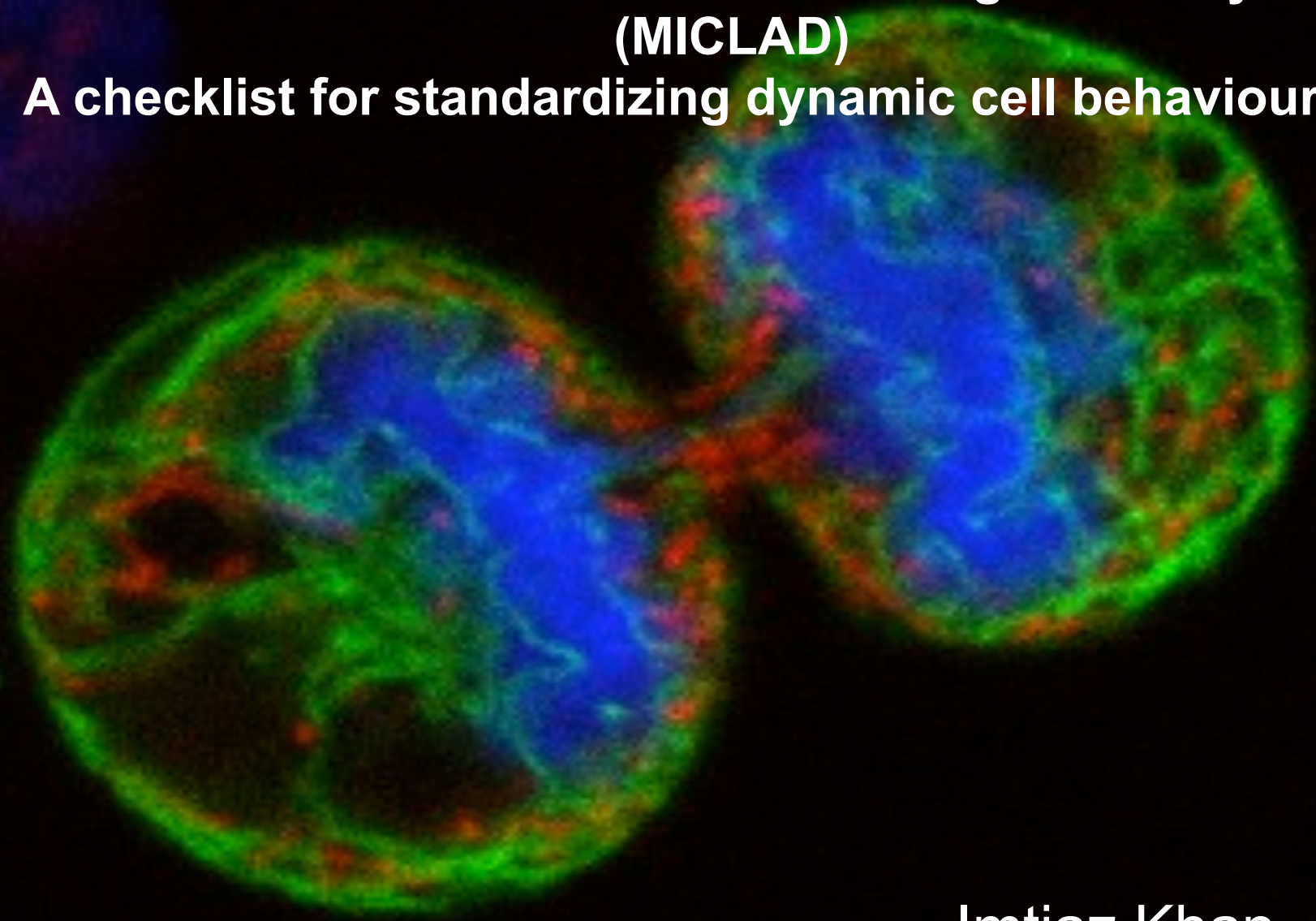


Minimum Information about Cell Lineages And Dynamics (MICLAD)

