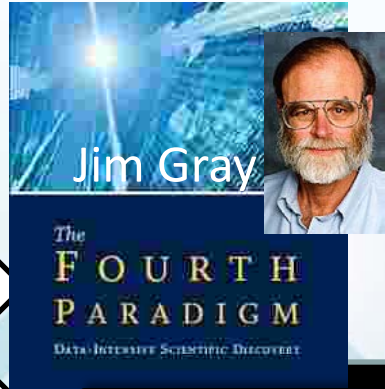
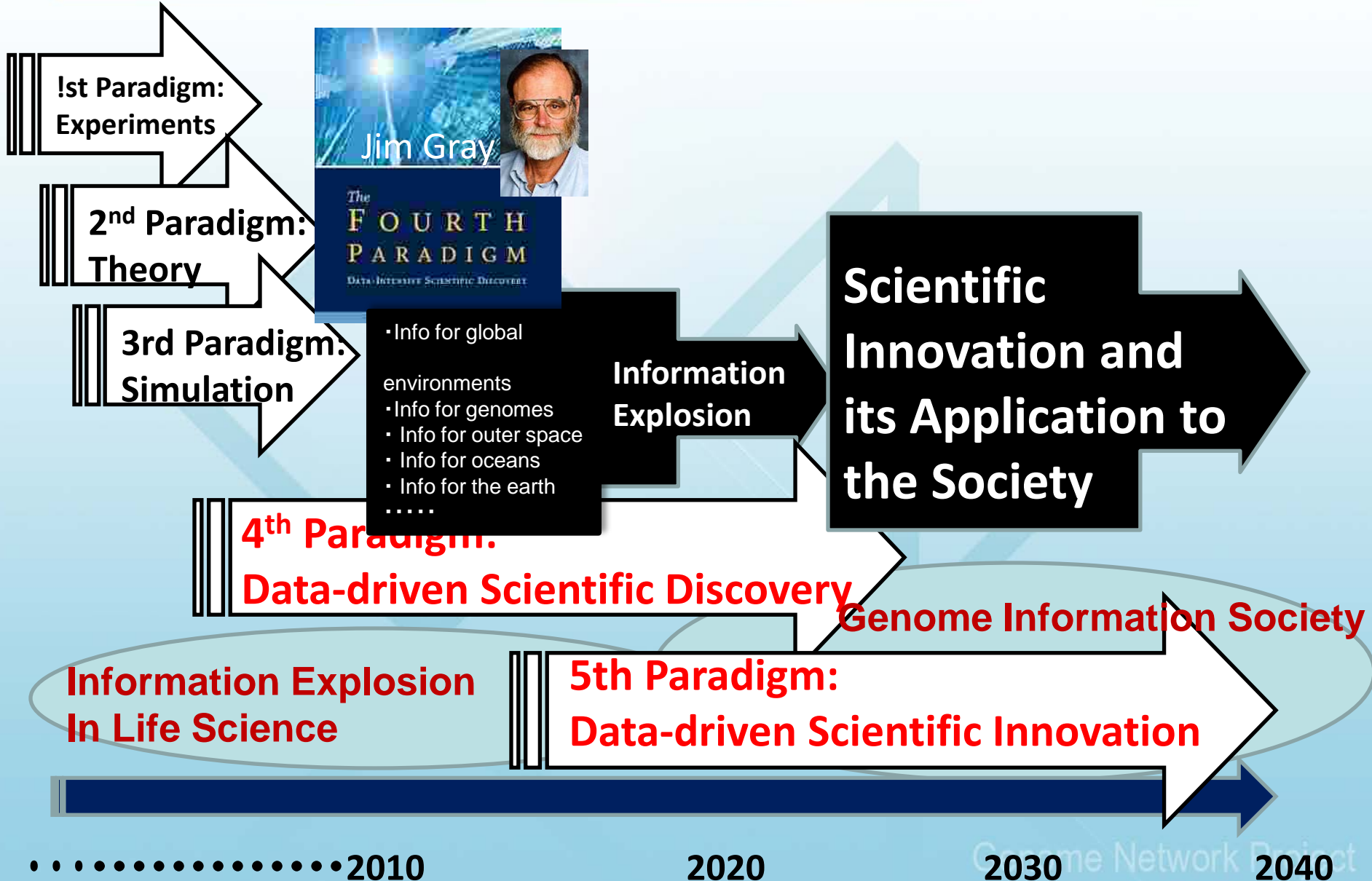


# ~Challenge: Paradigm shift~



# Beyond the 4<sup>th</sup> Paradigm proposed by Jim Gray



- Info for global environments
- Info for genomes
- Info for outer space
- Info for oceans
- Info for the earth
- .....

