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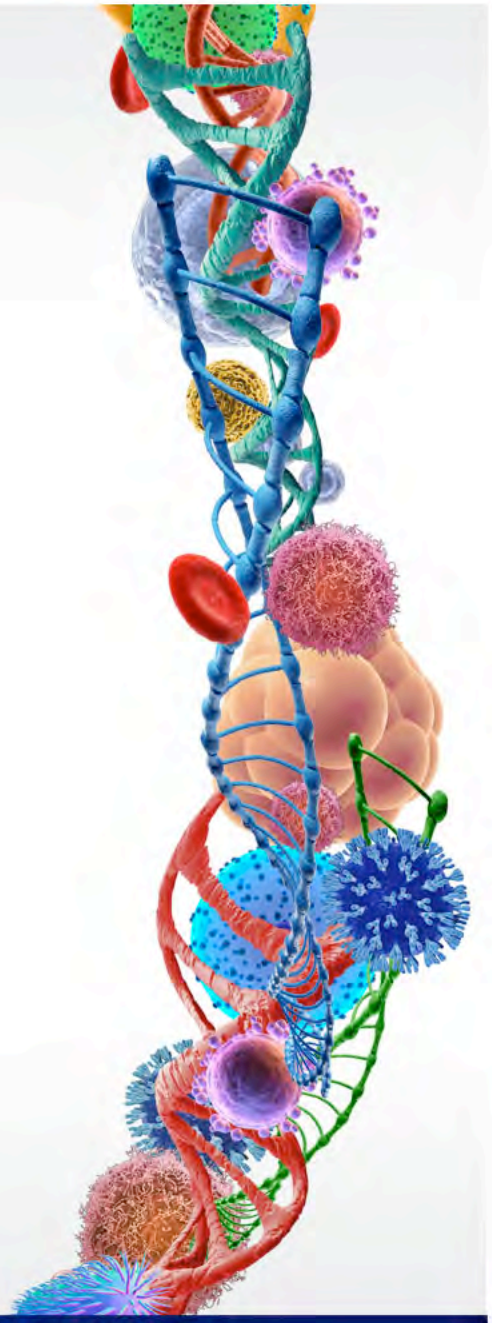


Science Reporters' Workshop:

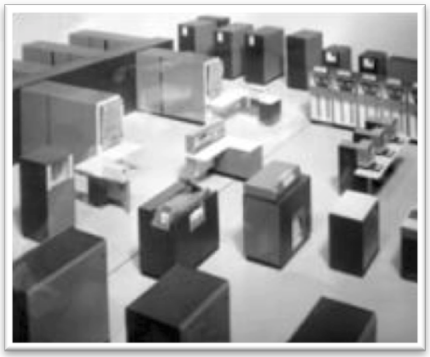
State of the field of genome sequencing industry