A checklist for standardizing dynamic cell behaviour data

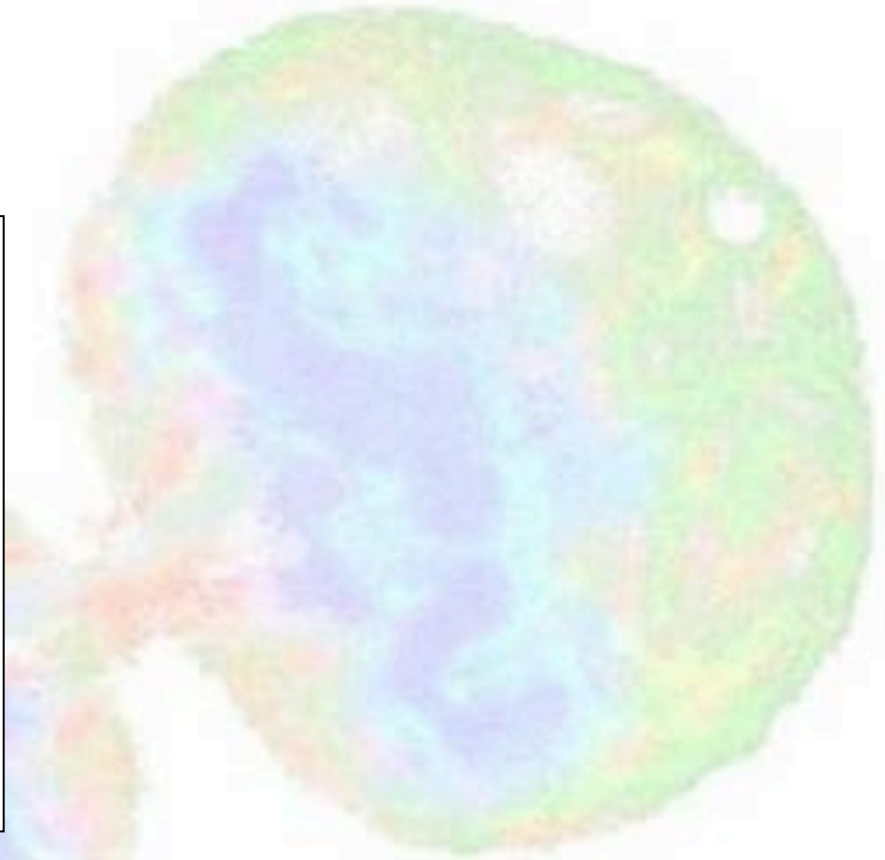
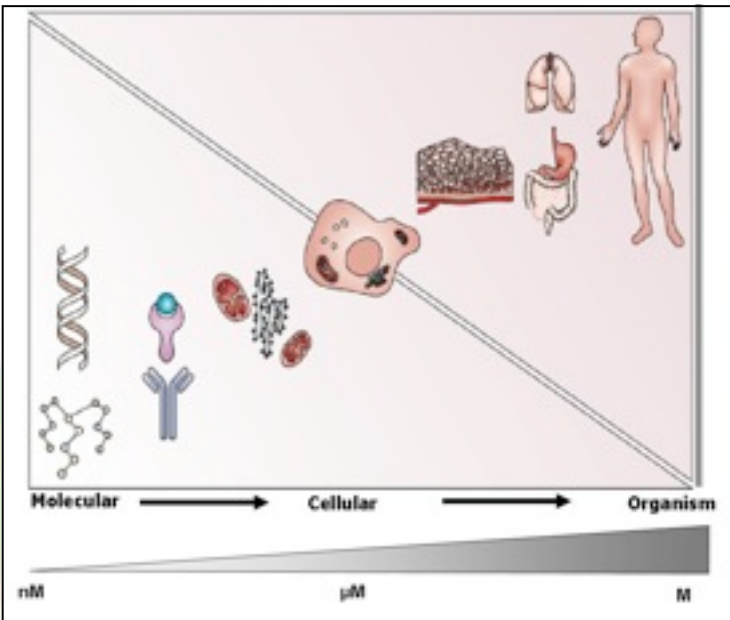