# Nature

INTERNATIONAL WEEKLY JOURNAL OF SCIENCE

THE BITER BIT  
Viral infections for viruses

TROPICAL CYCLONES  
The strong get stronger

BLACK HOLE PHYSICS  
A new window on the  
Galactic Centre

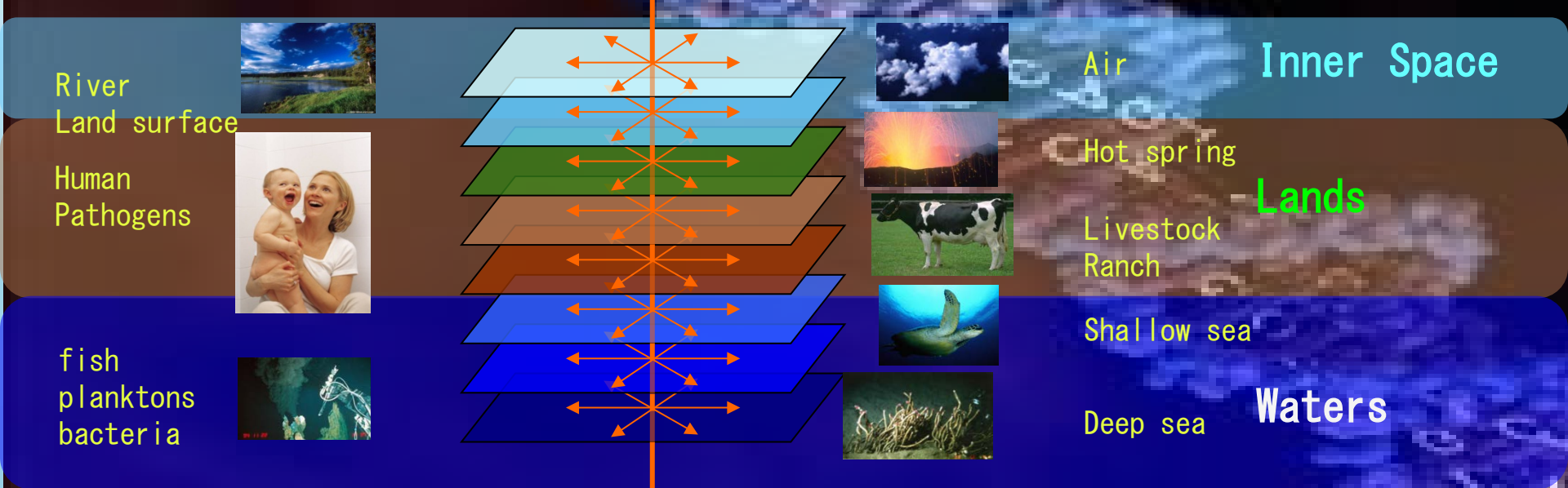
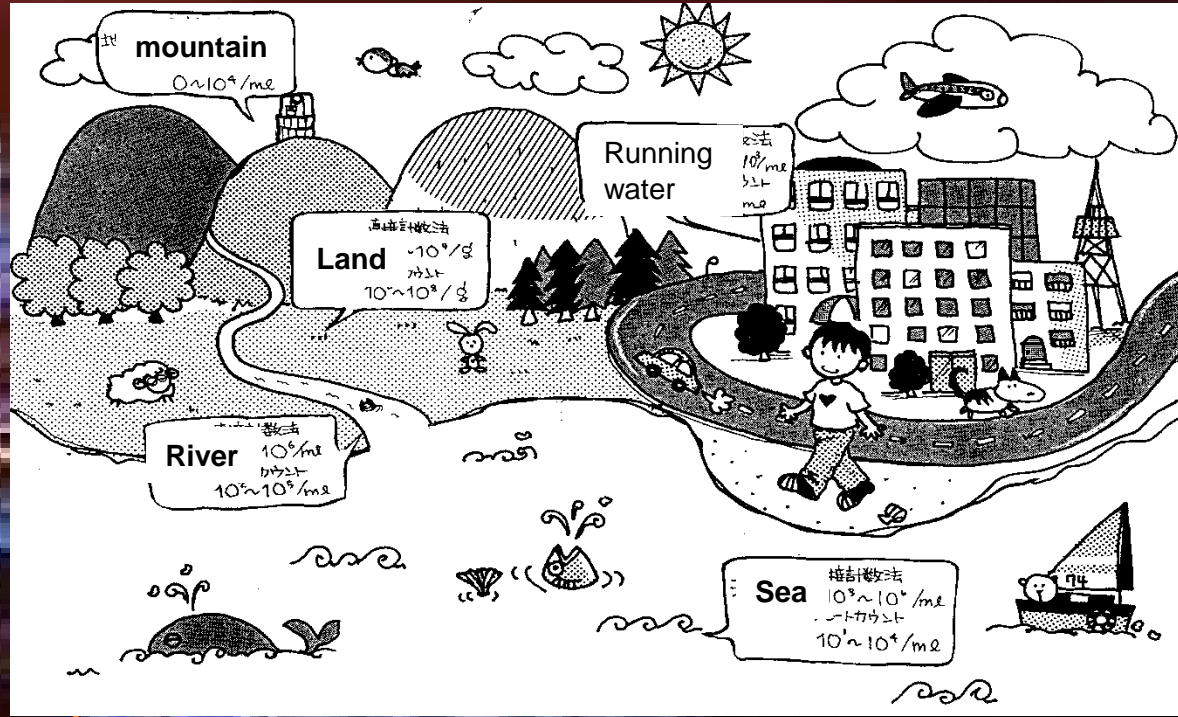
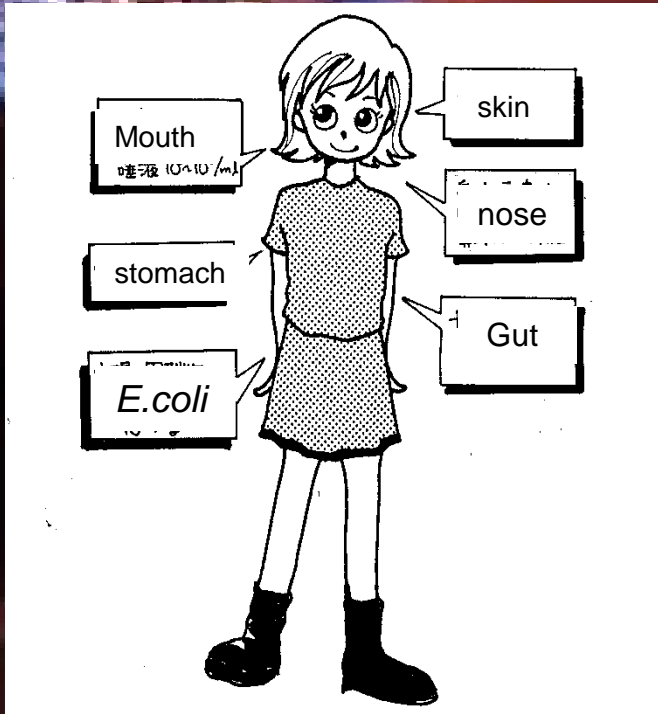
# BIG DATA

