

# Openness and Collaboration

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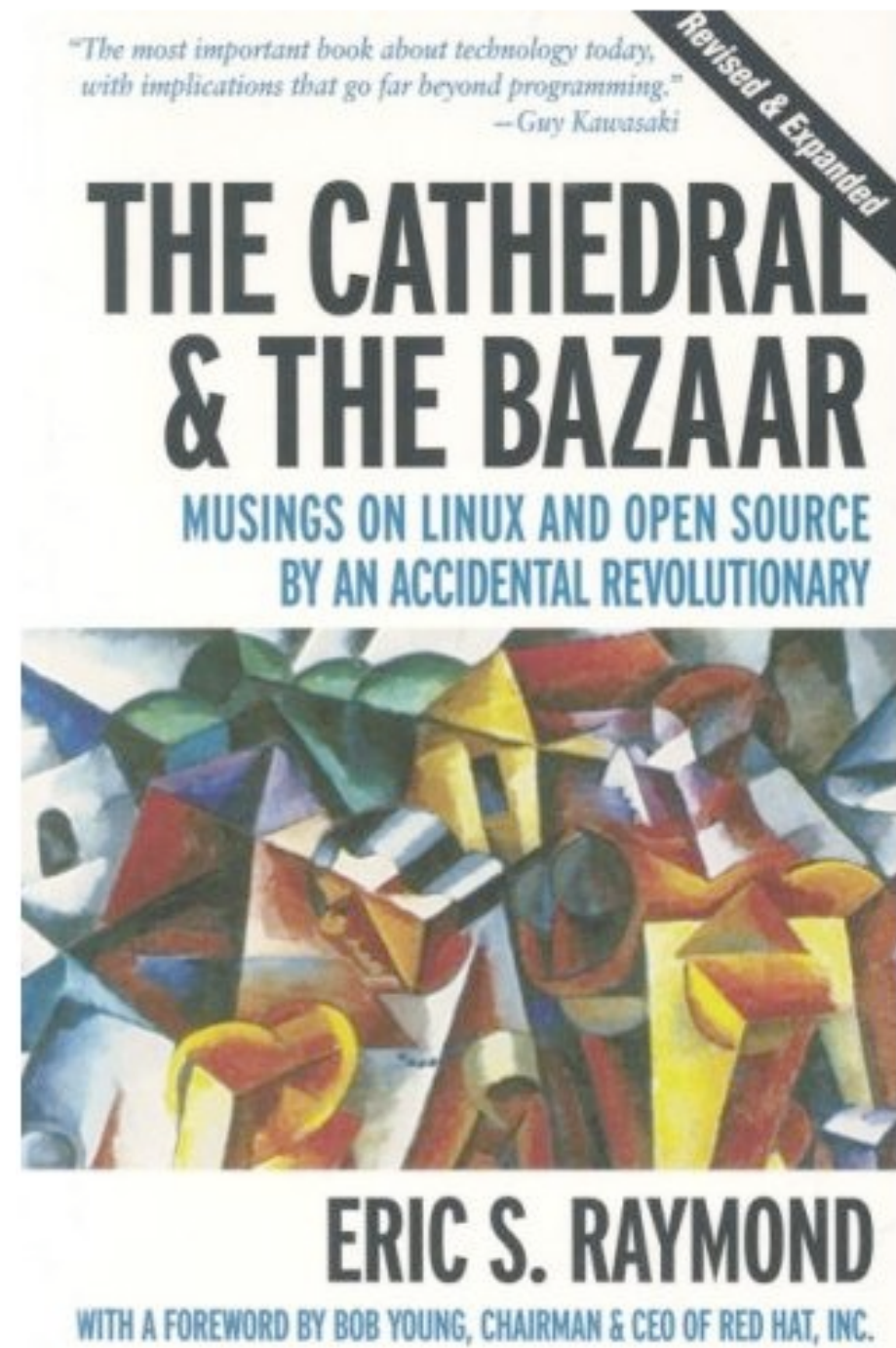
# Open Source

- The Open Source Movement began in the late 80s with the launching of the GNU project by [Richard Stallman](#).
- Freedom of Speech v.s. Free Lunch
  - *you should think of "free" as in "free speech", not as in "free beer."* (Richard M. Stallman)
- Copyright v.s. CopyLeft
- Open Source Software: Software in the public interest and compliant to GPL.
- Larry Lessig: **Current Copyright Law hampers Creativity!**
- Is it possible to generate profit from Open Source?

