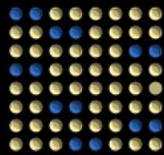# Microarray Production: Implementing Automation

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3rd Annual Ontario Microarray Symposium

Nov. 11-13, 2003

UHN Microarray Centre

The *Tornado* Continues

… moves technology beyond early
adopters into mainstream market.

~ Geoffrey A. Moore

UHN Microarray Centre

We're on the radar

UHN Microarray Centre

We're on the radar

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Queries

UHN Microarray Centre

The Microarray Centre

Microarray Users

Products
- Standard
- Custom
- Contract
- Collaborations

Admin.
- Ordering
- Shipping
- Invoicing

Tech Support
- Protocols
- Informatics
- Knowledge management

Media
- Tutorials
- Website
- Symposia
- Publications
- Conferences

Production

R & D

- Clone Production
- Array Production
- Quality Control
- Informatics

- Technology Development
- Data Analysis & Informatics
- Collaborations
- Applications

UHN Microarray Centre

What we offer

oHuman 34.6K
oDrosophila 14.6K
Mouse CpG 7.3K
Human CpG 12K
oTuberculosis 4.5K
Immuno 2.3K
Mouse 15K   + 7.4K
Human 19K
Human 1.7K
Yeast 6.2K
Customized   Bacteria, Fungus, Corn, Potato, Wheat

1998   2000   2001   2002   2003   2004

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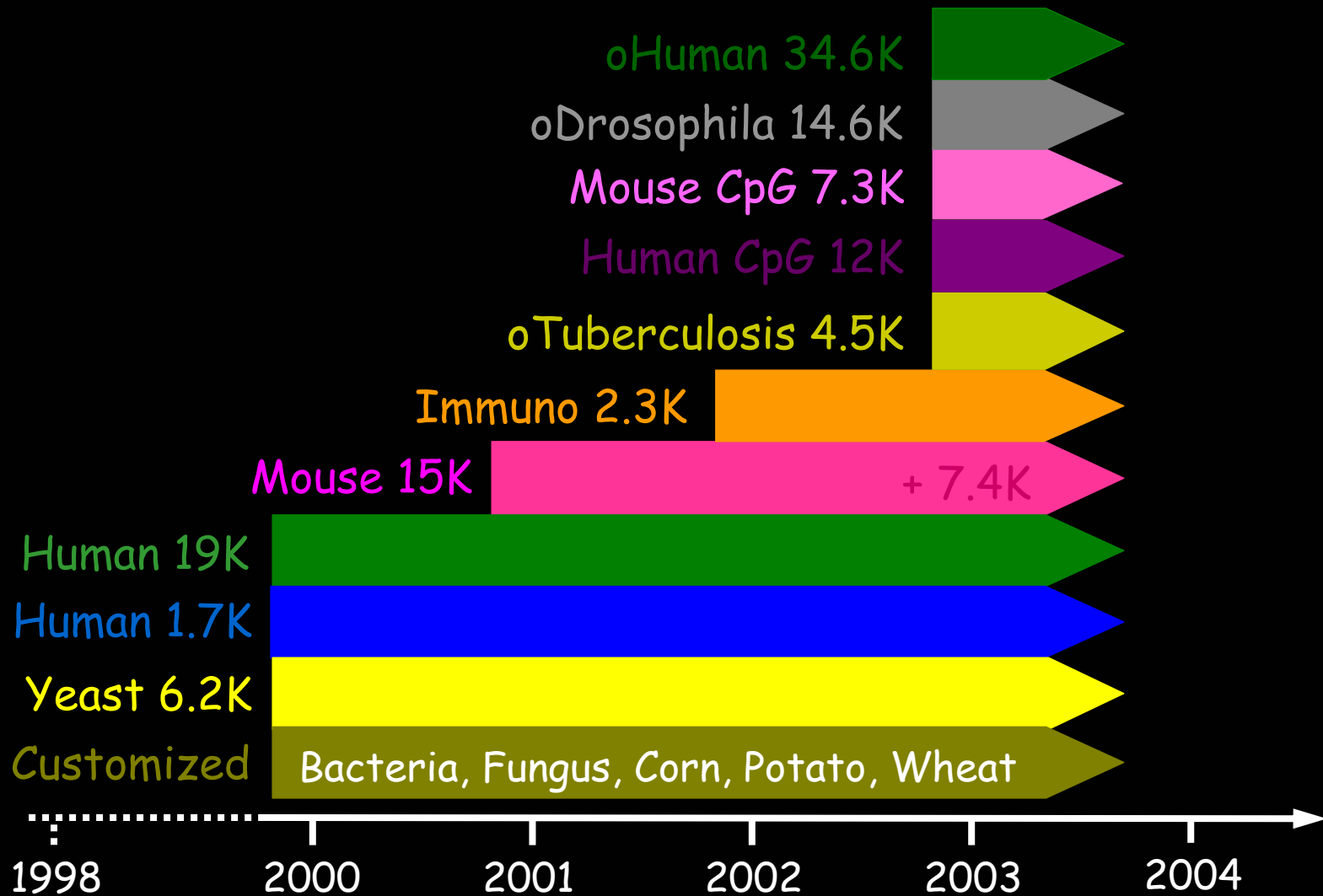
Where are we on the map?