Gregory T. Lucier
Chairman and CEO, Life Technologies

June 13, 2013

Ultimate Goal: Making High Throughput Sequencing Accessible to All

Main Frame



Mini Computer

Personal Computer

CE/Sanger Sequencing

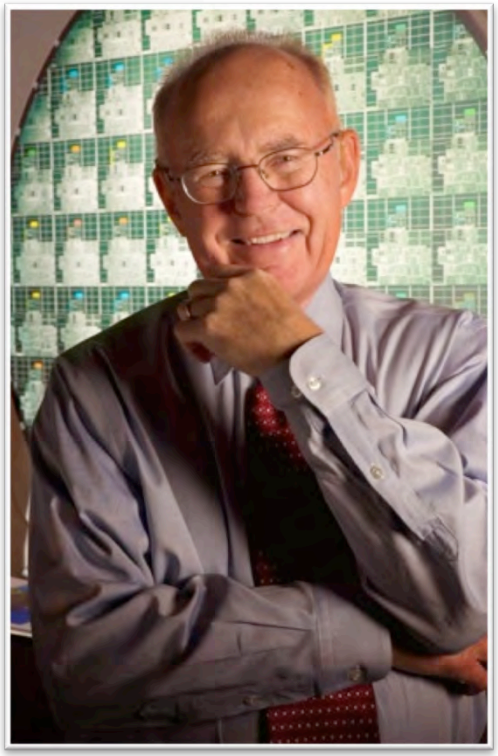
Next-Gen Sequencing

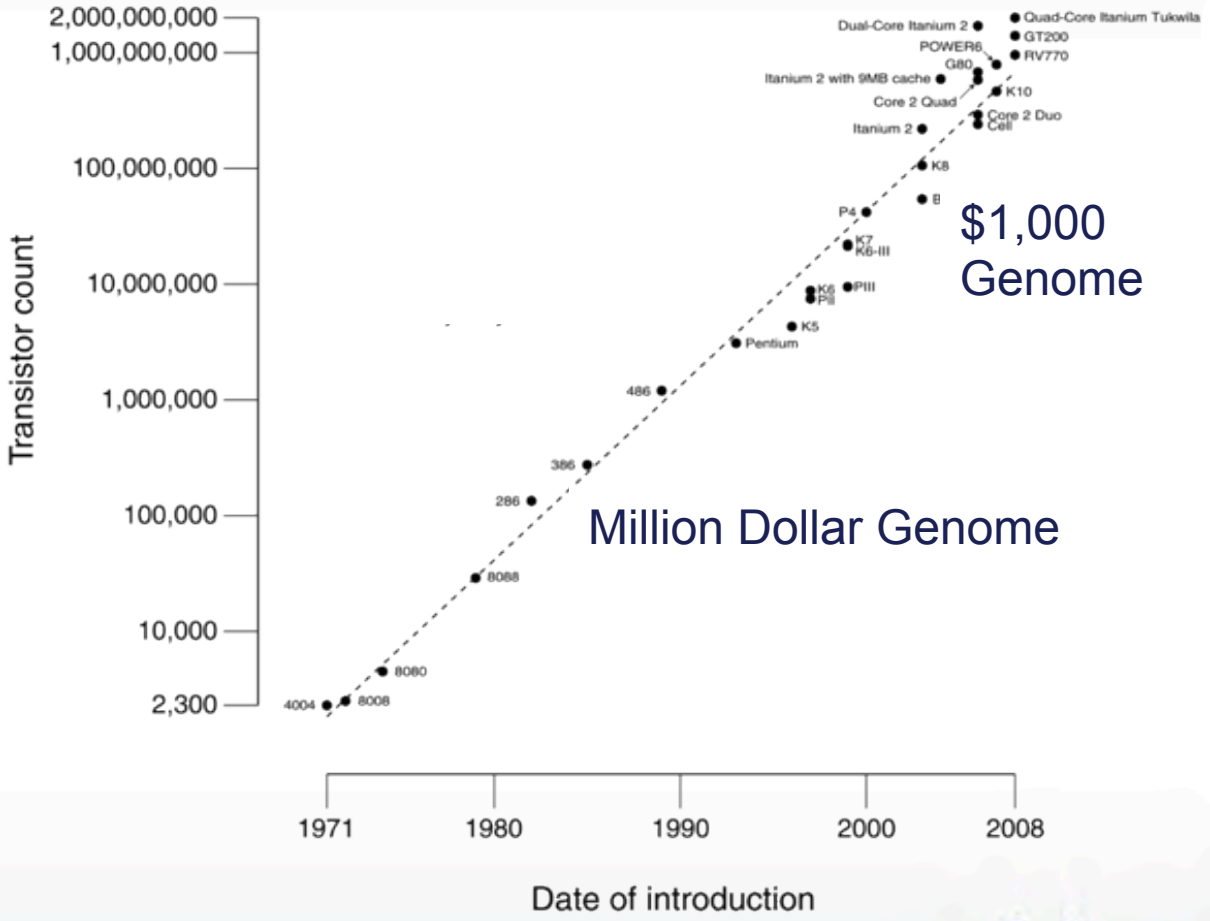
Ion Semiconductor Sequencing

<u>Requirements for Success</u>

1) Scalable, Affordable Technologies, 2) Simple and Complete Workflows, 3) Rapid Turnaround Times, 4) Strong Support – Community and Field Support