# Cathedral and Bazaar

## (Eric S. Raymond)

- Self-organised software development paradigm
- **Linus' Law: Given enough eyeballs, all bugs are shallow!**
- Many people doubted that this model can produce real innovative S/W
- Insight comes from creative individuals (capable ones are abundant globally) and the paradigm shifts of Internet and service model drives the spontaneous Bazaar style for truly innovative work.



# Copyright and Patent

- Originally, copyright protects media and patent protects ideas! Originally, a short term protection only.
- Why?
- Most of your ideas or knowledge are either learnt or borrowed from others! Often even your own innovation is inspired by someone.
- If I have seen further than others, it is by standing upon the shoulders of giants. - Issac Newton
- The purpose of openness is to [share and collaborate easily](#).

# Competition vs Collaboration

How could collaboration be possible if  
only the fittest survives?

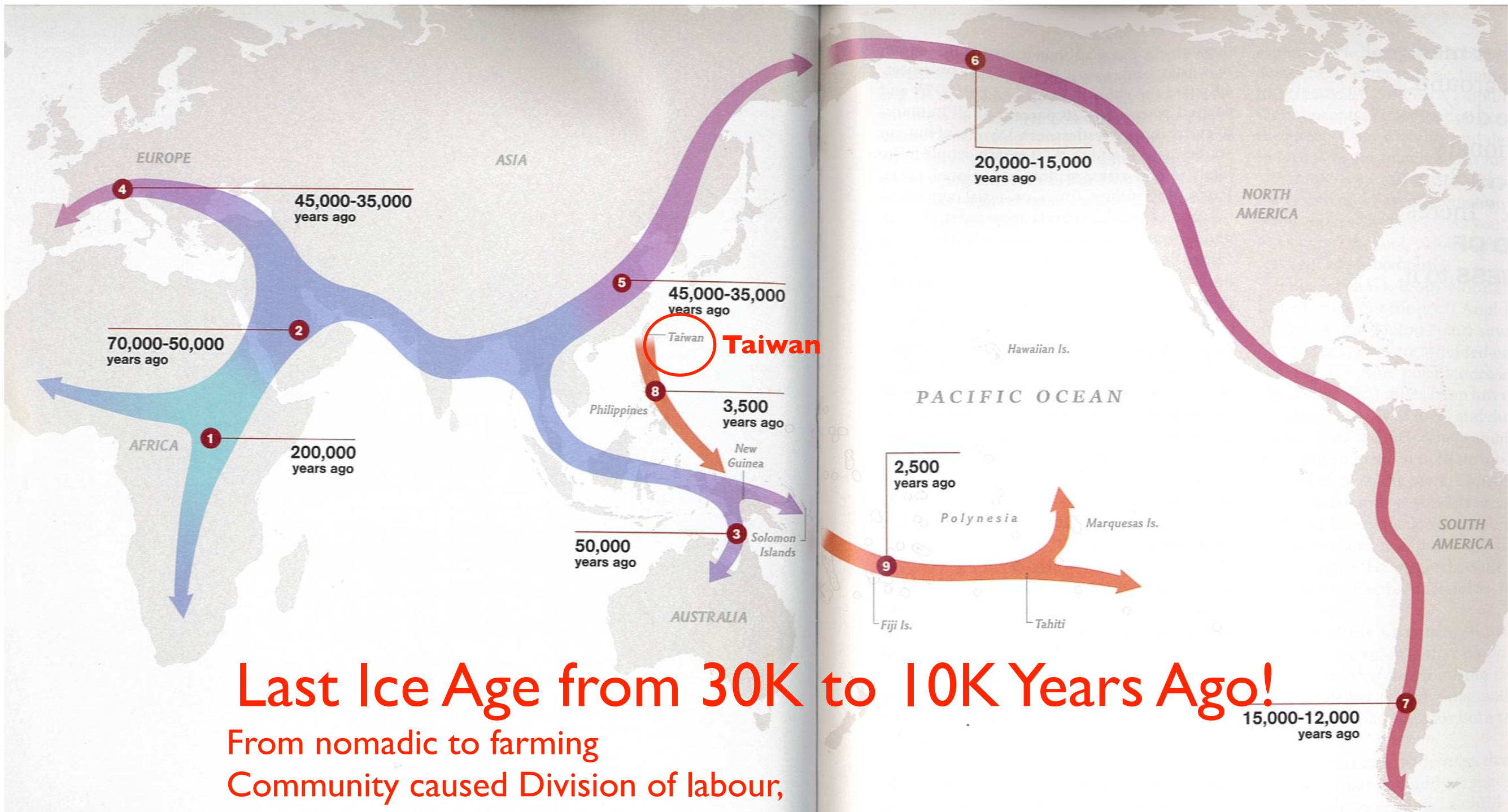
# Prisoner's Dilemma and Tit For Tat

- Due to the suspicious nature of the prisoners, it always ends up with the worst outcome!
- Robert Axelrod wanted to repeat Prison's dilemma in order to generated the Cooperative Strategy without Central Authority!
- Anatol Rapoport came out a Tit-for-Tat strategy that is nice, forgiving and retaliatory!
- Great impact to social sciences and anthropology. People try to develop New Economy theory where this new form of cooperation creates New Form of Wealth!

# What are the areas to Collaborate?

- University of Adelaide claims their curriculum are based on 10 Big Questions
- How did the Universe begin? How does the Earth work?
- What is Life? How did life evolve on Earth?
- How do we unravel the causes of disease? Why does Climate change?
- How can we feed the World sustainably? How can we reduce our reliance on fossil fuels?
- How will we conserve species diversity? Where will the nano-science revolution take us?





## Last Ice Age from 30K to 10K Years Ago!

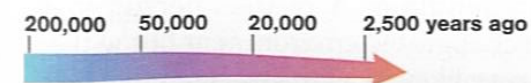
From nomadic to farming  
Community caused Division of labour,  
Demand and supply, Trading, formation of Township

### GLOBAL JOURNEY

Once modern humans began their migration out of Africa some 60,000 years ago, they kept going until they had spread to all corners of the Earth. How far and fast they went depended on climate, the pressures of population, and the invention of boats and other technologies. Less tangible qualities also sped their footsteps: imagination, adaptability, and an innate curiosity about what lay over the next hill.

- Migration of Homo Sapiens inspires ones to appreciate the importance of empathy to other Cultures!

