Understanding Genomics

The four bases:
- Adenine
- Cytosine
- Thymine
- Guanine

Chromosome
Coiled DNA
DNA double helix
What Can We Do by Knowing Your Genome?

- Guide selection of drug choices
- Suggest predispositions and symptoms
- Provide family planning insight
- Help inform proactive health management
**Our Background**

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>AWARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall, 1998</td>
<td><strong>TOP 10 INNOVATIONS</strong> 2015 THE SCIENTIST MAGAZINE</td>
</tr>
<tr>
<td>Francis deSouza</td>
<td><strong>SMARTEST COMPANY</strong> 2014 MIT TECHNOLOGY REVIEW</td>
</tr>
<tr>
<td>San Diego, CA</td>
<td><strong>10 BREAKTHROUGH TECHNOLOGIES</strong> 2013 MIT TECHNOLOGY REVIEW</td>
</tr>
<tr>
<td>~5,000 Employees</td>
<td><strong>12 MOST DISRUPTIVE NAMES IN BUSINESS</strong> 2013 FORBES</td>
</tr>
<tr>
<td>20 OFFICES GLOBALLY</td>
<td><strong>TOP 10 INNOVATIONS</strong> 2012 THE SCIENTIST MAGAZINE</td>
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<table>
<thead>
<tr>
<th>FINANCIALS</th>
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<tbody>
<tr>
<td>$2.22B 2015 Revenue</td>
</tr>
<tr>
<td>19% Revenue Growth YOY</td>
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</table>
Progressing Toward Our Mission

Clinical adoption is a reality today
Sequencing By Synthesis Overview

A. Library Preparation
- Genomic DNA
- Fragmentation
- Adapters
- Ligation
- Sequencing Library

NGS library is prepared by fragmenting a gDNA sample and ligating specialized adapters to both fragment ends.

B. Cluster Amplification
- Flow Cell
- Bridge Amplification Cycles
- Clusters

Library is loaded into a flow cell and the fragments hybridize to the flow cell surface. Each bound fragment is amplified into a clonal cluster through bridge amplification.

C. Sequencing
- Sequencing Cycles
- Digital Image
- Text File

Sequencing reagents, including fluorescently labeled nucleotides, are added to the flow cell and the first base is incorporated. The flow cell is imaged and the emission from each cluster is recorded. The emission wavelength and intensity are used to identify the base. This cycle is repeated "n" times to create a read length of "n" bases.

D. Alignment & Data Analysis
- Reads
- Reference Genome

Reads are aligned to a reference sequence with bioinformatics software. After alignment, differences between the reference genome and the newly sequenced reads can be identified.
# Illumina Platforms

## SEQUENCING SYSTEMS | Sequencing by Synthesis (SBS)

<table>
<thead>
<tr>
<th>POPULATION POWER</th>
<th>PRODUCTION POWER</th>
<th>FLEXIBLE POWER</th>
</tr>
</thead>
<tbody>
<tr>
<td>HiSeq X™ Five/Ten</td>
<td>HiSeq® 2500/3000/4000</td>
<td>NextSeq™ 500/550</td>
</tr>
</tbody>
</table>

## ARRAY SCANNER | Infinium

<table>
<thead>
<tr>
<th>FOCUSED POWER</th>
<th>CUTTING-EDGE ARRAY SCANNER</th>
</tr>
</thead>
<tbody>
<tr>
<td>MiSeq®, MiSeqDx™*, MiSeqFGx™</td>
<td>iScan®</td>
</tr>
</tbody>
</table>

* For in vitro diagnostic use

For Research Use Only. Not for use in diagnostic procedures.
<table>
<thead>
<tr>
<th>Cost Per Genome</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>$3,000,000,000</td>
<td>Human Genome Project 2003</td>
</tr>
<tr>
<td>$20,000,000</td>
<td>1st individual genome 2006</td>
</tr>
<tr>
<td>$2,000,000</td>
<td>1st NGS Genome 2007</td>
</tr>
<tr>
<td>$200,000</td>
<td>1st 30x genome 2008</td>
</tr>
<tr>
<td>$10,000</td>
<td>1st sub-10K genome 2010</td>
</tr>
<tr>
<td>$1,000</td>
<td>1st $1,000 genome 2014</td>
</tr>
</tbody>
</table>
Driving Innovative Sequencing Technology

Breakthrough technology enables lower sequencing costs

Sequencing Costs Plummeting
Cost per genome

$100 million

$10 million

$1 million

$100,000

$10,000

$1,000

Source: U.S. National Human Genome Research Institute, *Nature*
Leveraging Our Technology

*Integrated workflows from sample-to-answer*

SEAMLESS WORKFLOW SOLUTIONS ENABLE MARKETS

- Simplified library prep
- Custom content
- Flexible, economical sequencing
- Integrated analysis

For Research Use Only. Not for use in diagnostic procedures.
BaseSpace®

For Research Use Only. Not for use in diagnostic procedures.
BaseSpace® Sequencing Activity Worldwide

HiSeq®
MiSeq®
NextSeq™
Cumulative

For Research Use Only. Not for use in diagnostic procedures.
Who We Serve

Innovation drives expanding market opportunities

Reproductive Health  Oncology  Population Sequencing
Research  Complex Disease  Consumer  Infectious Disease
Forensics  Agriculture  Genetic Health  BioPharm
The Latest in Population-Scale Sequencing

Enabled by HiSeq X™’s unmatched speed and throughput

US Cancer Moonshot Task Force

$1B to accelerate 10 years of research to just 5 years

White House Initiative for Precision Medicine

$215M investment; Calls for new era of precision medicine

China’s Precision Medicine Initiative

$10B over 15 years; 2 million people

Genomics England

Sequence 100,000 genomes over 4 years

For Research Use Only. Not for use in diagnostic procedures.
Illumina Accelerator
*Driving value for genomics startups*

Hand-selecting the best entrepreneurs that are using genomics to unlock the power of the genome

[www.illumina.com/accelerator](http://www.illumina.com/accelerator)
How Genomics Can Change the Future

Joshua Osborn’s story

Learn More: NY Times June 2014
http://www.nytimes.com/2014/06/05/health/in-first-quick-dna-test-diagnoses-a-boys-illness.html?_r=0
How Genomics Can Change the Future

Lucas Meagu’s story

Learn More: The Telegraph, March 2015
How Genomics Can Change the Future
Marin Mejia’s story

Learn More: NBC San Diego January 2015
Reimagining the Future

There is a dramatic ‘DNA revolution’ happening today and Illumina is leading it. Our technology and the solutions we continue to bring to market are transforming our understanding of the genome – and will ultimately transform health care.

– Francis deSouza, 2016