OECD Meeting, Washington D.C.

Synthetic biology: Enabling Sustainable Innovation

Cord F. Staehler

July 9th, 2009

febit at a glance

- febit group, formed Spring 2005
  - febit holding gmbh, febit biomed gmbh and febit synbio gmbh
  - ~75 Employees located in Heidelberg (Germany)
  - broad and strong Intellectual Property Portfolio
- febit Inc., formed Summer 2006
  - ~25 Employees located near Boston (USA)
- Investors: dievini advisors in health sciences, TechnoStart, IQT IN-Q-TEL

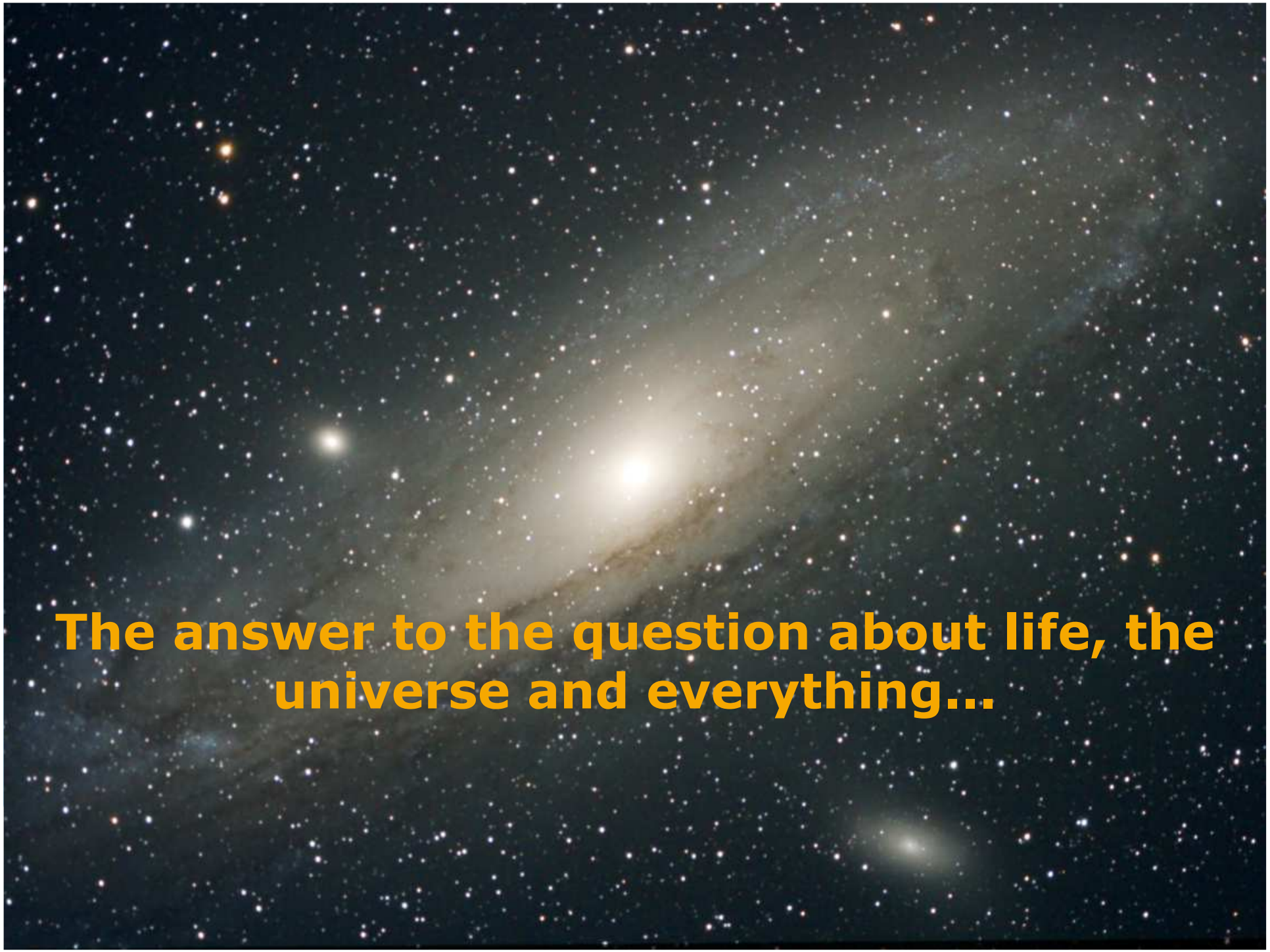
Deutschland Land der Ideen – Ausgewählter Ort 2006

