

Toward Smart Healthcare



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Levels of Biological Information

HEALTH CARE

Ecologies

Societies/Populations

Individuals

Organs

BIOSCIENCES

Tissues

Cells

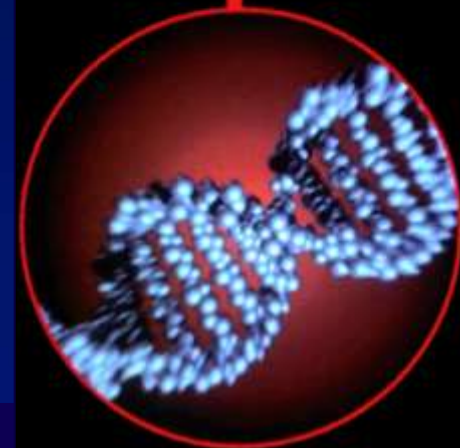
Protein and gene networks

Protein interaction networks

Protein

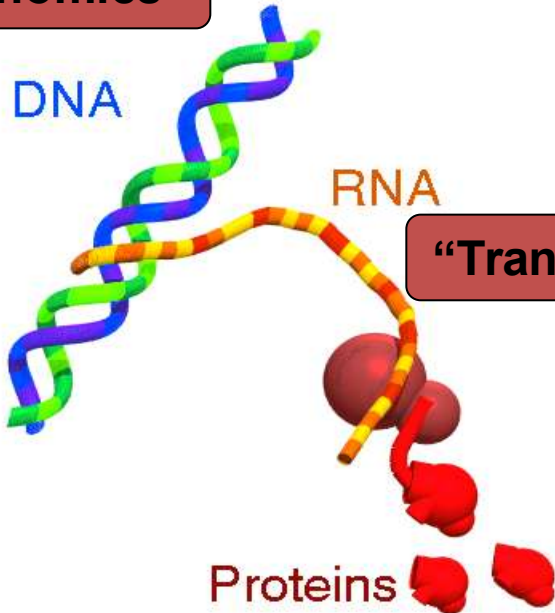
mRNA

DNA



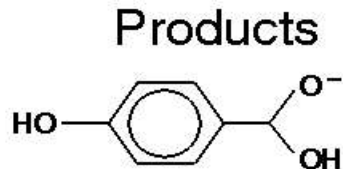
From Genomics to Phenotypes

“Genomics”



“Transcriptomics”

“Proteomics”



