

# Bioinformatics

Is there a sustainable bioinformatics business model?


CSIRO

BIOINFORMATICS



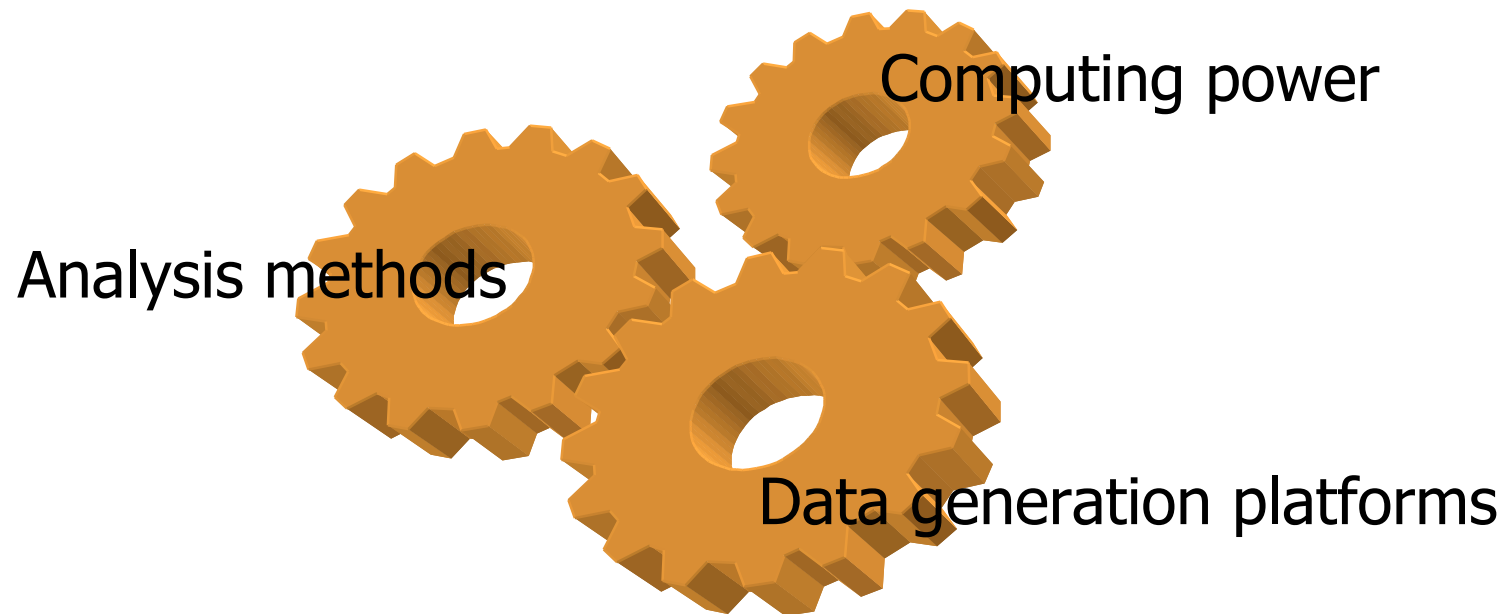
# Summary



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1. The big picture
  2. The technology & value proposition
  3. Why don't traditional business models work?
  4. New routes to market

# The Big Picture

- Bioinformatics is:
  - driven by the generation of data,
  - moderated by hardware and analysis methods



# Bioinformatics

- Protein folding
  - Structural biology

1980's +

- 
- Sequence

- Homology (BLAST)
- Databases (GenBank, KEGG)
- Data integration  
Gene ( $10^4$ ) -> transcript ( $10^5$ ) -> protein( $10^7$ )

1990's +

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- $p > n$ 
    - Array data

2000 +

# CSIRO Bioinformatics



- Data Mining + Statistics

- Experience of Bayesian statistics
  - Remote sensing, salinity
- Data Mining in highly confidential environments
  - Taxation, Health Insurance, Investment Banking
- Financial Risk Modelling
  - General Insurance, Retail Banking
- Biotechnology

# Technology



- Array Informatics for  $p > n$  data
  - Sophisticated supervised multivariate statistics
  - IP protection
- Advantages
  - Concise signatures
  - Scalable
  - Robust

# Examples of $p > n$ data

- DNA
  - SNP chips
- RNA
  - Microarrays (Affymetrix, spotted arrays)
  - SAGE/MPSS
- Protein
  - 2-D gels, LC-M/S M/S, Protein chips
- Chemical
  - Compound chips
  - Metabolites