StartUp Deutscher Gründerpreis – McKinsey – ZDF

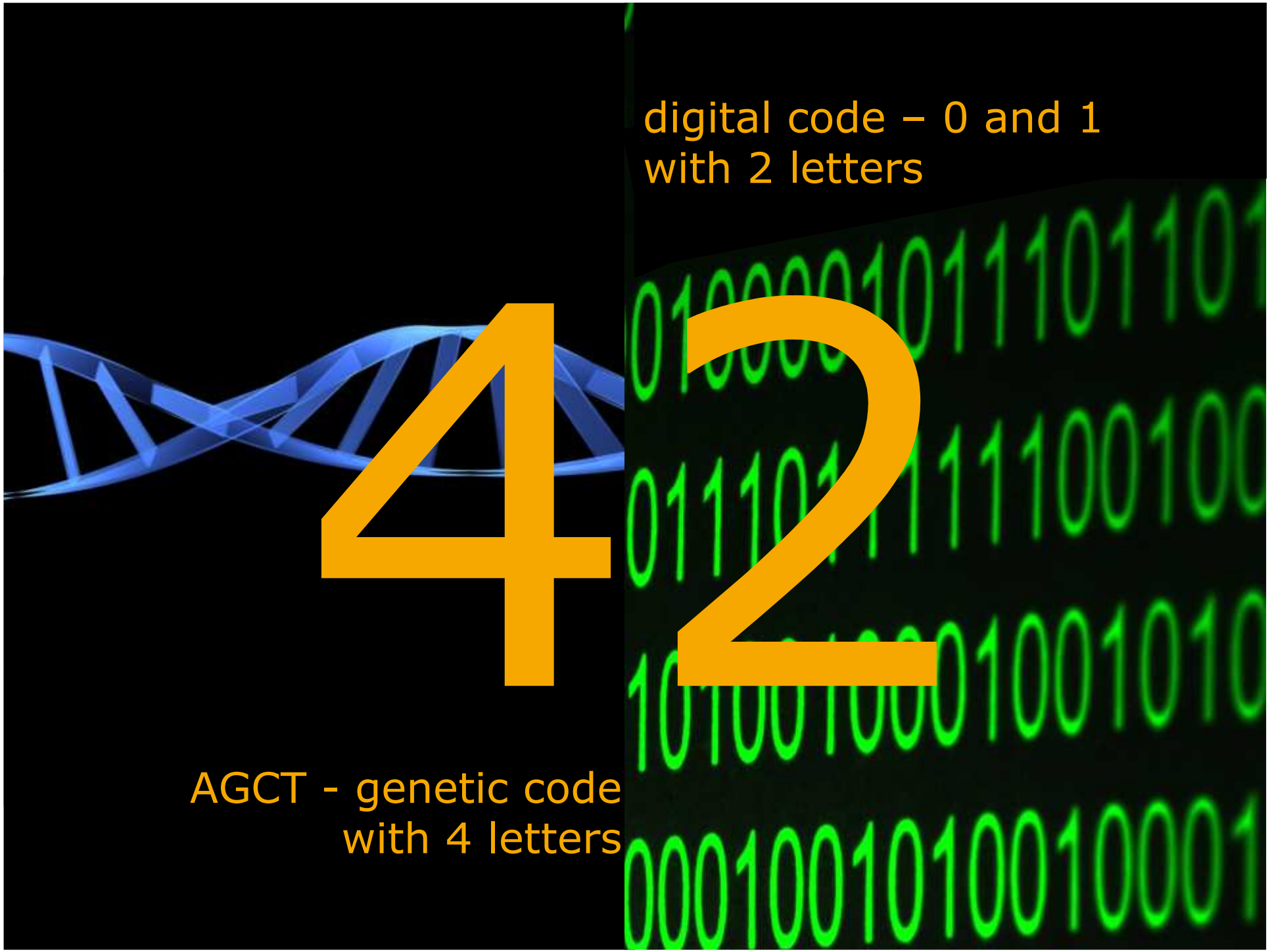
HAUPT PREISTRÄGER 2006 Mittelstands Programm

Innovationspreis der deutschen Wirtschaft – Erster Innovationspreis der Welt

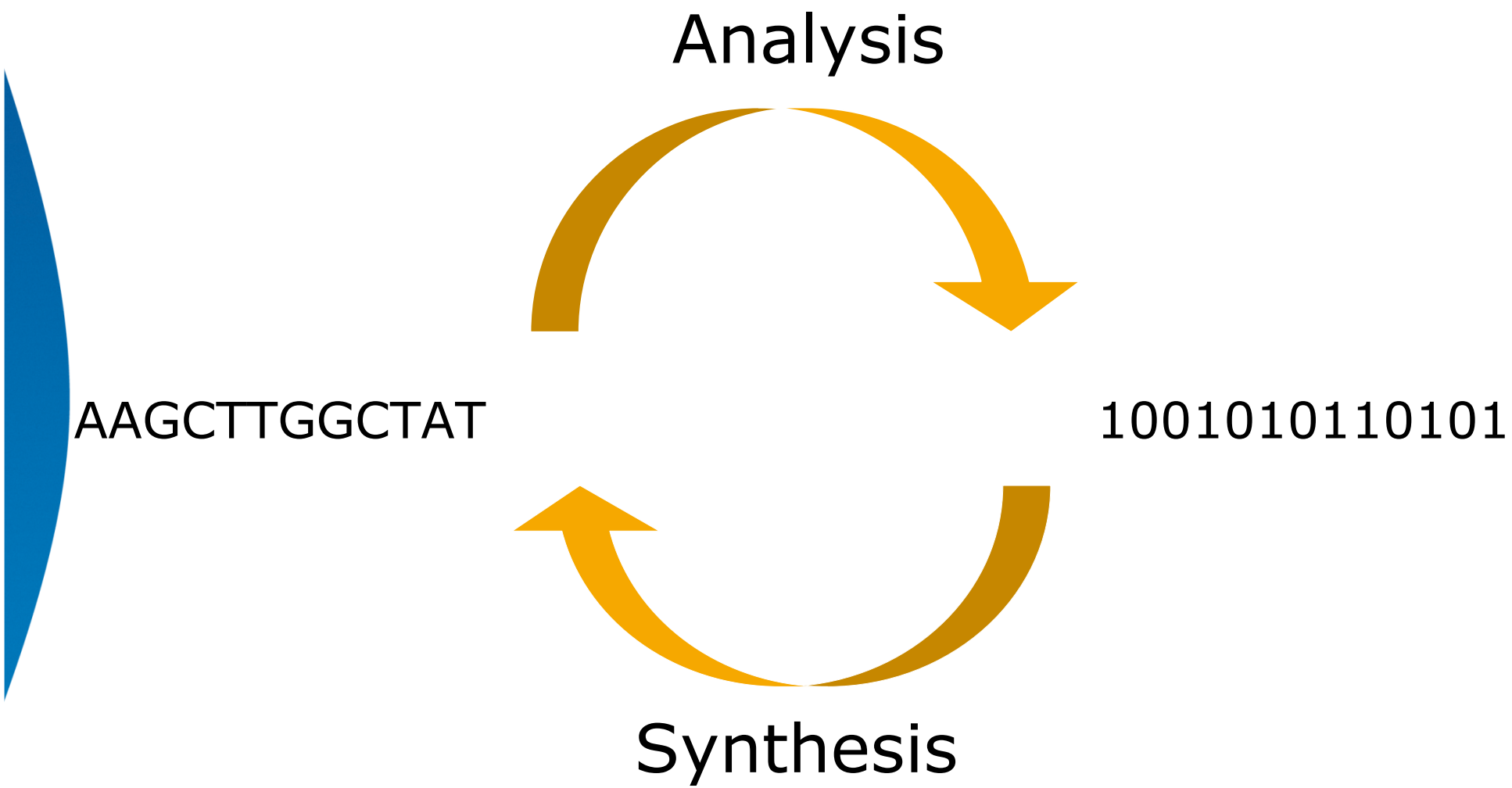
ENTREPRENEUR DES JAHRES® FINALIST 2002


The answer to the question about life, the universe and everything...