Organism behavior



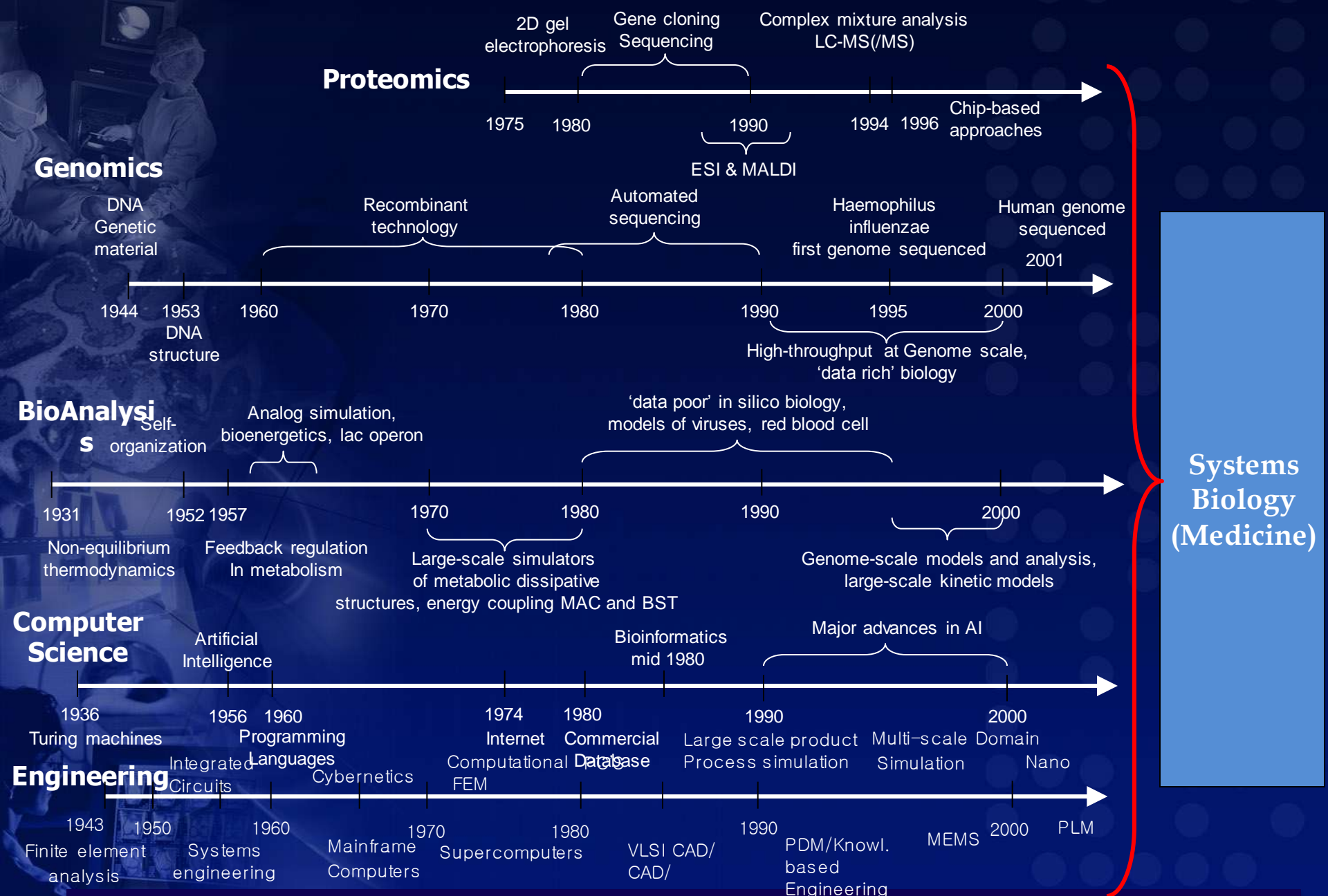
Cell and tissue behavior



“Cellomics”

“Metabolomics”





Bernhard O. Palsson

Information Technology Laboratory, National Institute of Standards and Technology