# $p > n$ is a Paradigm Shift!



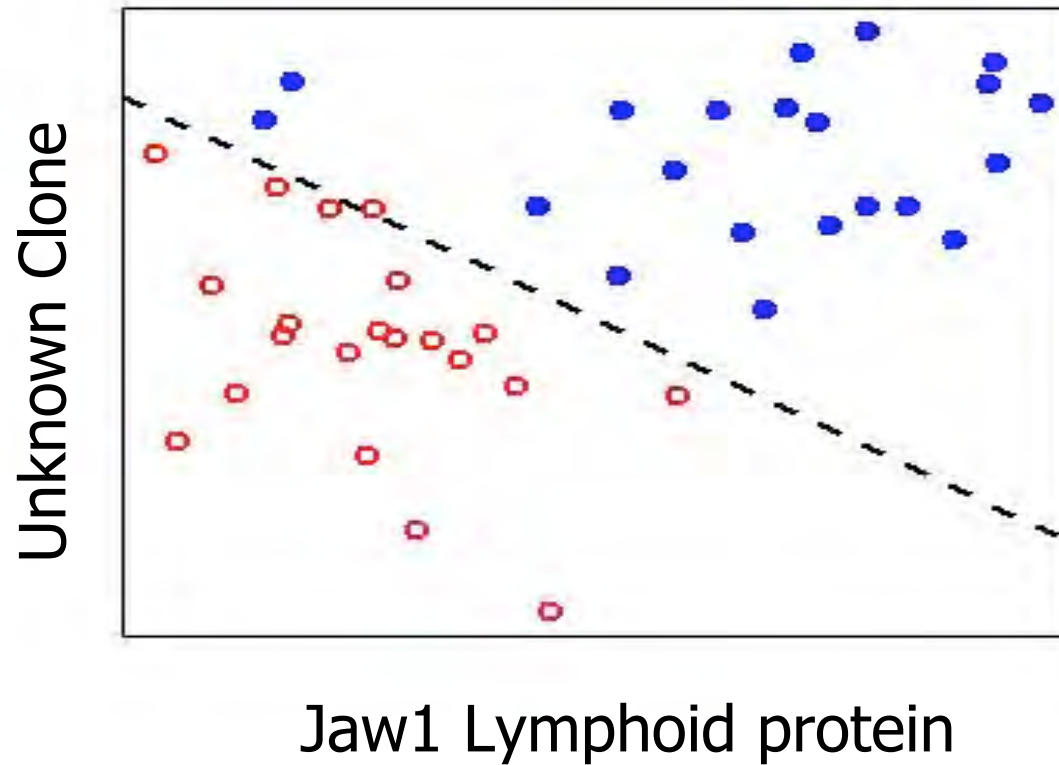
- New for molecular biology
  - Traditionally one experiment equalled one measurement
  - We tend to treat microarray data as 30,000 Northern's (ie parallel experiments)
- Current analysis techniques operate on that basis
  - Gene by gene analysis generating long lists of differentially expressed genes

# Alizadeh DLBCL Data




- Alizadeh *et al.*, Nature, Vol.403, Feb.2000
- 42 arrays diffuse large B-cell lymphoma (DLBCL), classified into two subtypes, germinal centre B cell-like and activated B cell-like
- 4026 gene expression levels measured via microarray

# Two Gene Classifier




# Value Proposition



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- Predictive toxicology
    - Profiles predictive of compound failure in preclinical studies
    - Save \$\$\$ off development costs
  - Pharmacogenomics
    - Population profiling for efficacy/toxicity
    - Rescue drugs from Phase III failure
  - Diagnostics
    - Small predictors mean that conventional technology can be used (eg. PCR based assays)


# What are the issues?



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- Market definition
    - “Bioinformatics” is poorly defined/segmented
  - Commodity pricing
    - Customers are conditioned to use “point & click” black boxes
    - Value is disguised
  - Service mentality
    - Technology seen as subservient to wet lab data

# Existing Business Models



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- Software
    - Consolidation of providers/offerings
    - Crowded market
    - Commodity pricing drivers
    - Freeware
  - Service
    - Difficult to extract appropriate value
    - Resistance to outsourcing

# You can lead a horse to water...



David:

"...we don't sell software."

Potential client:

"Yes we understand that.....can you let us have a demo CD?"

# New Routes to Market



- Protect and exploit IP
  - Licensing
  - Joint venture
  - Spin-out/Spin-through
- Develop a new story
  - This is not 1990's sequencing!

# Licensing



- License the IP (enabling technology)
  - Slice by application area  
human therapeutic, human diagnostic, plant, animal, etc
  - Dice by data type  
DNA, RNA, protein, metabolite
  - Carve out specific areas that may be more profitable as a JV or spin-out

# Joint Venture



- Prospects of significant revenue
- Identify applications where a combination of technologies create a powerful synergy and a new, sustainable business proposition
  - Predictive Toxicology
  - Diagnostics

# Spin-out/Spin-through



- Package some of the IP up and spin it out
  - 3<sup>rd</sup> party funding
  - JV or acquire extra skills/technologies
  - Prospects of significant capital growth
- Spin-through essentially the same, but roll technology into existing company for equity

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