1010100010101

**D. Howe, M. Costanzo, P. Fey, T. Gojobori,  
L. Hannick, W. Hide, D. Hill, R. Kania, M.  
Schaeffer, S. St Pierre, S. Tweigger,  
and S. Rhee**

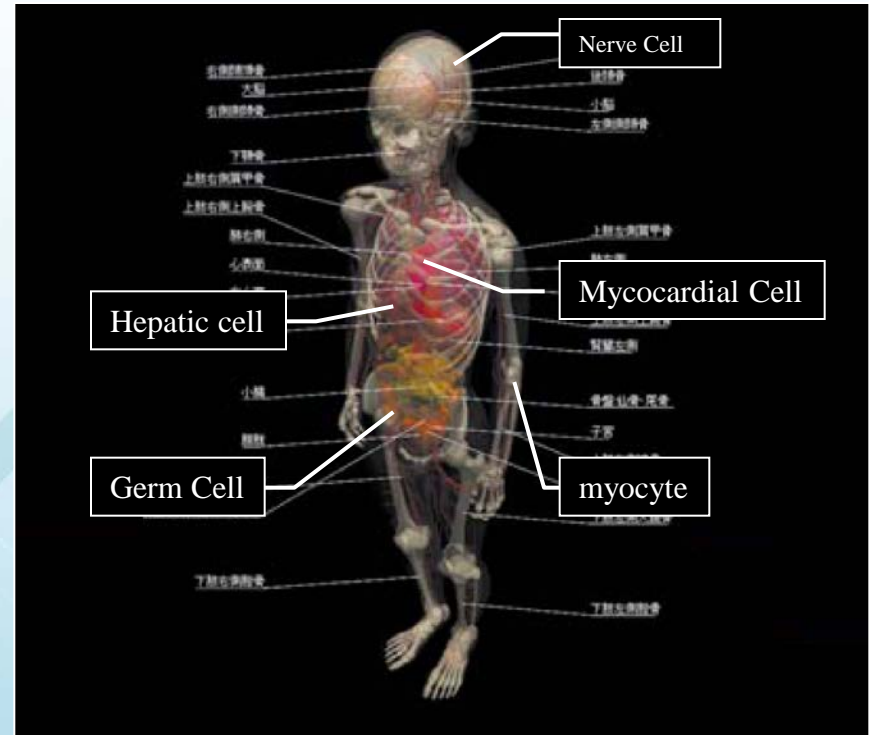
*Nature (2008) 455: 47-50*

# Genome Information-oriented Society !



# OmicS on Cell / Tissue Level

- Human consisted of 60 trillion of cells
- The cells biochemically clustered into 250 categories
- Constructs the database with validated annotation