Human arrays
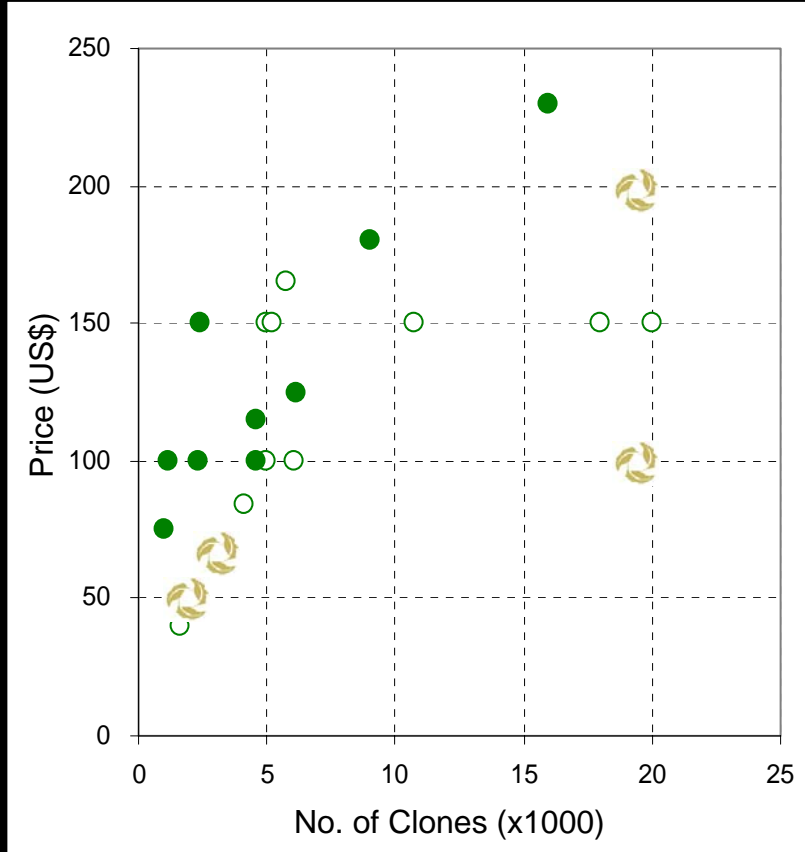
Mouse arrays
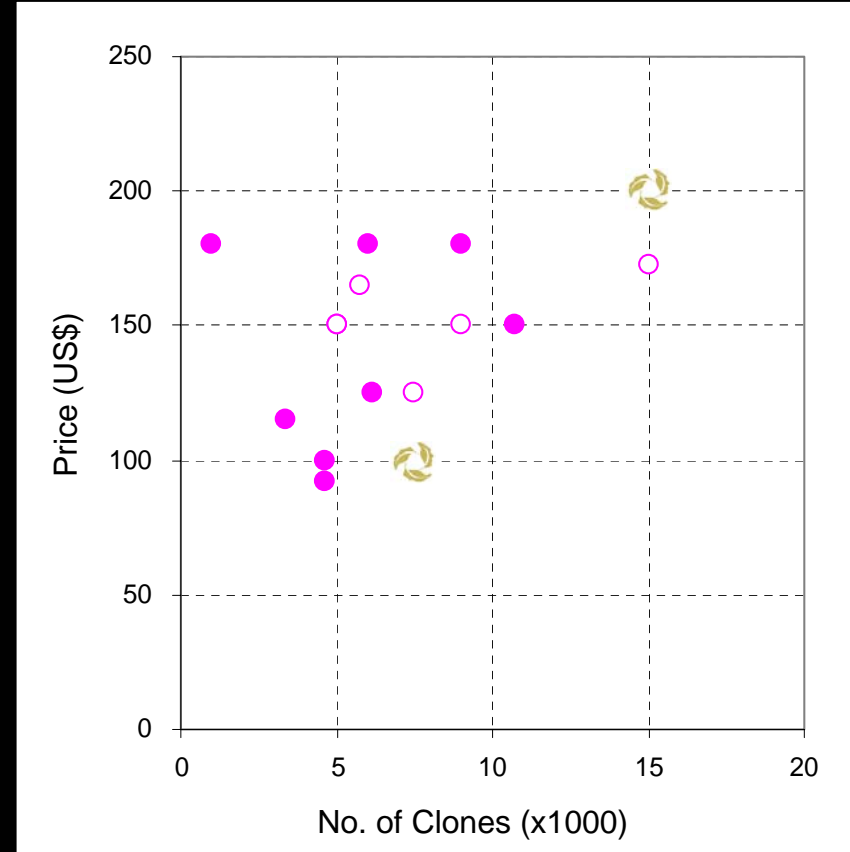
Solid and hollow dots represent double and single spotting arrays respectively.