42
Douglas Noel Adams (DNA),
The Hitchiker's Guide to the Galaxy


digital code – 0 and 1
with 2 letters
42
AGCT - genetic code
with 4 letters

Connecting Digital and Genetic Code



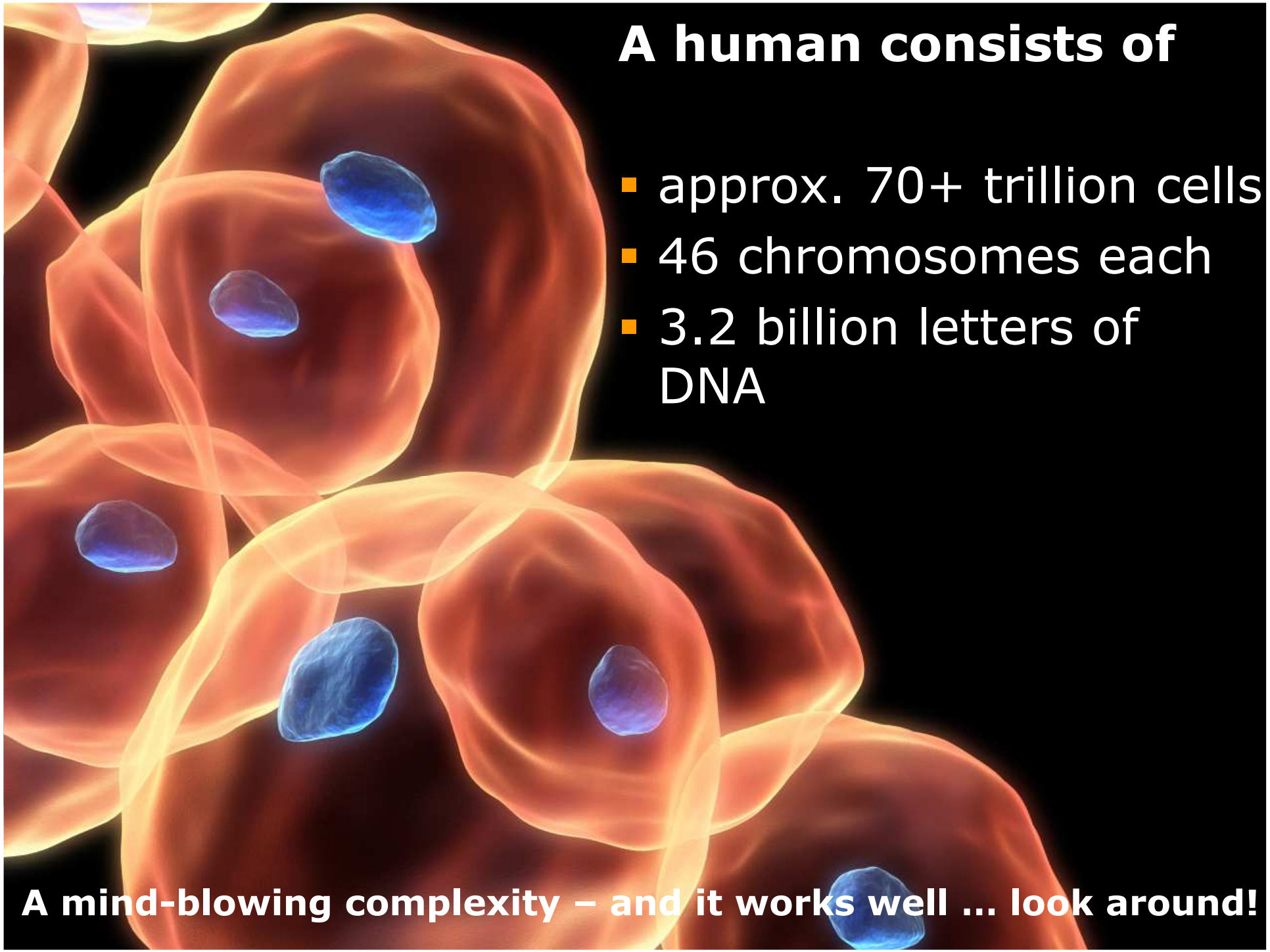
Geniom "industrializing" Synthesis **and** Analysis