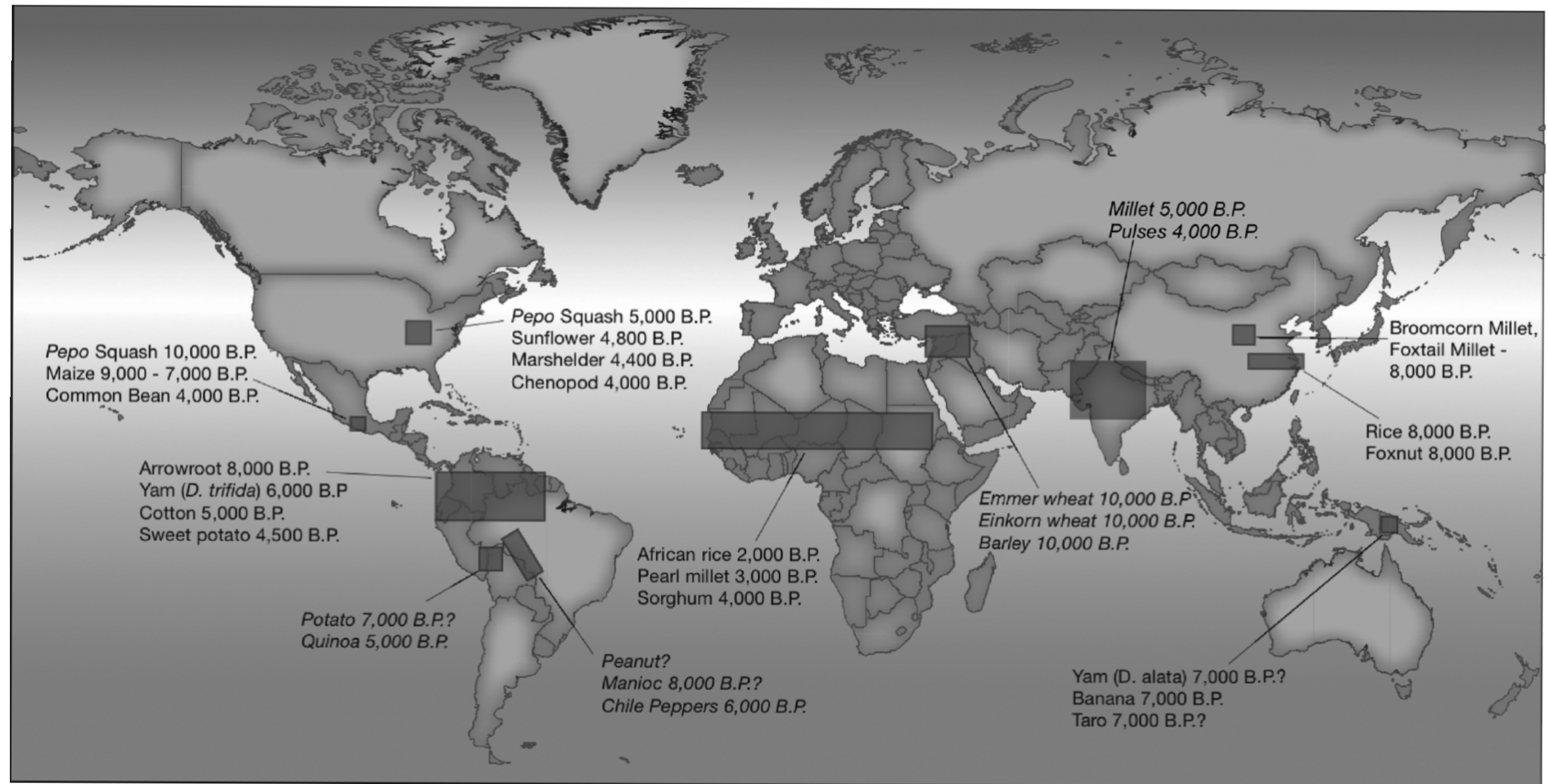
Generalized route with migration dates



MAP: INTERNATIONAL MAPPING  
SOURCES: CHRIS STRINGER, NATURAL HISTORY MUSEUM, LONDON



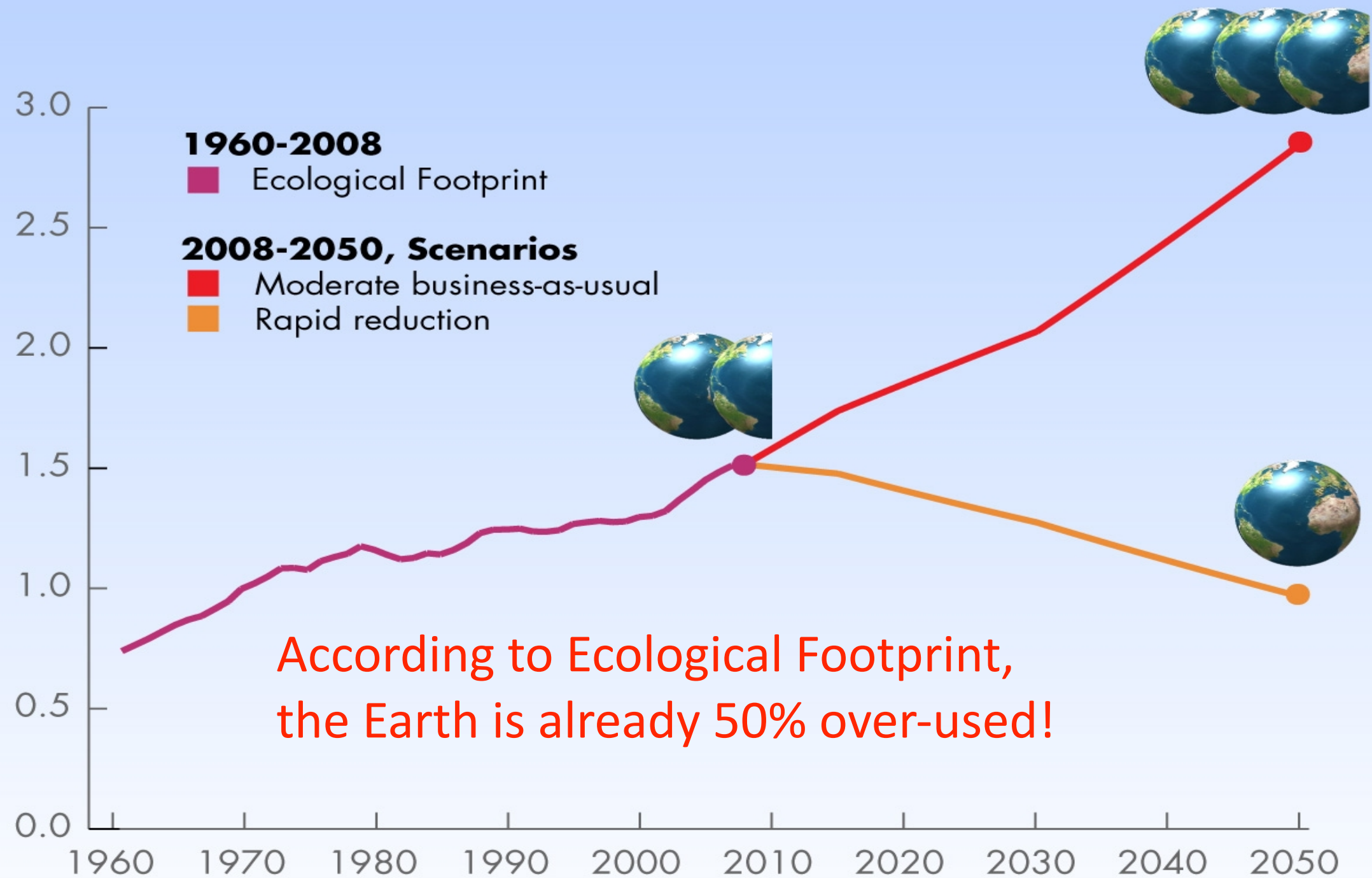
# Nikolai Vavilov's Centers of Origin and Diversity



# Amazing Achievements of Industrial Revolution

- Since the Industrial Revolution for the last 250 years
- Most of the infectious diseases were controlled. Life expectancy from 30 to 70 years globally
- Global adult literacy increased to over 80%
- Food production has outgrown population growth. Food consumption per capita increases 35% globally since 1950

# Ecological Footprint



*y-axis: number of planet earths, x-axis: years*

Source: <http://www.footprintnetwork.org>

# Global Issues of the Mankind

- Population growth
- Food
- Environment
- Energy
- Climate and weather
- Natural Disasters
- Culture and Bio-diversity, etc

# The Earth is On Fire!



**Global warming**

**Earthquakes**

**Climate  
change**

**Air quality**

**Fresh water**

**Volcanoos**

**Ocean acidification**

**Energy**

**Deforestation**

**Epidemic  
diseases**

**Biodiversity loss**

**Tsunami**

**Food supplies**



# Our World is Out of Balance!

- Severe imbalance between people and Planet Earth; Great inequality between people
- The 50% poorest people own 1% of global wealth; the 1% richest people own 40% of global assets. Women earn only 10% of global income.
- Modern medicine has answers to many diseases, yet millions die every year of curable disease.
- Many developed nations produce surpluses of food, while close to a billion people suffer from hunger