Sources from <linkage.rockefeller.edu/wli/microarray/core.html>

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Automation

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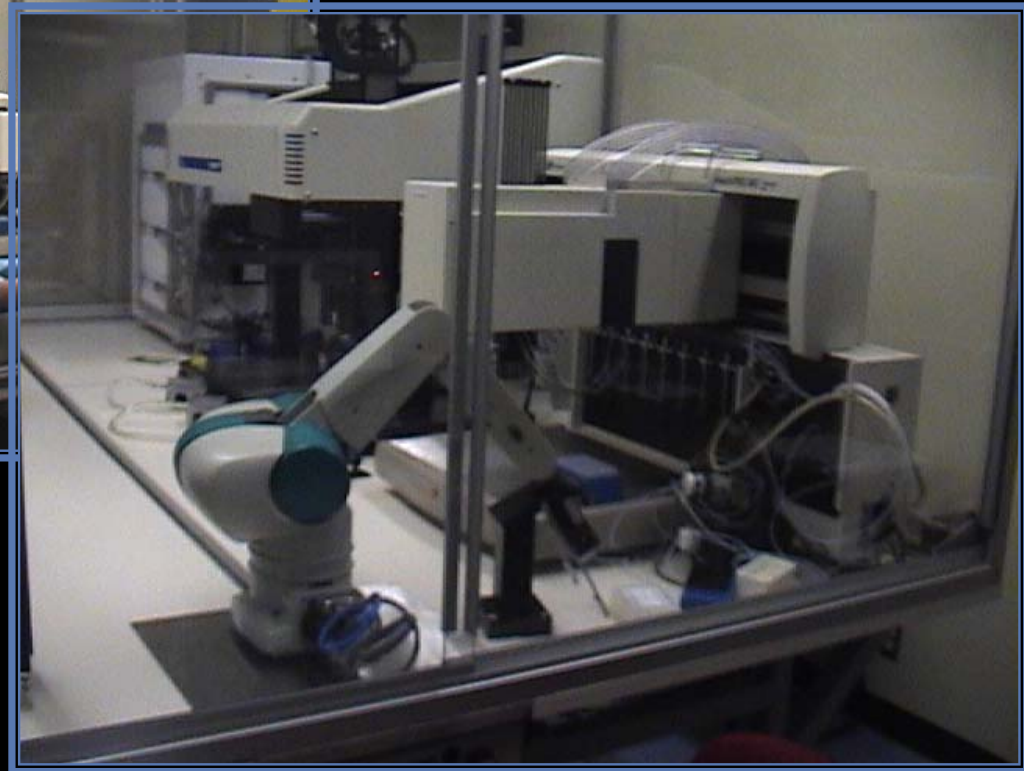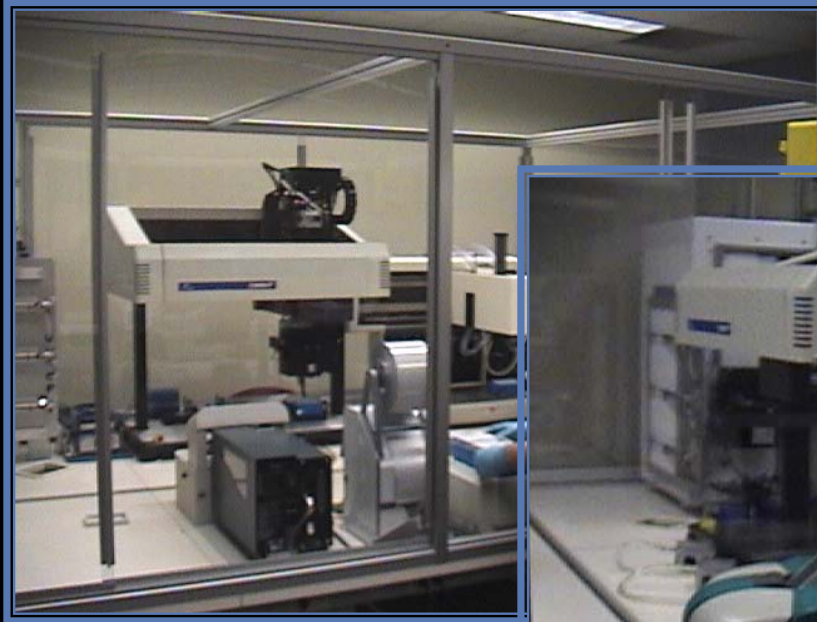
Automation