Read

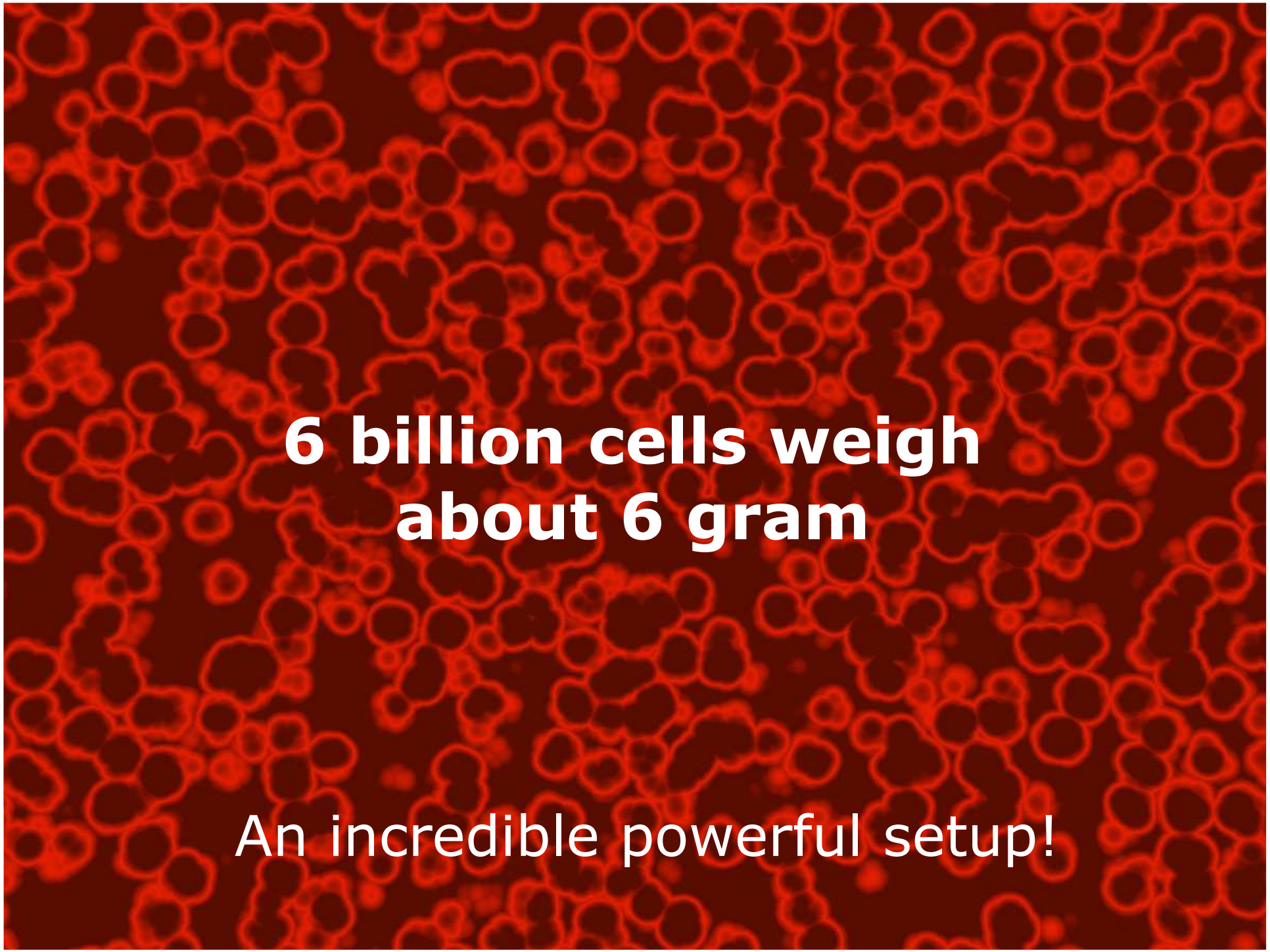
AAGCTTGGCTAT

1001010110101

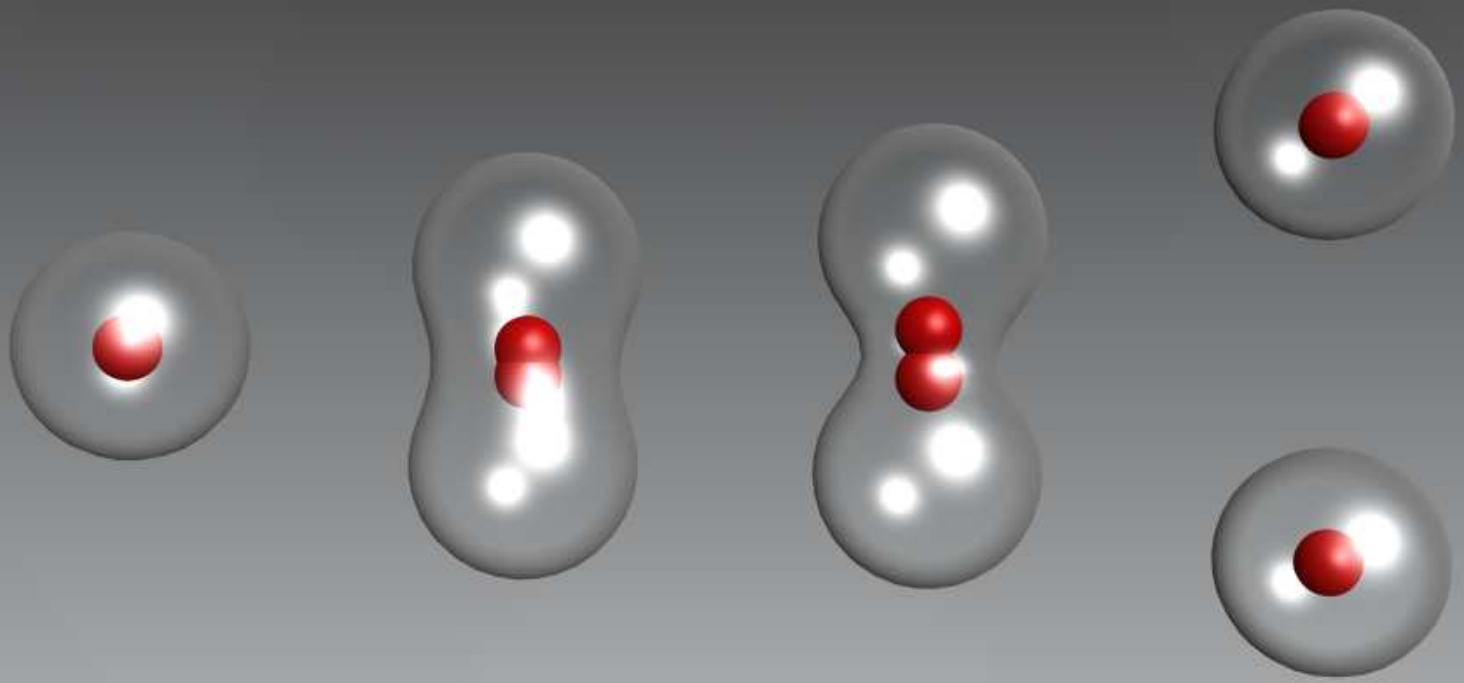
Write


A human consists of
approx. 70+ trillion cells
46 chromosomes each
3.2 billion letters of DNA
A mind-blowing complexity – and it works well … look around!


World population about 6 billion
http://www.census.gov/ipc/www/popclockworld.html


6 billion cells weigh
about 6 gram
An incredible powerful setup!