# Vision2050

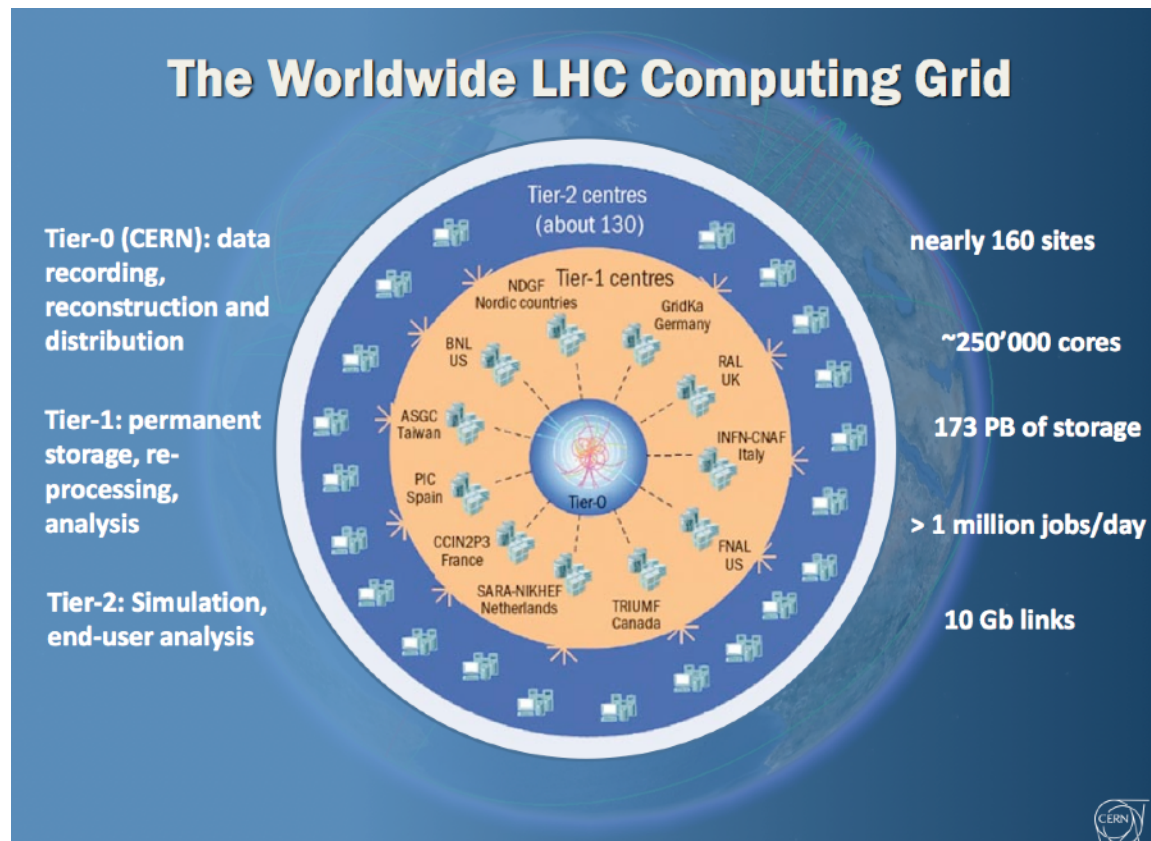
**We need a long term vision of a sustainable world in which, by mid-century, 9 billion people can live a decent quality of life within the planet's limited resources**

**How can we sustain if humanity cannot sustain?**





# Most Significant Data Intensive Science Paradigm: LHC Experiments



Global Effort → Global Success

Results today only possible due to extraordinary performance of accelerators – experiments – Grid computing