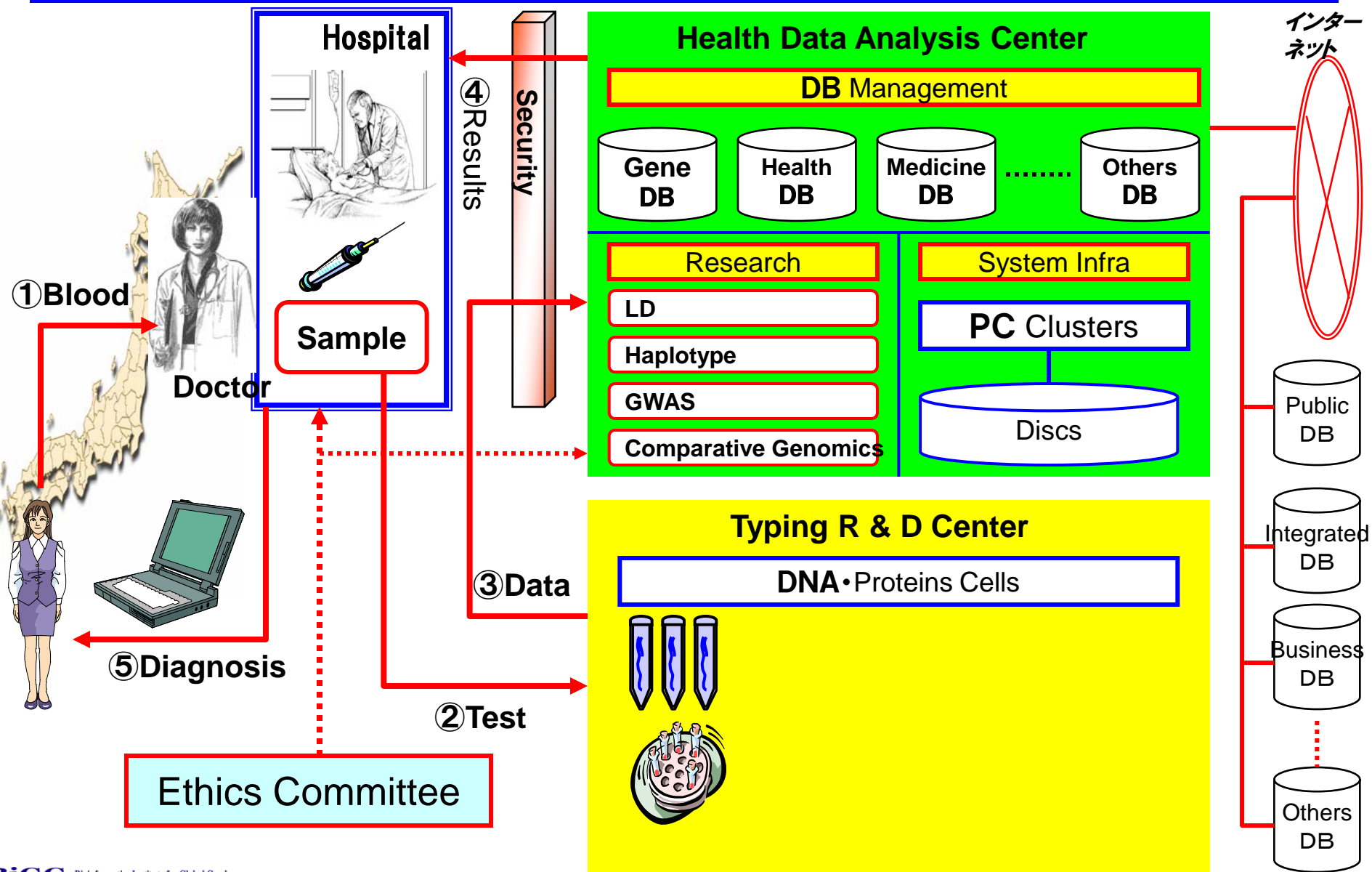


**Translational to Personalized Medicine;**

➤ Integrating data in molecules' information / databasing

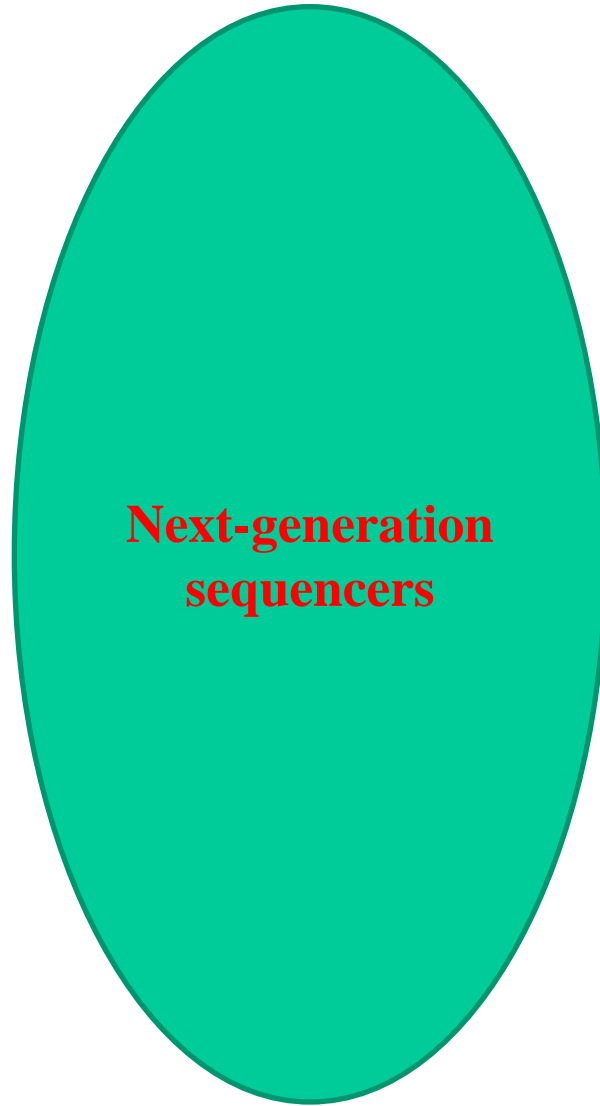
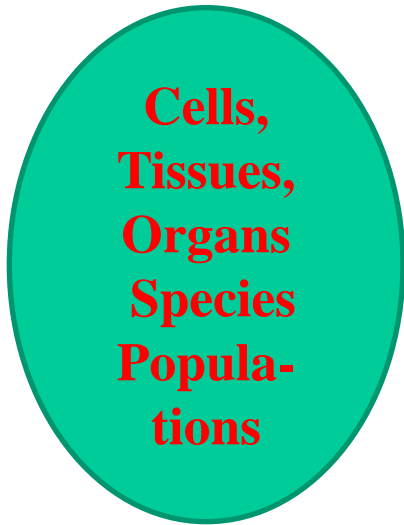
➤ Integrating with clinical data / **Translational Informatics**