Human: 45 cell divisions in 40 weeks until birth



The POWER of biology – exponential cell growth driven by Genes!

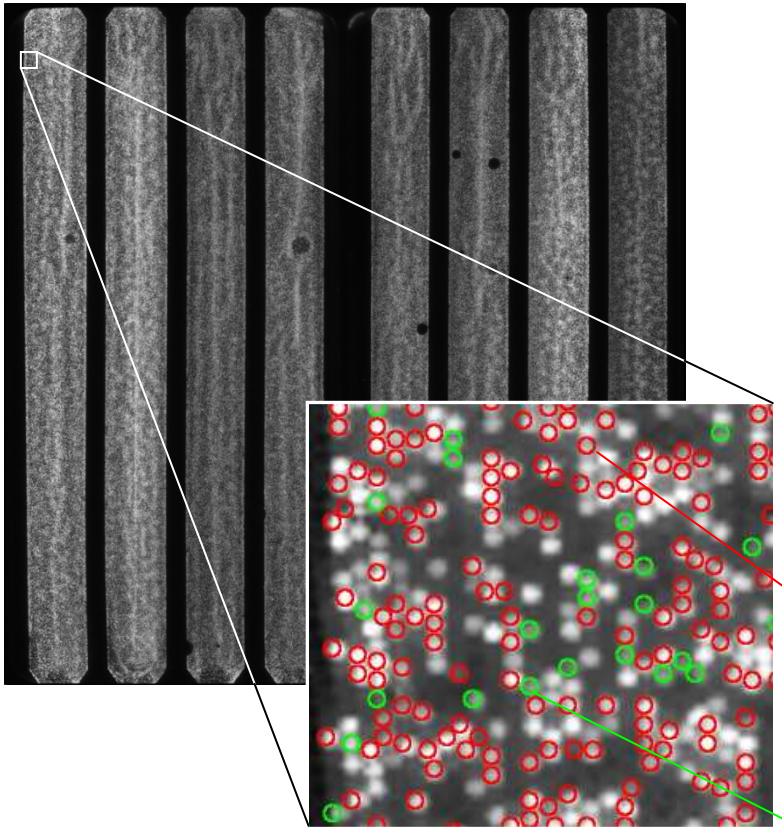
Mass production of Genes based on perfect parts: Megacloning Project

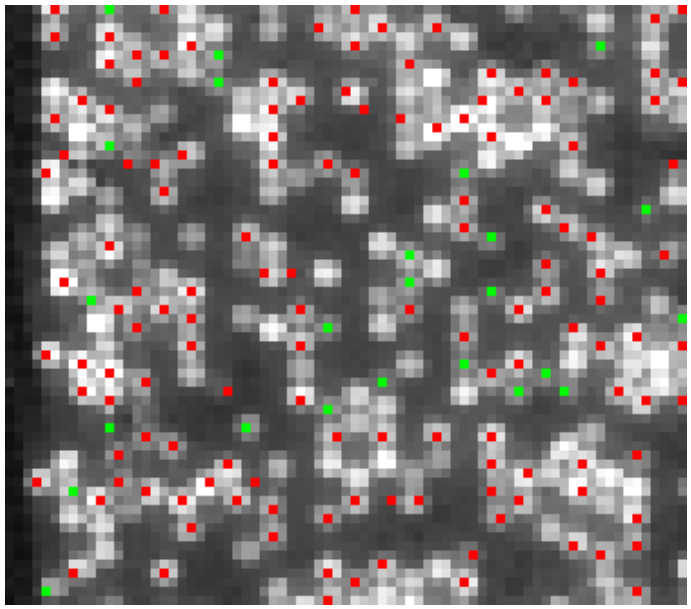
Genome Sequencer FLX (454 GS FLX)

Geniom one:
Up to 30 Mb of Oligos/day

454 Sequencer:
Up to 250 Mb Reads/day

Sequencing Bead localization





```
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CACTCGGAGTATCGGCAGATTCCGCAGCTCCAAGAGCATGGACCGACTTGCTTAC
CGCTTTCAACAACGTCCTGAAGGACAGGCATCTACCATCACCATCACTAGGACCC
AGCTTTCTTGTACAAAGTGGTCCCCCGAAGA
```

```
>FL3SQ3101APG7U rank=0000081 x=173.0 y=216.0 length=193
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CTTTCAACAACGTCCTGAAGGACAGGCATCACCATCACCATCACTAGGACCCAGC
TTTCTTGTACAAAGTGGTCCCCCGAAGA
```
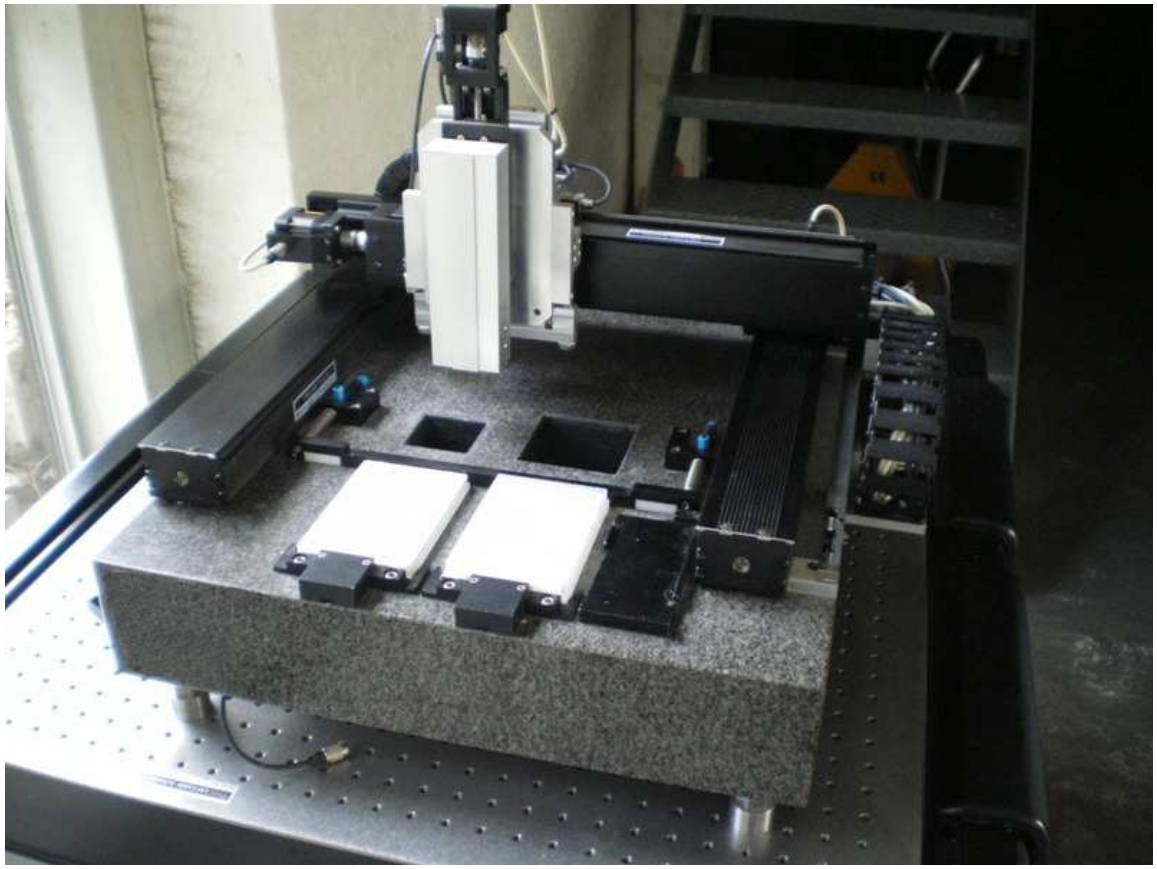