40 Years of Accumulated Moore's Law





Semiconductor Scalability Has Strong Historical Precedent

1979
Intel 8088
29,000 Transistors
$125

Today
Intel® Ivy Bridge Core i7
1.4 Billion Transistors
$325

1975
1st Digital Camera (Kodak)
0.01 Megapixel
$15,000

Today
iSight Camera (iPhone 5, Apple)
8 Megapixel
$199

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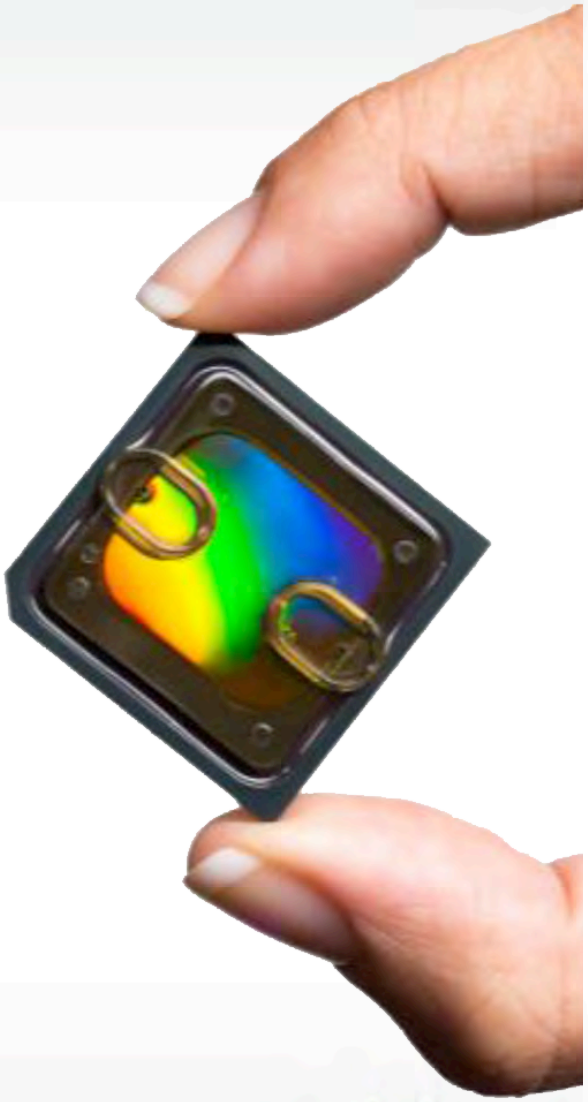
Semiconductor Affordability

Semiconductor economies of scale

Electronic detection

Unmodified nucleotides



Low-cost, fast, small form factors

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Movement in the Industry

- Decreasing grant monies to government and academic labs
- Consolidation of pharmaceutical and biotechnology industries
- Tens of thousands of people have had all or some part of their genome sequenced
  - 1000 Genome Project recently completed sequencing at low coverage 2,534 individuals form 26 populations around the world
- Industry leaders:
  - Roche hostile takeover bid of Illumina
  - Life Technologies being acquired by Thermo Fisher
  - Illumina cutting ties with Oxford Nanopore - termination of commercial agreement in 2016
  - Roche terminating agreements with DNAe (semiconductor-based sequencer) and IBM (nanopore-based sequencer)