➢ Clone production and Automation

Amplification	17 d	7 d	PCR / Evolution P3
⬇			
Verification	25 d	15 d	
⬇			AGE / Gel Doc / Bioanalyzer
Purification			
⬇	20 d	12 d	Biomek 2000 / Evolution P3
Quantification			
⬇			Spectramax / Bioanalyzer
Plate Preparation	35 d	6 d	Evolution P3 / Genevac HT8

H19K 97 d   **40 d**
M15K 68 d   **30 d**

Thermo CRS

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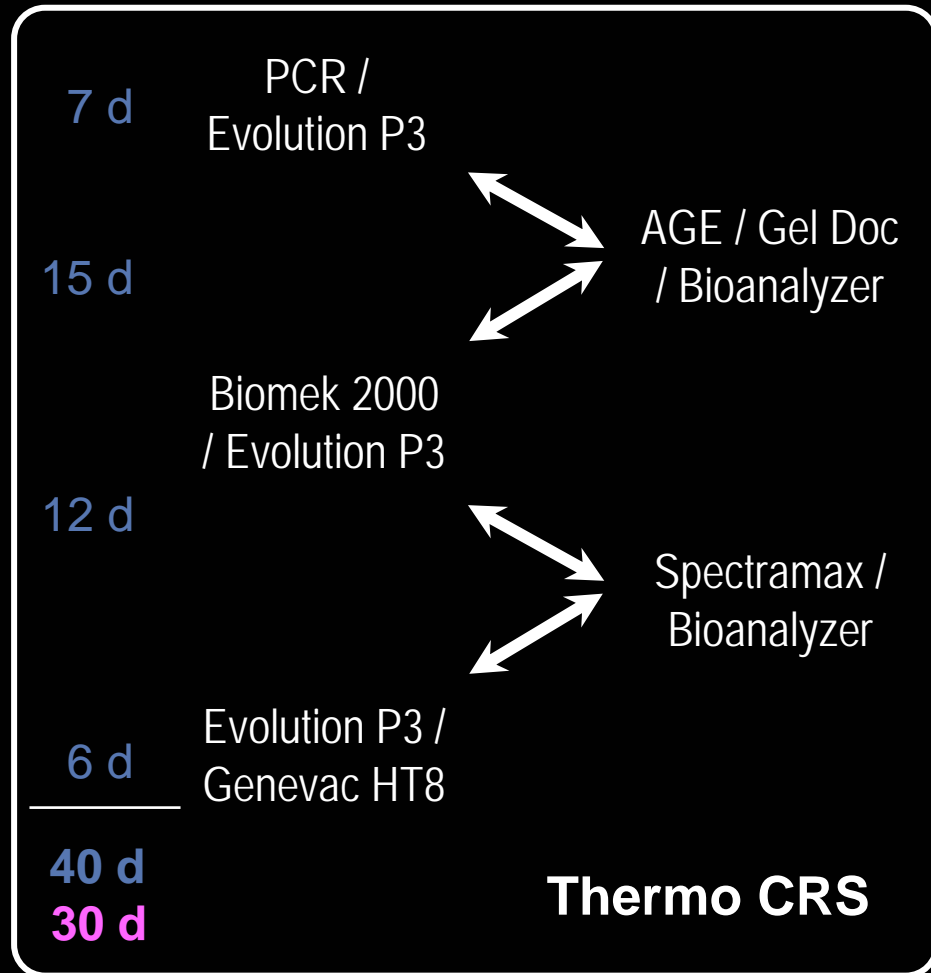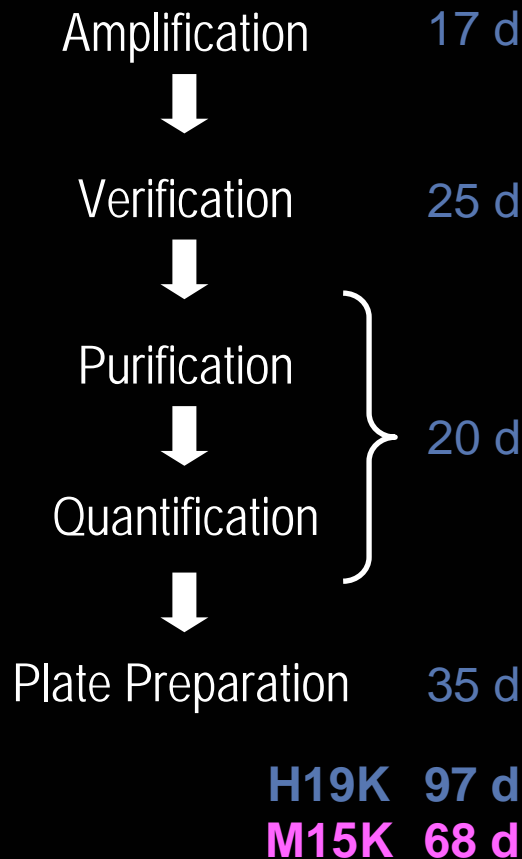
Automation