Automated DNA recovery

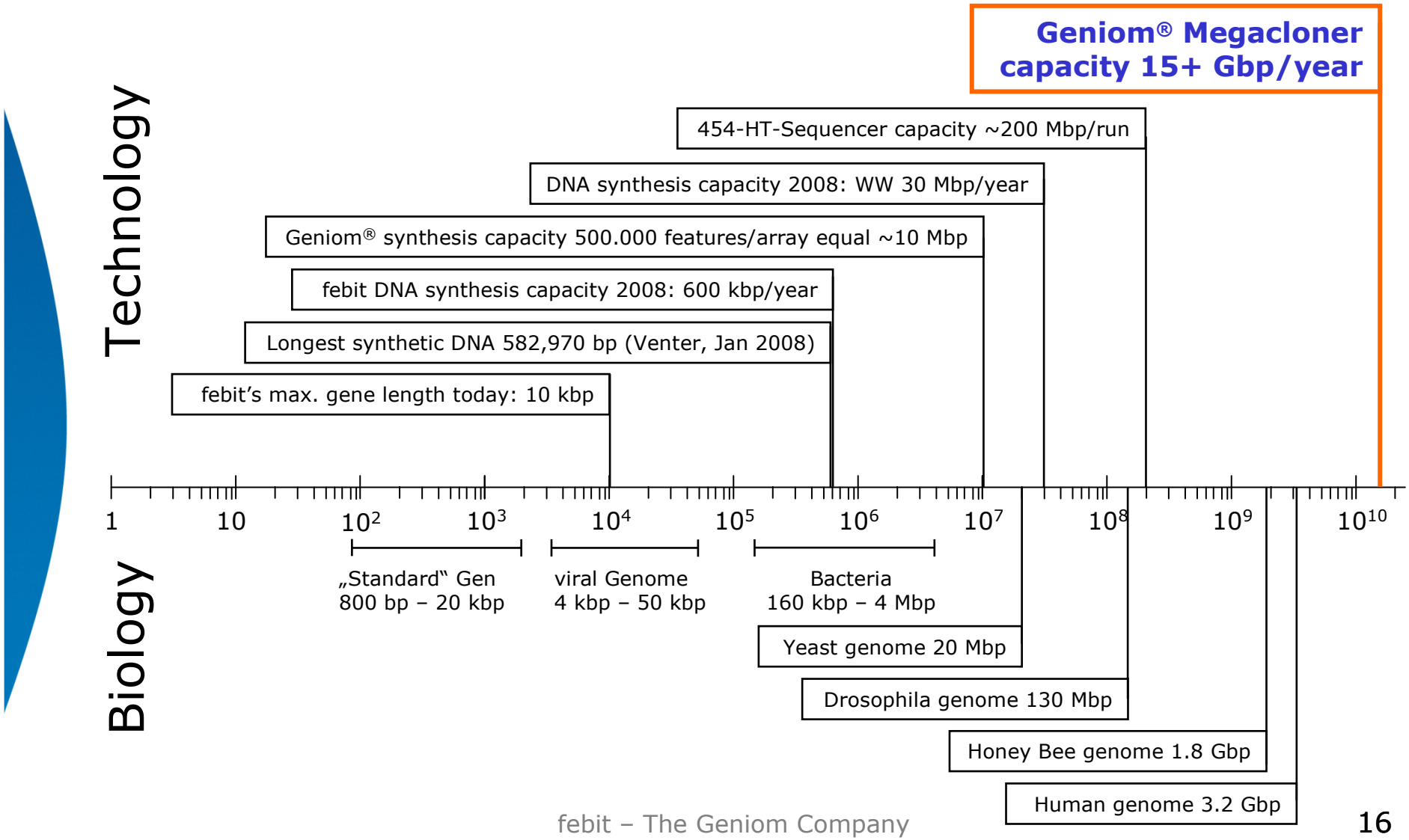


micro-actuator for bead picking

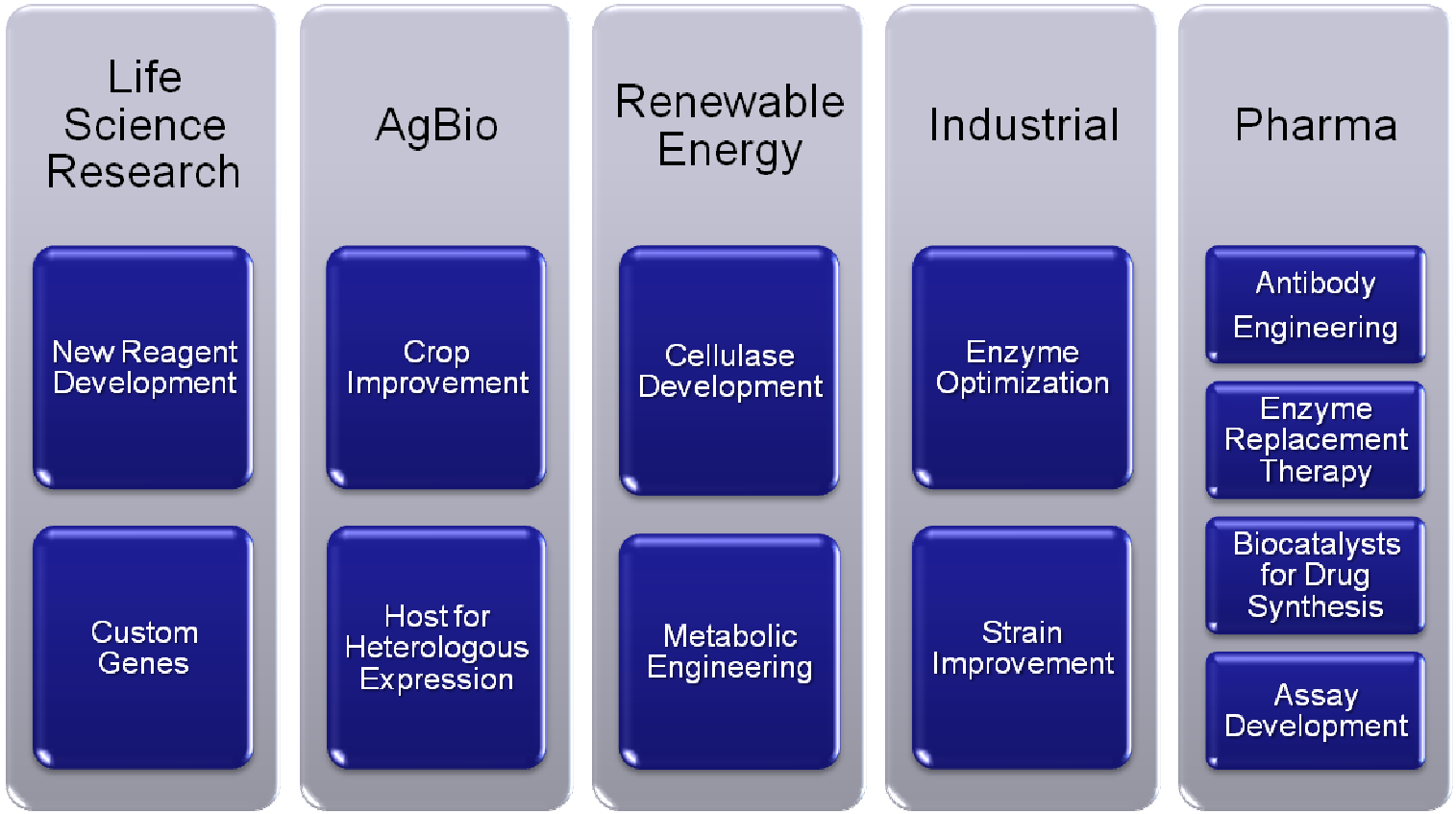
First Megacloner Results

- 440.000 sequence reads a 250 bp per run (per day)
- error rate of starting material 1 error in 150 bp
  → ~19% of fragments (250 bp) are correct
  → 83.600 beads to be extracted
  → carrying 20.9 Mbp sequenced & correct DNA
- for comparison: world wide synthetic DNA production in 2008 ~50-60 Mbp