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Living in a DNA Economy

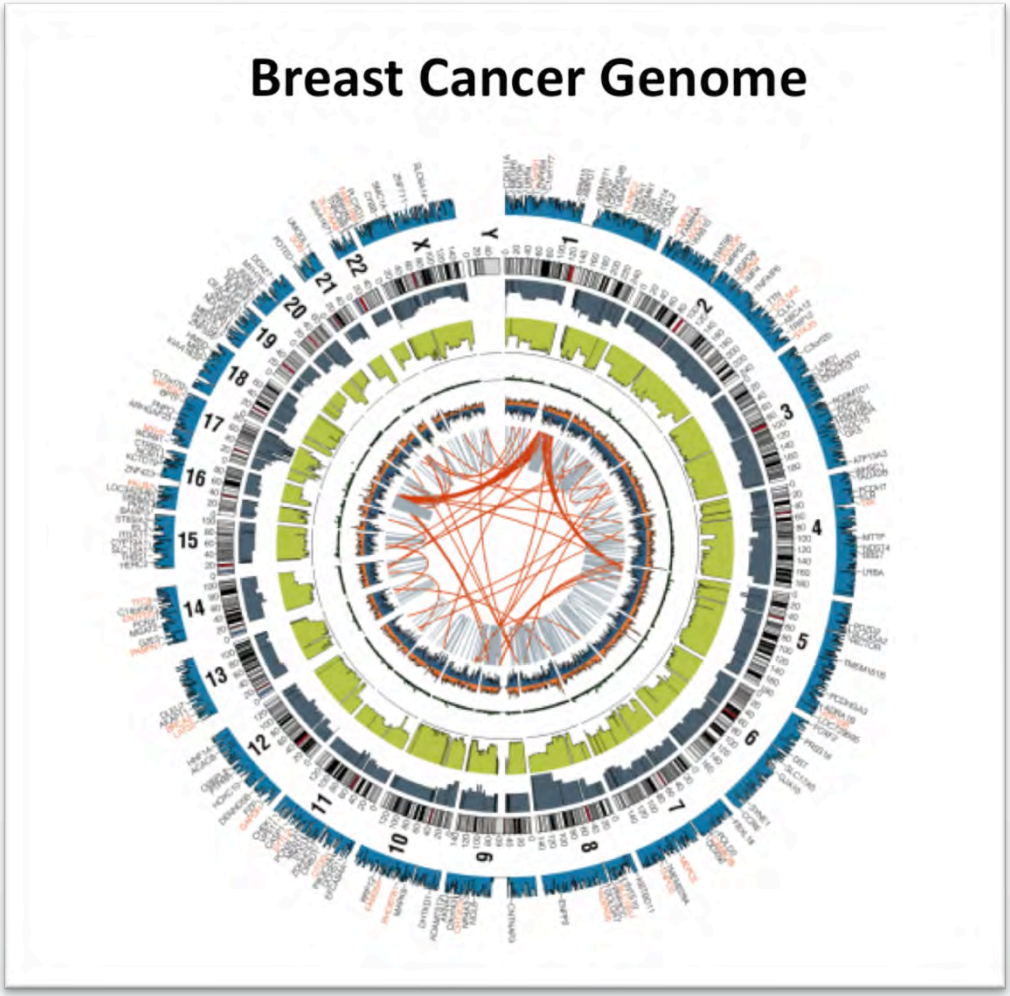
- Federal investment in the human genome sequencing projects directly and indirectly generated:
  - $965 billion in economic activity
  - More than 53,000 direct genomics-related jobs
  - $293 billion in personal income.

The 24-year U.S. investment in genomics amounts to $2/ year for each U.S. resident, generating nearly $1 trillion in cumulative economic impact to date

Barriers to Continued Growth

- Policy
  - Regulatory and reimbursement systems need to catch up and pay for the value they can help create
- Practice
  - Doctors need to integrate genomics more fully into their practice of medicine
  - Informatics presented in a user friendly, impactful format
  - Lack of data sharing
- Funding
  - Genomics technology industry is very U.S. dominated - in large part because of strong partnership between the government and industry
  - Use of genomics, however, will become a race to lead the next phase of the genomics revolution

Personalized Oncology:
Applying Cancer Genomics and Informatics



Next-Generation Sequencing: Beyond Healthcare

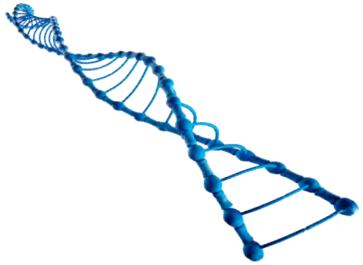
Research

Health

Reading DNA

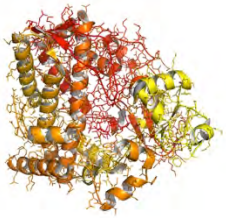
Writing DNA

Fuel



Bio Chemicals

Enzymes



Police sketch is not enough

+

Genetically ID'ed suspect

Human Identification

=

Positive ID

Food