Advances Making Future Health Vision Attainable

Advances in Computing, Imaging, and Information Technology

Internet-based Software



Speed and Storage



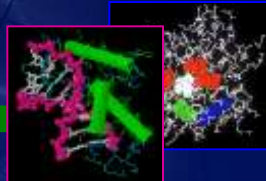
Networking Communications and Imaging



mPCD



Advances in Healthcare Practice



Disease Management



Evidence-Based Healthcare



Continuum of Care

Future Health Vision

Advances in Healthcare Technology



Human Genome Project



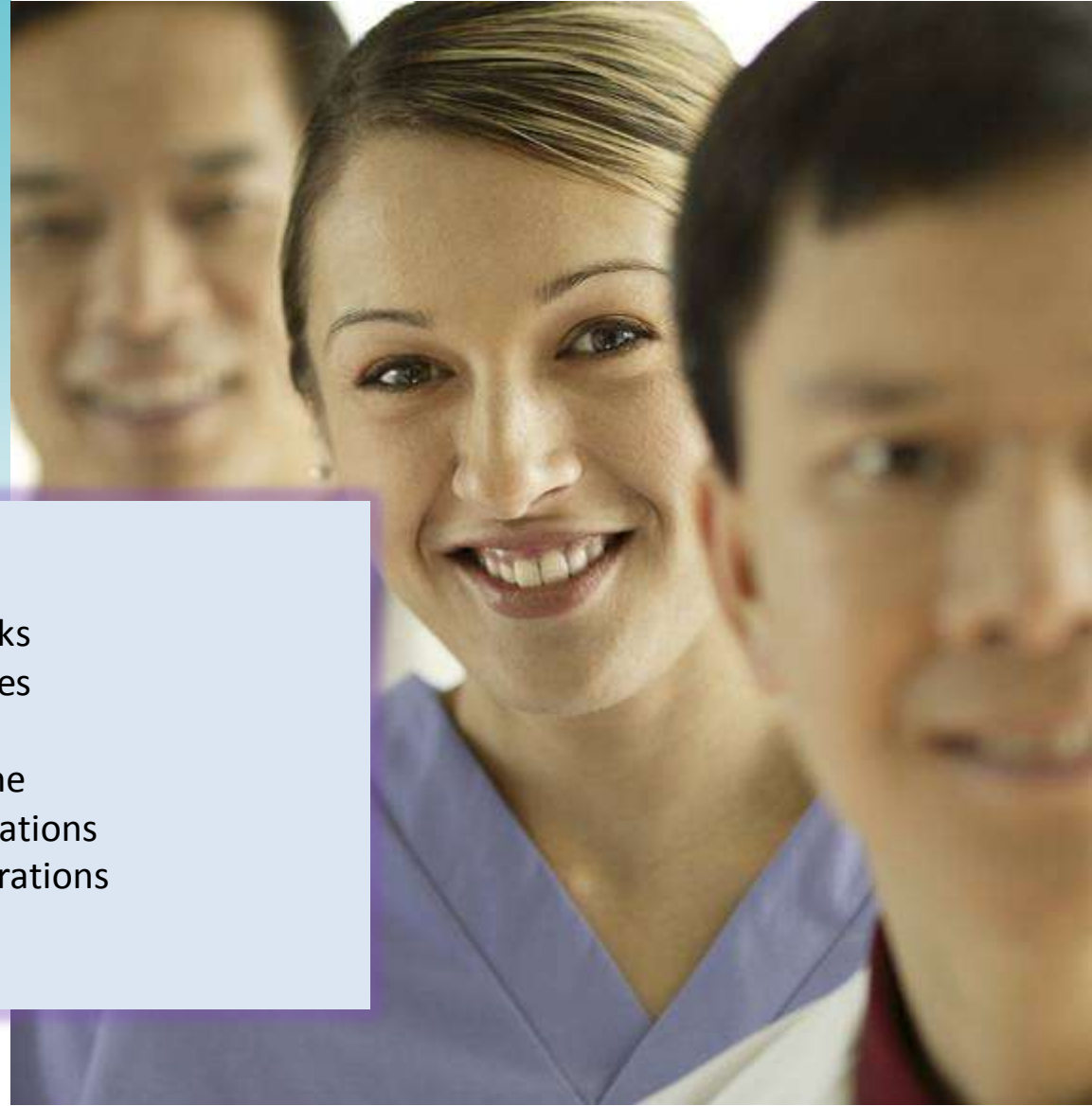
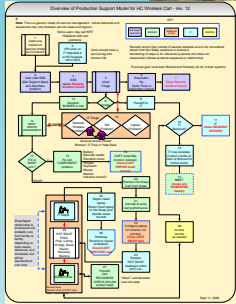
Pharmaceuticals and Nutraceuticals



Medical Devices

on Technology Laboratory, National Institute of Standards and Technology

Courtesy: Jack Corley



Smart Healthcare

- Smart Devices
- Smart Networks
- Smart Processes
- Smart EMRs
- Smart Medicine
- Smart Organizations
- Smart Collaborations
- Smart Society
- Smart Planet

Courtesy: Fred Hosea, Ph.D.
Program Director
Clinical Technology

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21st Century Medical Care will require significant scaling of Clinical Technology lifecycle management skillsets and services

**20th Century Medicine:
Stand-alone Devices**

Plan

- System lifecycle
- Tech assessment
- Design consultation
- Standards consultation
- Contract consultation
- Systems integration

Build

- Facility upgrades
- Equipment planning
- Deployment, staging
- Testing, safety
- Asset management

Run

- Planned maintenance
- On-call, Dispatch services
- Break/fix
- Hazard alerts, recalls
- Patches, upgrades
- Asset retirement

ENTERPRISE STRATEGY



**21st Century Medicine:
Net-New Lifecycle Requirements**

- HealthConnect integration
- Simulations, prototyping
- System/device testing, certification
- New allied provider sites
- ITIL compliance
- ICE – Integrated Clinical Environments
- Meaningful Use compliance
- Major upgrades, conversions: IPv6, ICD-10, HL7 v3
- Home care technologies, services
- Self-monitoring, behavioral support
- Family support technologies
- PHRs
- Telehealth
- Telemedicine
- Nanotechnologies
- Genomics
- Distributed sites of member care
 - mobile clinics
 - ambulance
 - gym
 - retail
 - travel
 - worksite pods
 - skilled nursing facilities
 - assisted living
- New Hospitals
- Robotics
- OR of the future
- Interoperable clinical systems
- Clinical decision-support
- Clinical process re-engineering

Lifecycle Management Infrastructure