# Personalized Health Care System



# NGS

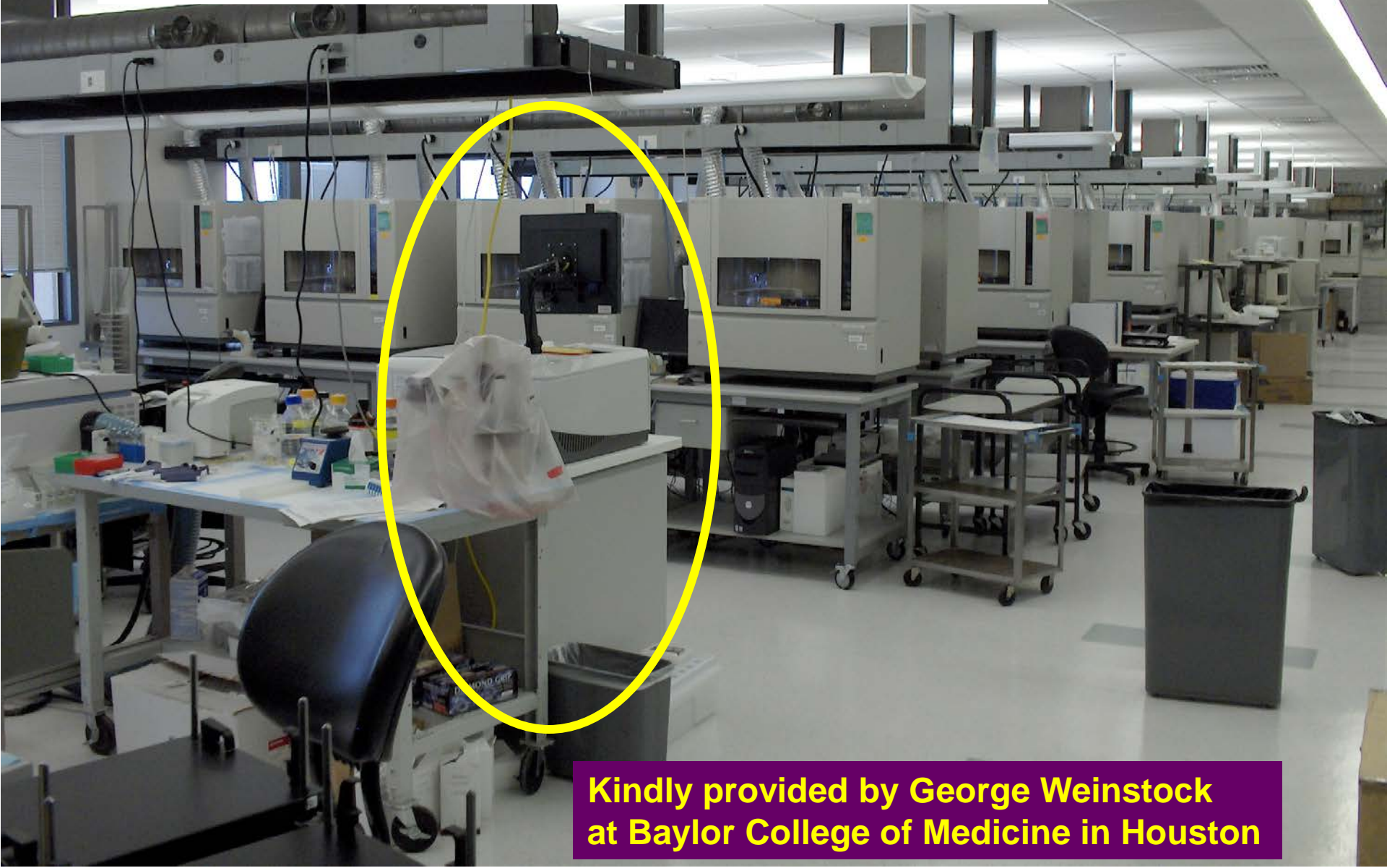
**Bio-samples**



**Database  
Data Analysis  
Informatics**



# シーケンサー(塩基配列決定装置)



Kindly provided by George Weinstock  
at Baylor College of Medicine in Houston



Item	Description
Read Length and Speed	512 nanopores x 15bp/sec => ~7500 bp/sec
Read Accuracy	99.8%
6 Hours Life Time	150 x 106bp
Applied Current /Blockage	60 picoamps to anywhere from 20-40 picoamps
No. of nanopore	2,000 nanopores / cartridge. Will become available in early 2013 containing over 8,000 nanopores. →Delivers a complete human genome in 15 minutes.
Sample Preparation	Any user-derived sample preparation resulting in double stranded DNA (dsDNA) in solution is compatible with the system.
Amplification	No sample amplification.
Cost	\$900
Commercialization	Oxford Nanopore intends directly to customers with