➢ Array production and Automation

Printing ➡ High-throughput arraying robots

⬇

Processing ➡ Automated batch processing

⬇

Quality Control ➡ Benchmarking

⬇

Tracking ➡ Barcodes, LIMS

⬇

Sample Management ➡ Life span of clone sets

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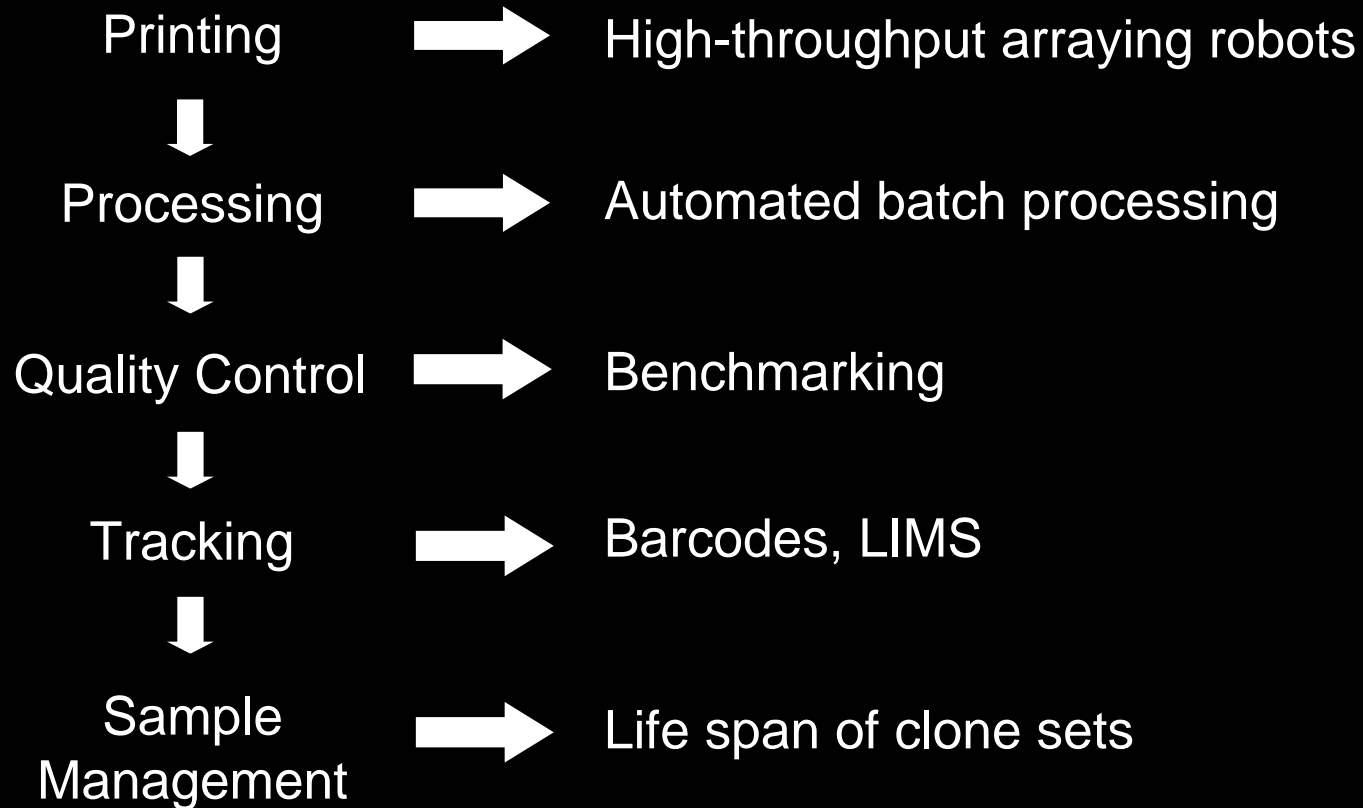
High-Throughput Array Production