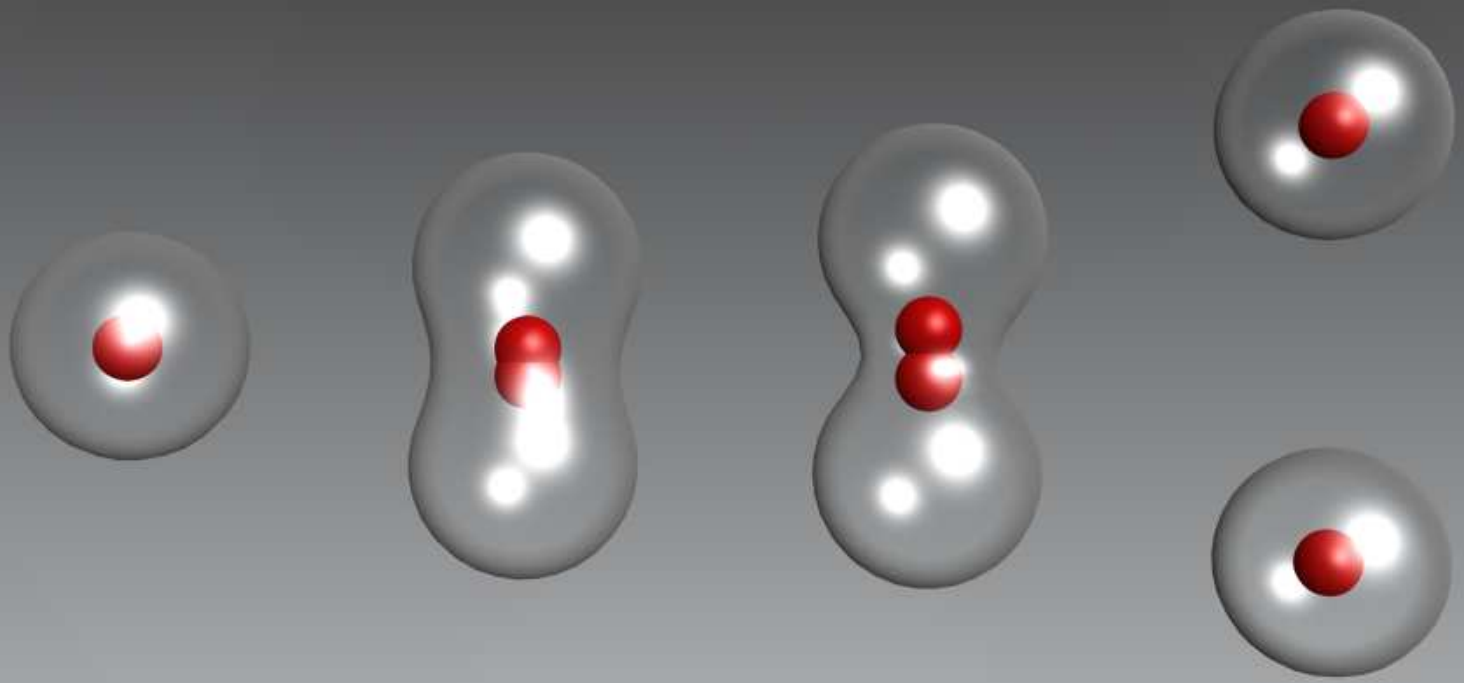
Next Disruptive Wave



Synthetic Biology Applications – a tremendous opportunity



Exponential cell growth driven by Genes



Requires guidance and sorrow handling to enable sustainability!

mission

IASB
International Association Synthetic Biology

Representing both **providers, users and consumers** of synthetic biology, IASB aims at bringing the field to full potential by

promoting **biosecurity and biosafety**

as well as

facilitating and standardizing applications

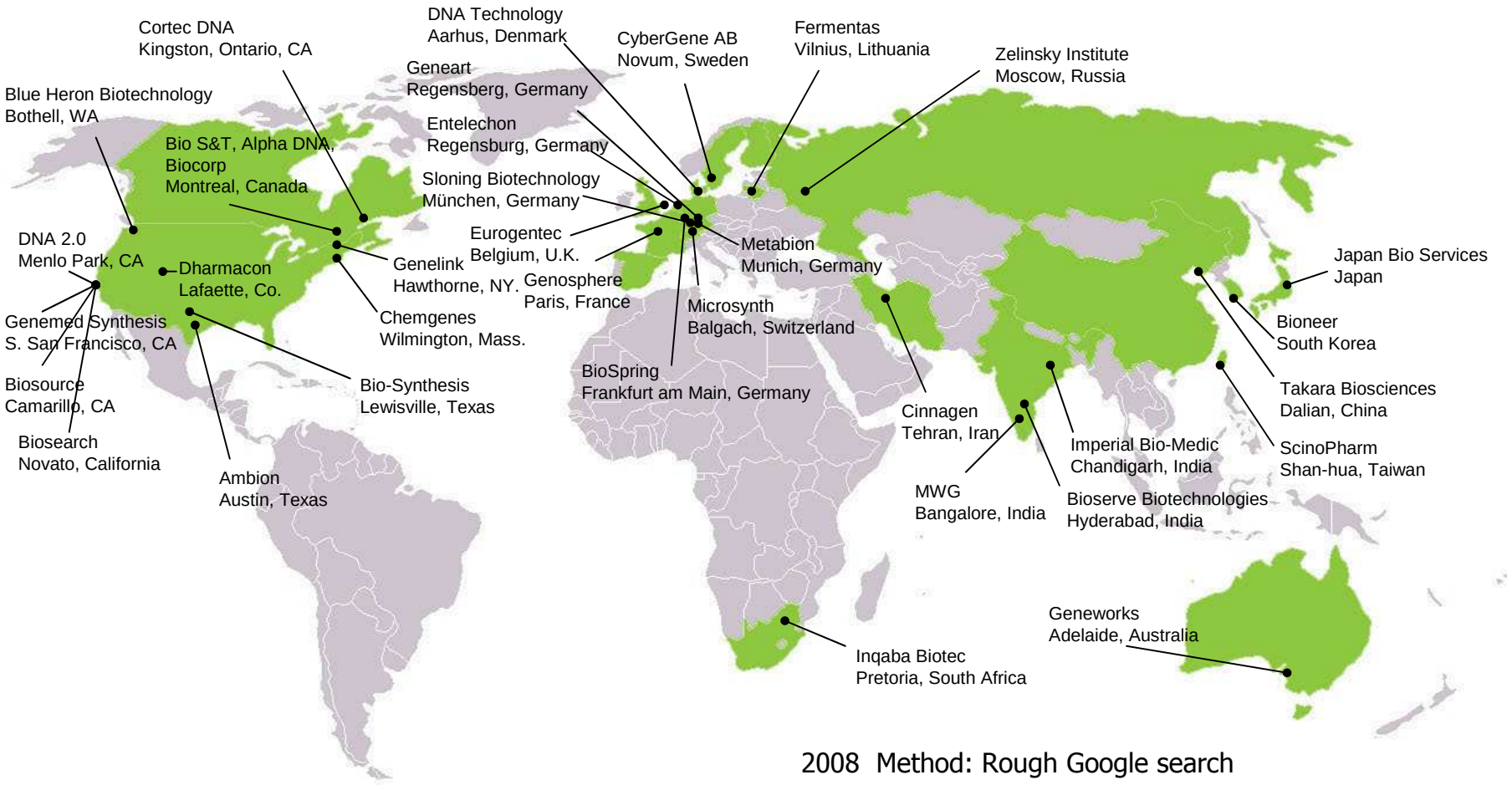
Roadmap


2009
• Code of Conduct
• Seal of Approval
• Making gene synthesis more secure
• Internationalization: Develop US representation
2010
• Develop action plan for oligonucleotides
• Response to drastic growth of public sequence information
• Internationalization: Representation in Asia
2011-15
• Standardize techniques, interfaces, building parts in synthetic biology
• Cooperative screening and control infrastructure

Code of Conduct Project - Content

- Compliance with all national/international and export regulations
- Screening of customers and sequences
- Cooperation with authorities
- Store data on inquiries for forensic purposes
- Build Virulence Information Repository - VIREP
- to be finalized in 2009 …

An exciting, fast growing industry still at its infancy - map of DNA synthesis companies worldwide -



2008 Method: Rough Google search

Contact us and join or support the IASB

www.ia-sb.eu