Imtiaz Khan

Institut Pasteur, 19 May' 09

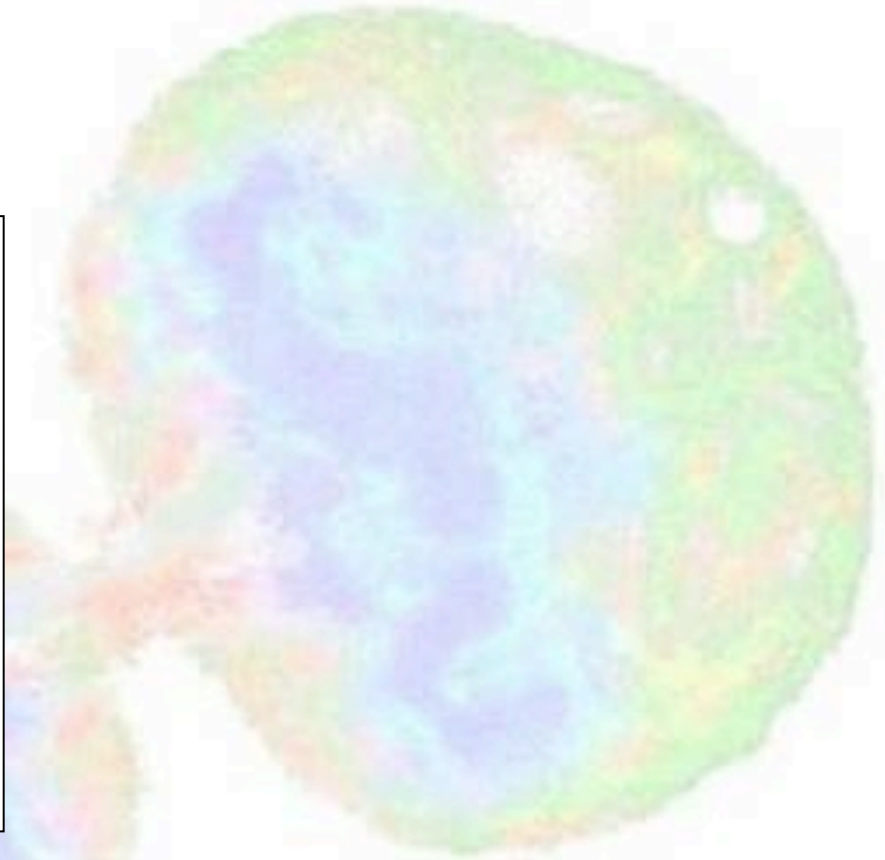
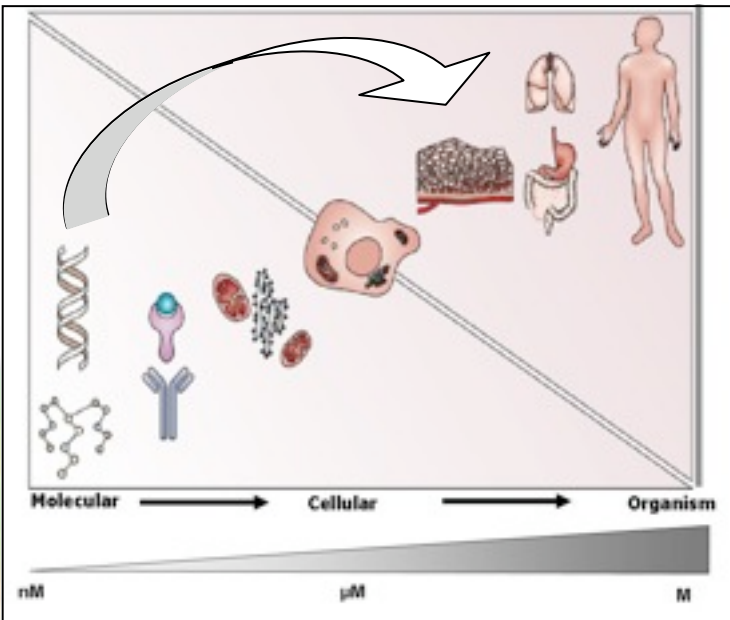
Molecular – Cellular Translational Gap