- ➢ No. of Arraying Robots = 6
- ➢ Simultaneous printing = 670 arrays
- ➢ Operation Time = 16 hrs/day

Arraying robot

SMP3 (0.25 ul uptake)
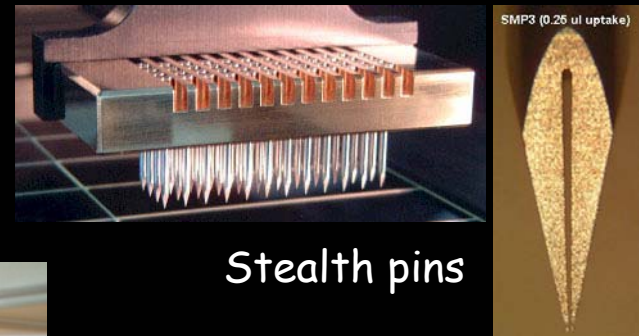
Stealth pins

Barcoded slides

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Automation (Slide Processor)

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Queries
Queue
Quantities

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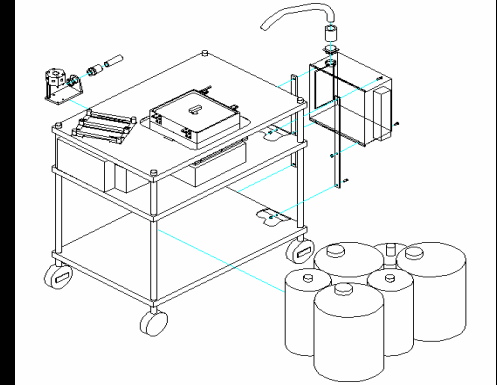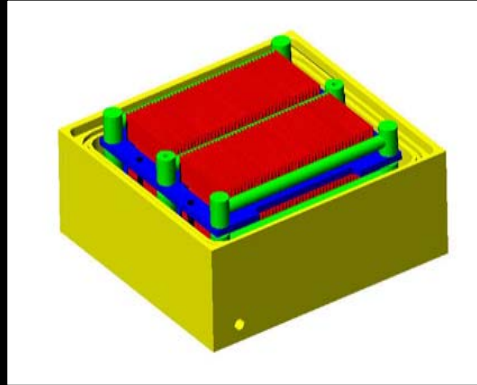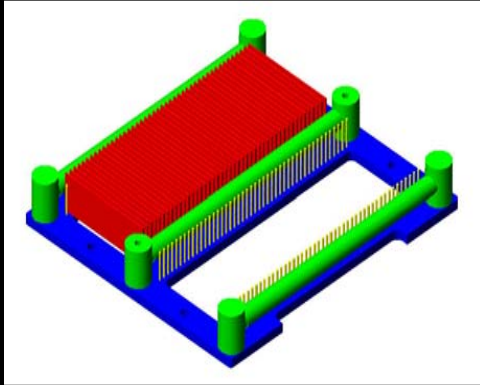
More Clone Sets ⇨ More Printing

Jan 2000 – Aug 2003:
> 52,500 arrays shipped
> 1.3 trillion spots
~30 million spots/month

oHuman 34.6K
oDrosophila 14.6K
Mouse CpG 7.3K
Human CpG 12K
oTuberculosis 4.5K
Immuno 2.3K
Mouse 15K
Human 19K
Human 1.7K
Yeast ORFs
Customized

