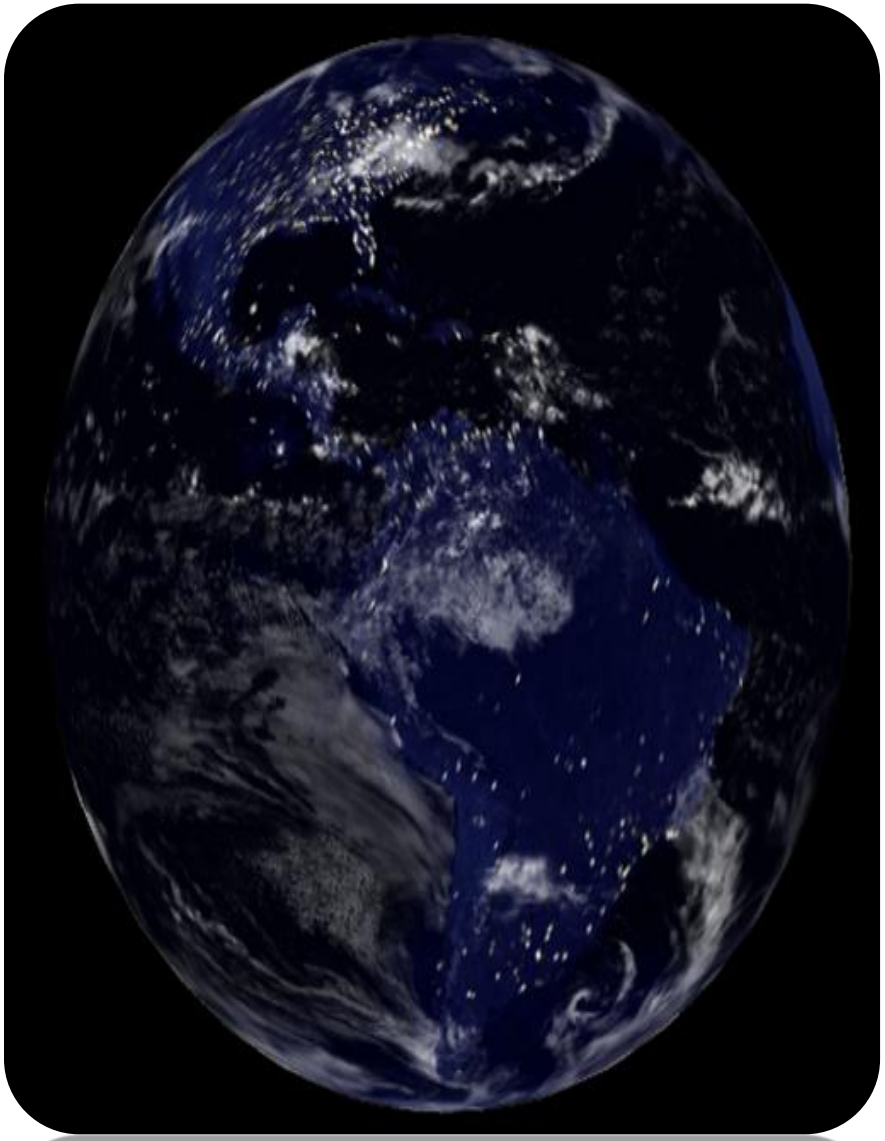
A service that allows researchers to browse, overlay, and explore interdisciplinary data sources

ChronoZoom: History in its broadest possible context

Worldwide Telescope | Earth

- A seamless visual environment
- Sky and earth-based visualizations
- Create and share tours of your data

Introducing an Excel Add-in for geo-spatial data visualizations



Cooperation through the sharing of data and information generates new knowledge.

“If I have seen a little further it is by standing on the shoulders of Giants.“

– Issac Newton, 1676

http://research.microsoft.com/Accelerators

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