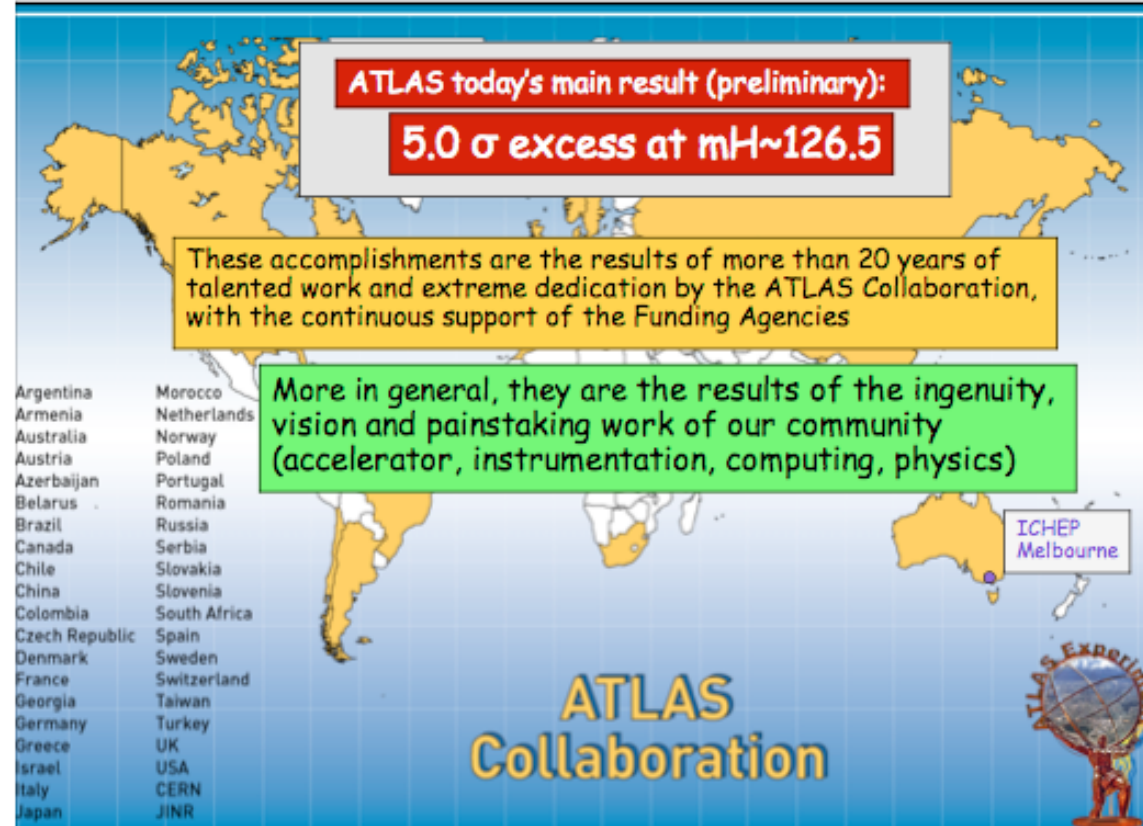
Observation of a new particle consistent with a Higgs Boson (but which one...?)

Historic Milestone but only the beginning

Global Implications for the future



R-D Heuer



July 9<sup>th</sup> 2012 ICHEP CMS Higgs J. Incandella for the CMS COLLABORATION

## Conclusion

We have observed a new boson with a mass of **125.3  $\pm$  0.4 (stat)  $\pm$  0.5 (syst)** at significance level of 5  $\sigma$

- The LHC is the first particle accelerator to be built in the 21st century
- The Project started in earnest in 1987 with Rubbia's Long Range Planning Committee recommending the LHC as the right choice for CERN's future.
- Great appreciation of the work of teams that built and now operate the magnificent LHC accelerator
- The CMS experiment is a tribute to the vision of its founders, the dedication of all of its thousands of collaborators in constructing and preparing the experiment in terms of hardware, software, computing, and physics analysis, and now the ones who operate and analyze the data (mostly young scientists!).