+10K
+1.5K
+7.4K
+?K
+0.5K

Bacteria, Fungus, Corn, Potato, Wheat

1998   2000   2001   2002   2003   2004

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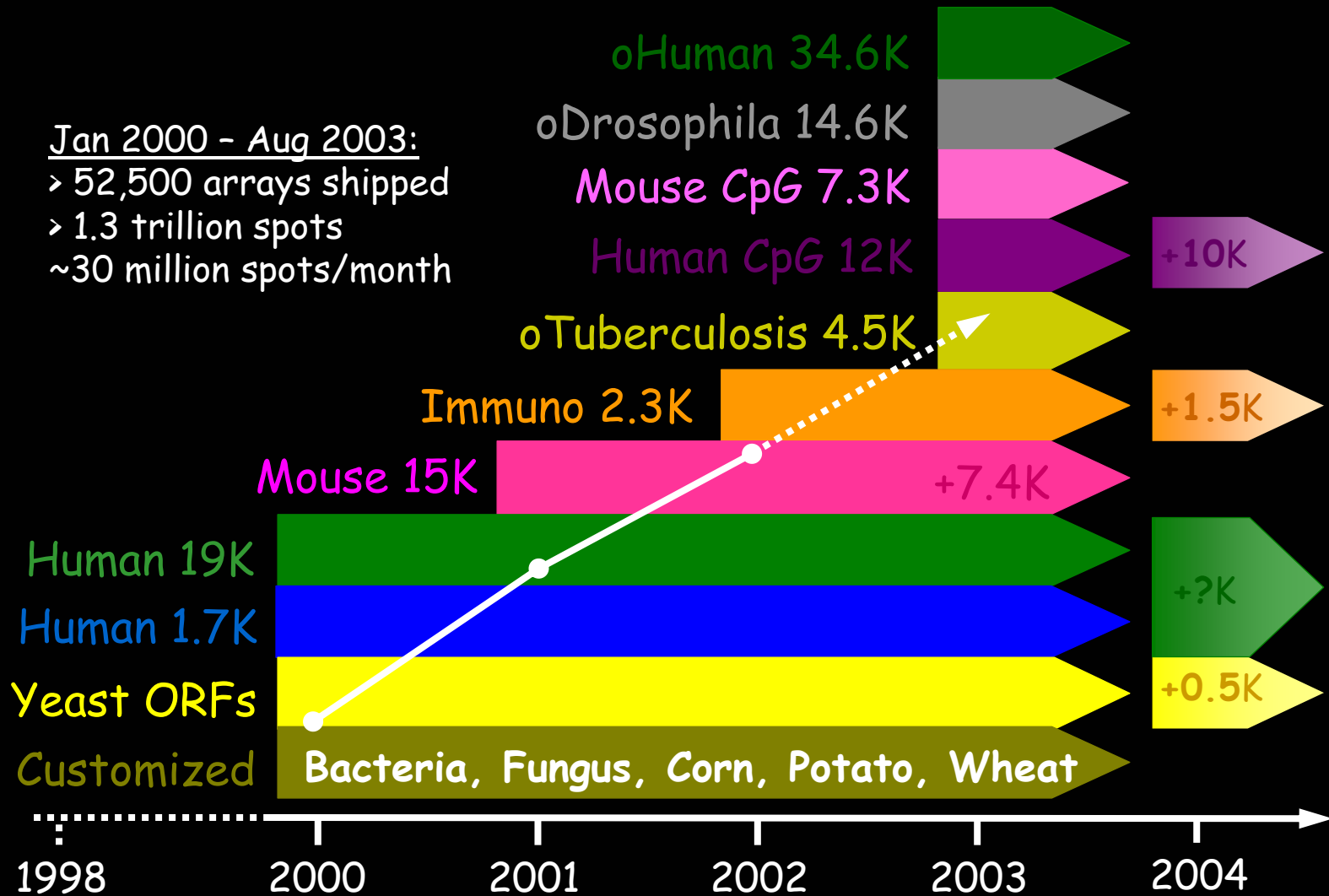
More Spots ⇨ Higher-Density Array

➢ Human Genome Oligos Set: 34,580 70-mers (QIAGEN)
➢ Designed based on the Ensembl Human 13.31 database and Human Genome Sequencing Project
➢ Contains 2,664 clones present in the H19K array
➢ 48-grid, single-spotted array on a single slide
➢ Spot-to-spot distance of 150 microns
➢ At this density, over 40,000 spots can fit on one array
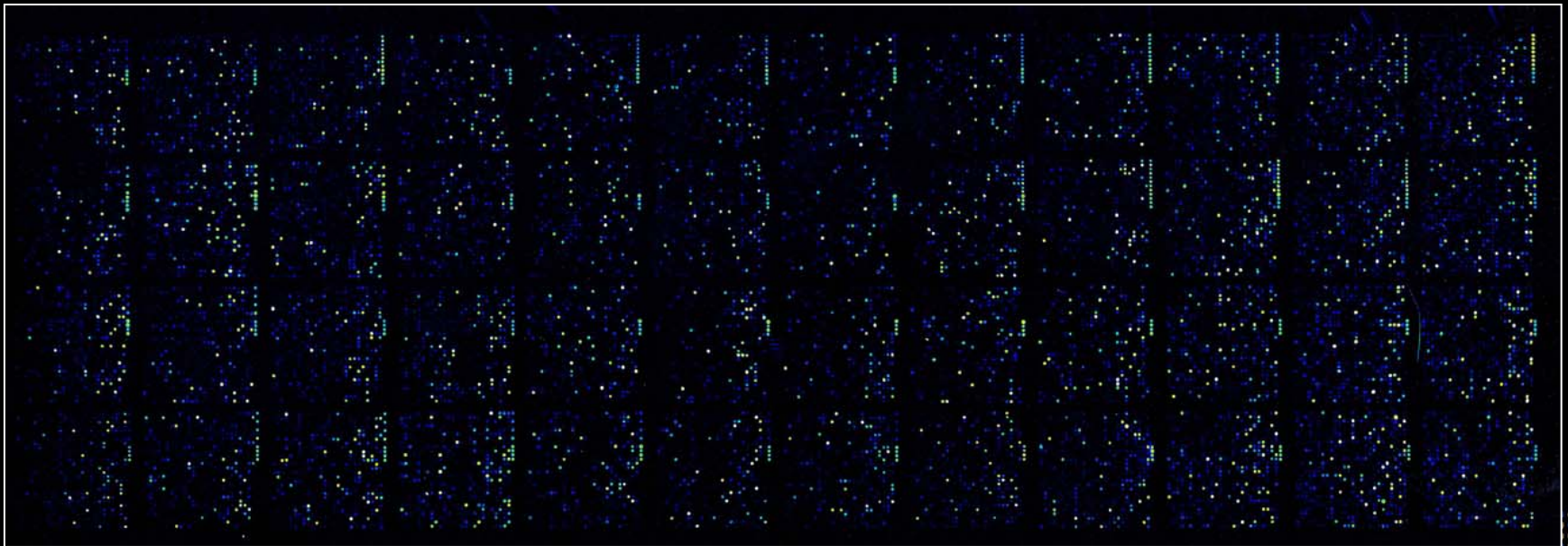
Hybridization using Universal Human Reference RNA (Stratagene).