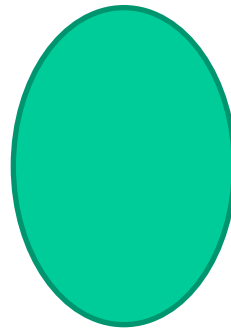


# Nano Pore Oxford (2012)

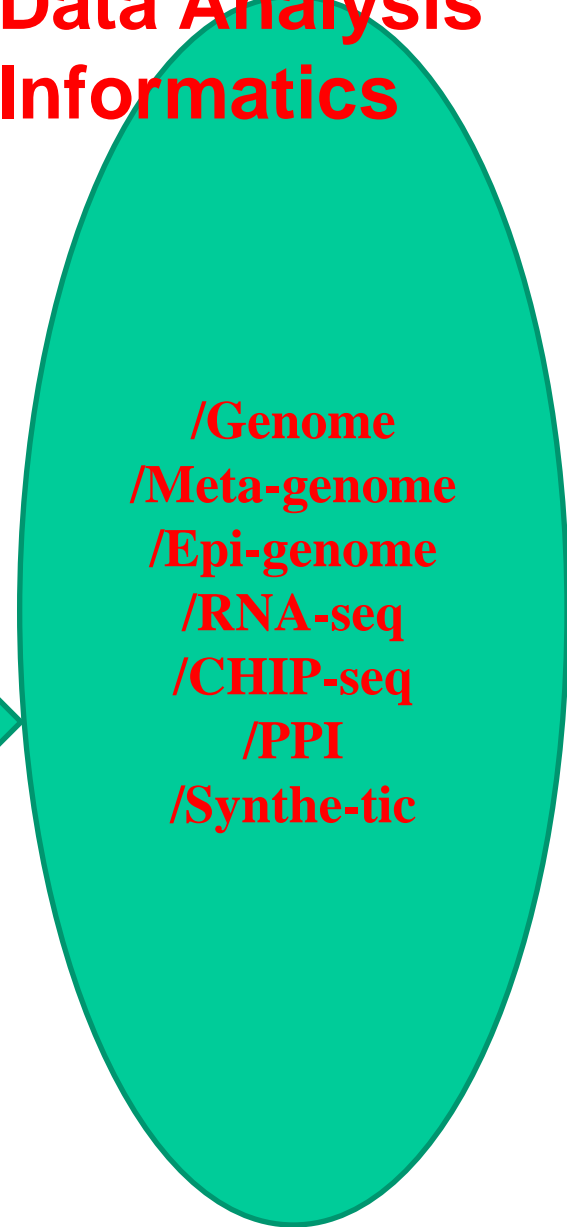
# Bio-samples



**NGS**



# Database Data Analysis Informatics



**Hospitals and  
Clinical Stations**

The diagram consists of two ovals. The top oval is light green and contains the text 'Hospitals and Clinical Stations'. The bottom oval is yellow and contains the text 'Basic Science and Biomedical Sciences (Life Science Dept and Medical School at University)'. Two black arrows point upwards from the yellow oval to the green oval, indicating a flow or relationship from basic science to clinical practice.