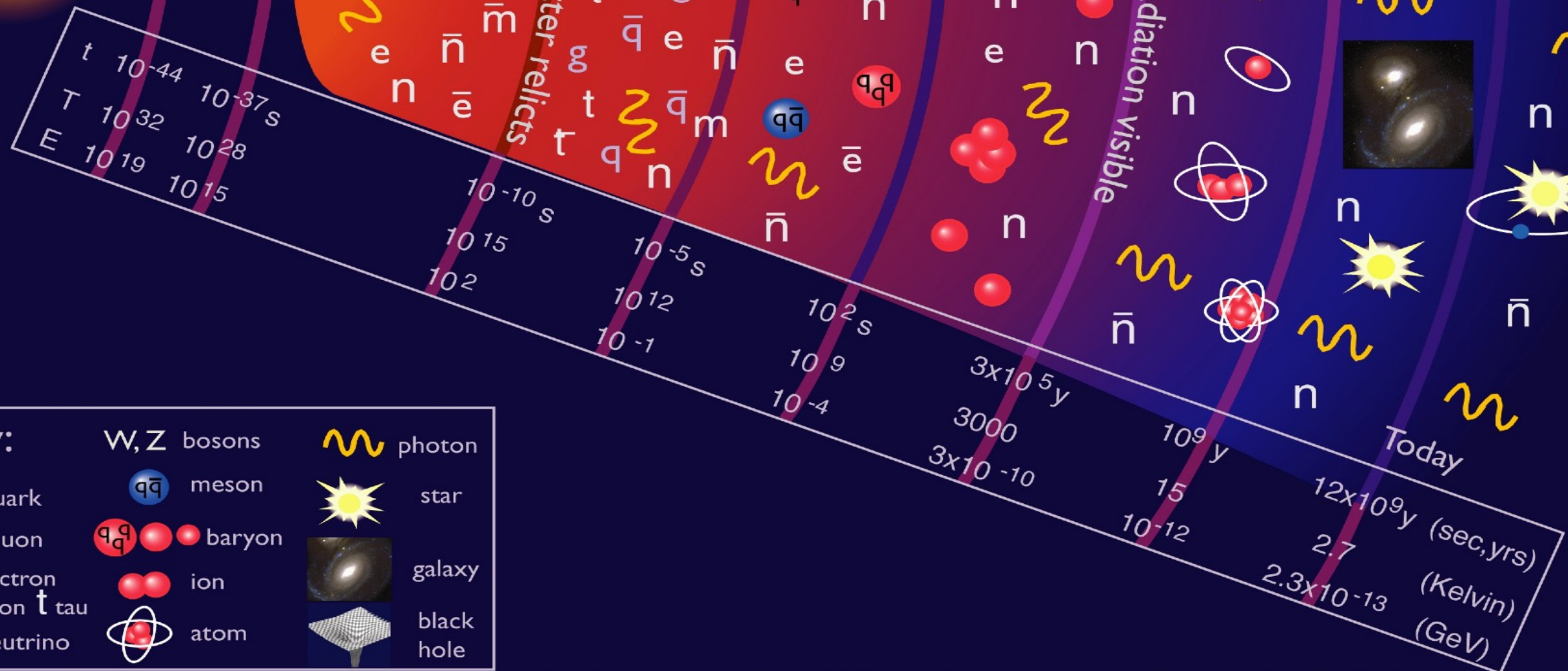
# History of the Universe

Higgs 存在所有粒子之前, 並能穿透時空

Accelerators: CERN-LHC  
FNAL-Tevatron  
BNL-RHIC  
CERN-LEP  
SLAC-SLC  
high-energy cosmic rays

Inflation

BIG BANG



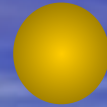
$$\Delta x \cdot \Delta p \geq \hbar$$

$$\Delta E \cdot \Delta t \geq \hbar$$



# Cosmic Inflation

baby universe



observable size of the Universe



$\times 10^{30}$  or more



**looks perfectly  
smooth & flat**

explains  
"homogeneity" & "flatness"

**birth of mega-size  
universe**

quantum vacuum fluctuations are also stretched to mega scales  
and they become seeds for formation of stars and galaxies

# William Whewell

- One of the members of Philosophical Breakfast Club, who promoted the idea that Science is a Public Good!
- He organized the 1st Big Science experiment in the world!
- In July 1835, Whewell organized a great tide experiment where the tides were measured every fifteen minutes for a fortnight at over 650 tidal stations in nine countries, including Great Britain, France, and the United States. He used these simultaneous measurements to draw a map of co-tidal lines to determine the motion of the tide wave as it progressed in the oceans.

# **From Open Source to Open Data to Open Science**

**If I have seen further than others, it is by standing  
upon the shoulders of giants.**

*Issac Newton*