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Queries
Queue
Quantities
Qualities

UHN Microarray Centre

A "PI" Solution

Products → **Informatics** → 🙂
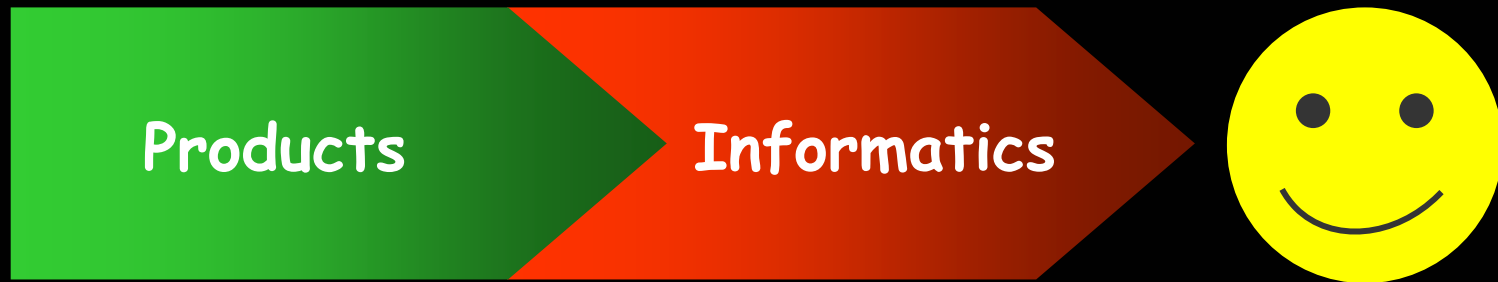
- ➢ Capacity & Efficiency
  - Size of clone sets
  - Array format
  - Production platform
- ➢ Variety
  - Universal or Theme
- ➢ Facility and Resources

- ➢ Knowledge
  - Protocols
  - Applications
  - Analytical tools
- ➢ Data Management
  - Clone sets
  - Experimental data

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ProCIS (Production Cycle IS)

Master Set

Replicate

Working Set → Amplify → Amplified Set

Weigh

Printing Set

Usage Table

Scan Slides

Batch List

Print

Printed Microarrays

Process

Processed Microarrays

QC

Fill orders

Shipment Records

QC Report with Images

Analyze

Certificate of Analysis

Resuspend

Lyophilized Set

Dry

Agarose Gel Electrophoresis

PCR Report with Gel Images

Purify

Purified Set

Quantify

Transfer

Yield Report

Printing Set

Sequencing Set

Sequence and Annotate

Genelist

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Coming Soon

UHN Genome Array

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Acknowledgements

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Customer Support
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Informatics
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Zhibin Liu
Carl Virtanen

Engineering
Yasin Bismilla
Mohammad Jooyandeh
Bill Liu
Sasan Raghibizadeh

R & D Group
Eric Ho, Neil Winegarden
Dr. Jim Woodgett

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THANK YOU

Queries
Queue
Quantities
Qualities

A "Products-Informatics" Solution

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