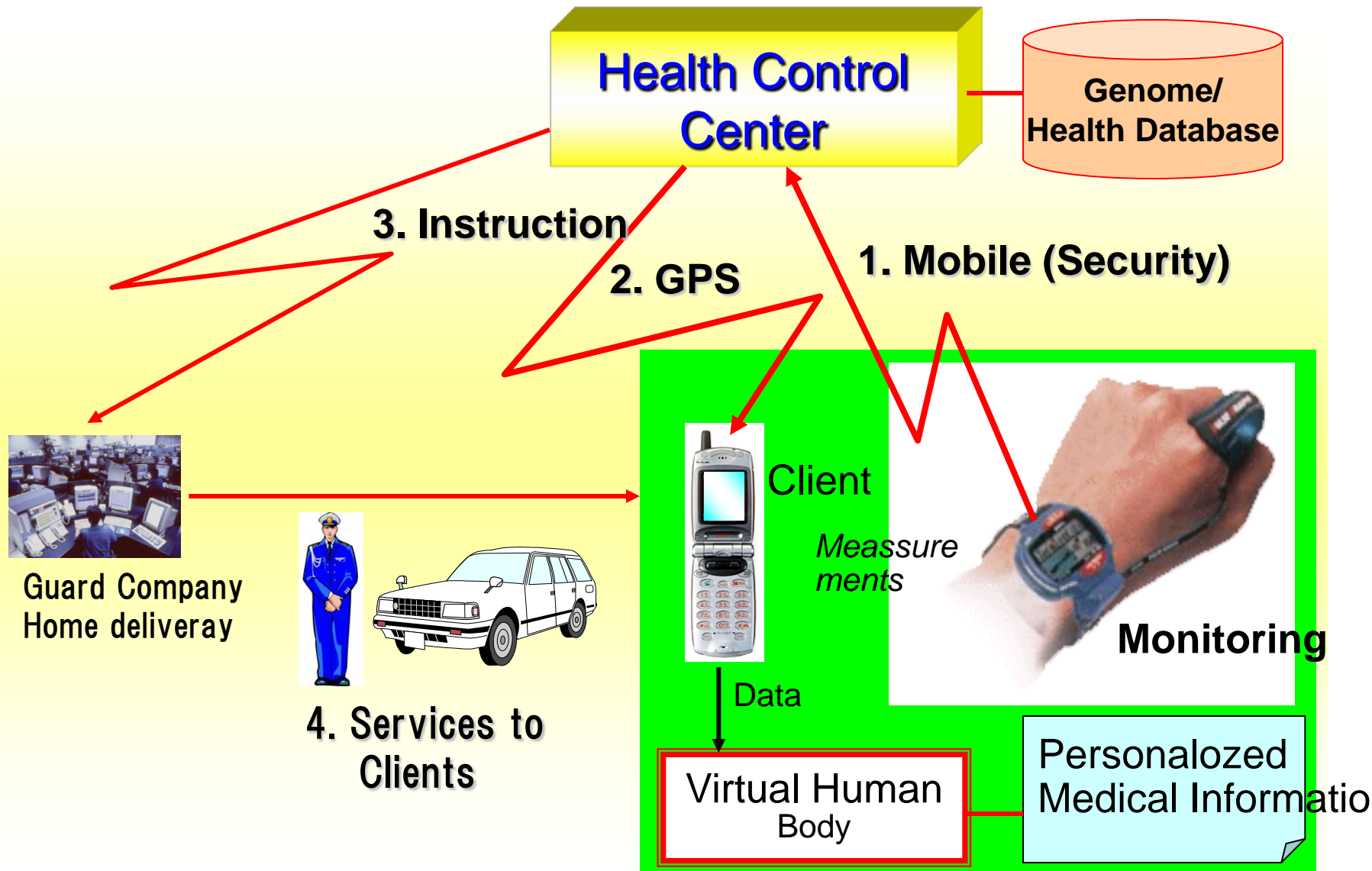
**Basic Science and  
Biomedical Sciences  
(Life Science Dept and Medical  
School at University)**

**Hospitals and  
Clinical Stations**

The diagram consists of two ovals. The top oval is light green and contains the text 'Hospitals and Clinical Stations'. The bottom oval is yellow and contains the text 'Basic Science and Biomedical Sciences (Life Science Dept and Medical School at University)'. A thick black arrow points from the top oval down to the bottom oval. Two thinner black arrows point from the bottom oval up to the top oval, one on the left and one on the right.

**Basic Science and  
Biomedical Sciences  
(Life Science Dept and Medical  
School at University)**

# Point of Care



# Action Plan 2012: Computational Cancer Genomics

## ◆ Action Plan in 2012

### 1. Selection of Replication Model

- Genealogy of cancer cells from genomes

### 2. Maximum Likelihood Algorithm

全体計画	2011 (H23)	2012 (H24)	2013 (H25)	2014 (H26)	2015 (H27)
	Preparation	Optimization			
		Model Choice	Analysis		

## ◆ Cancer Progression and Metastasis

Tracing back of ◆ Cancer Progression and Metastasis by constructing a phylogenetic tree of cancer cells by genomic information

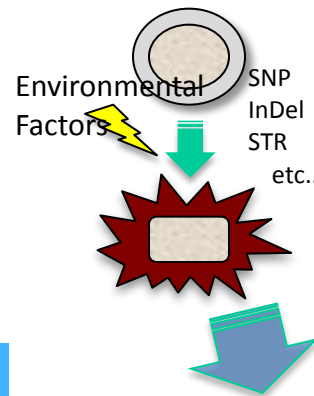
→ Medical Application

## Huge Computation

### ◆ Data acquisition データ

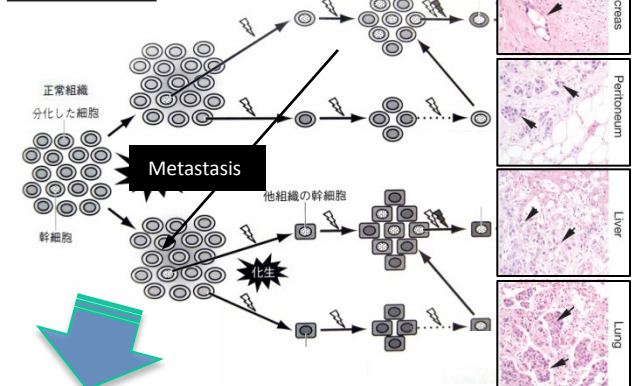
(Yachida et al. Nature 467:1114-1119)

### ◆ Genomic diversity



### ◆ Cell replication

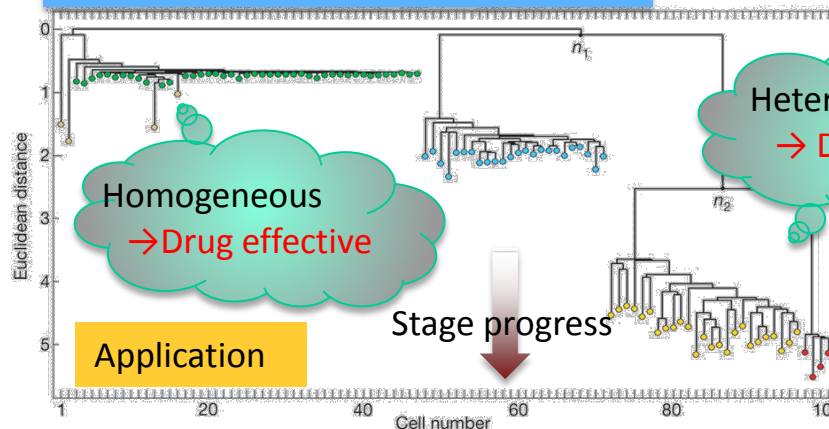
#### Metastasis



Origin of Cancer cells

## Genomic phylogeny

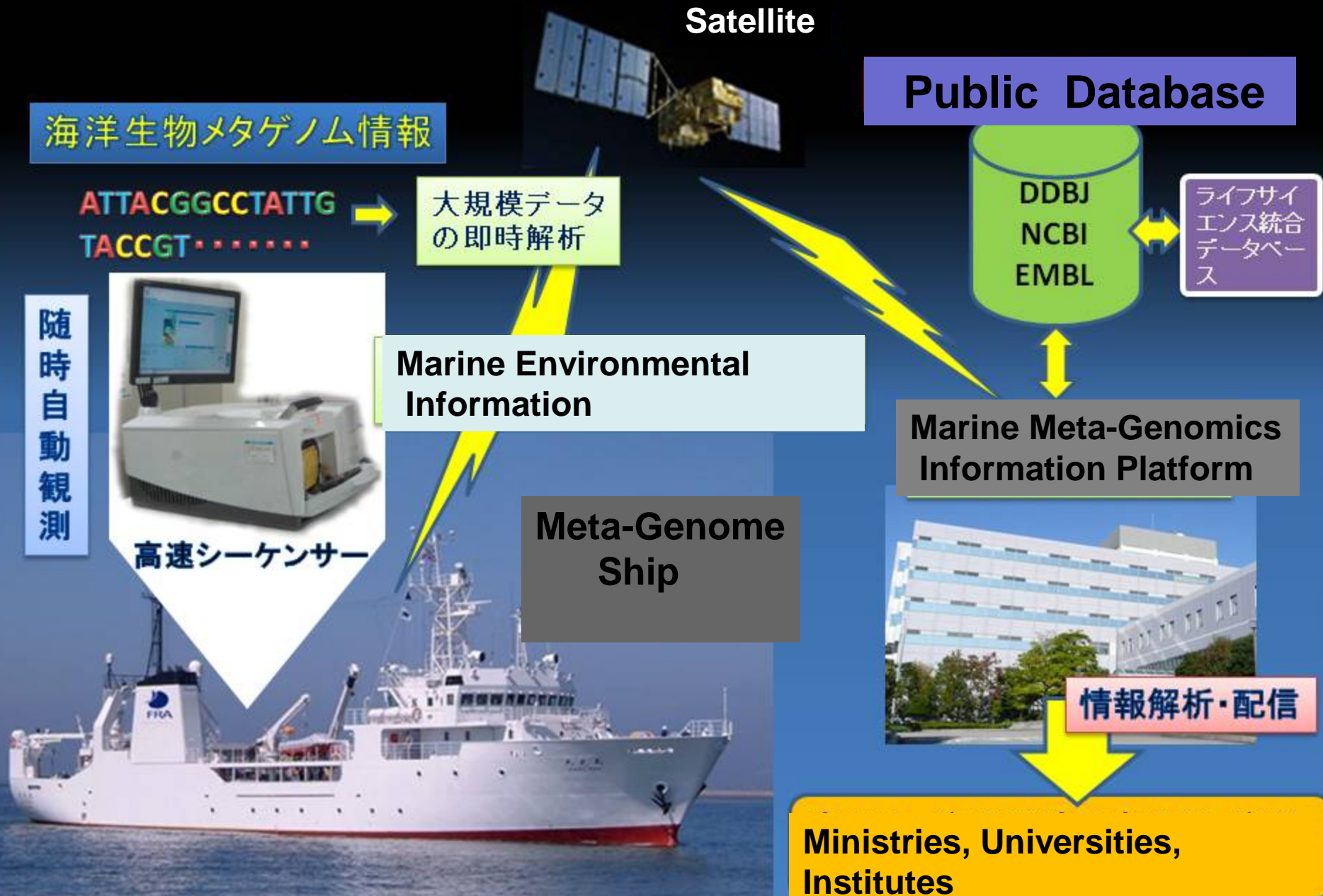
原図: 実験医学 Vol.29 (20): 3291 および Yamada S. et al.(2010) Science, 467:1114-1119より転用



原図: Navin N. et al.(2011) Nature, 472:90-95より転用

## • K Super Computer

# Marine Monitoring System by use of Meta-Genomics



**~Vision~**

**Proposal of a view of  
the new society by  
innovation~**





# Summary

“Genome Information-  
oriented Society”

~ g-Society ~

Genomics + Monitoring

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# データジャーナル

## 複合分野のデータ統合

# Data Science Journal