Nat Rev Cancer 2008



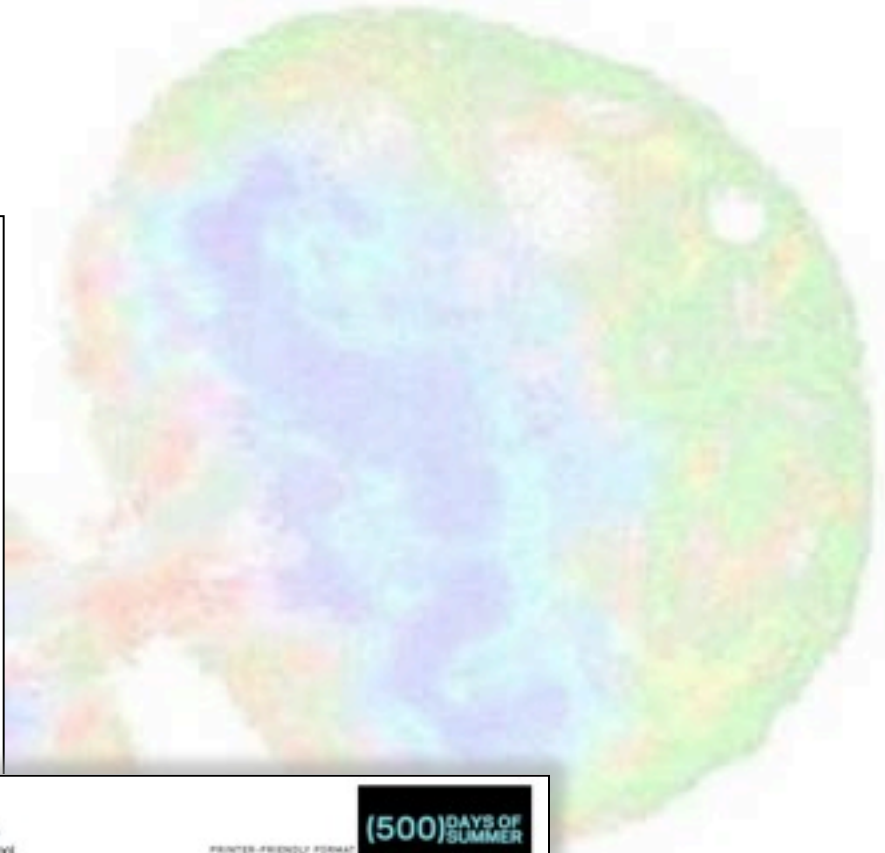
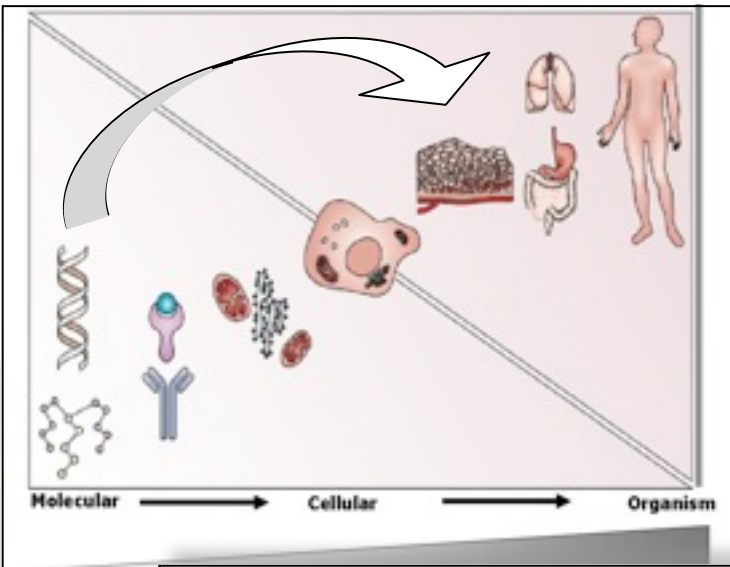
Molecular – Cellular Translational Gap

Nat Rev Cancer 2008



Molecular – Cellular Translational Gap

Nat Rev Cancer 2008



The New York Times

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April 16, 2009

Genes Show Limited Value in Predicting Diseases

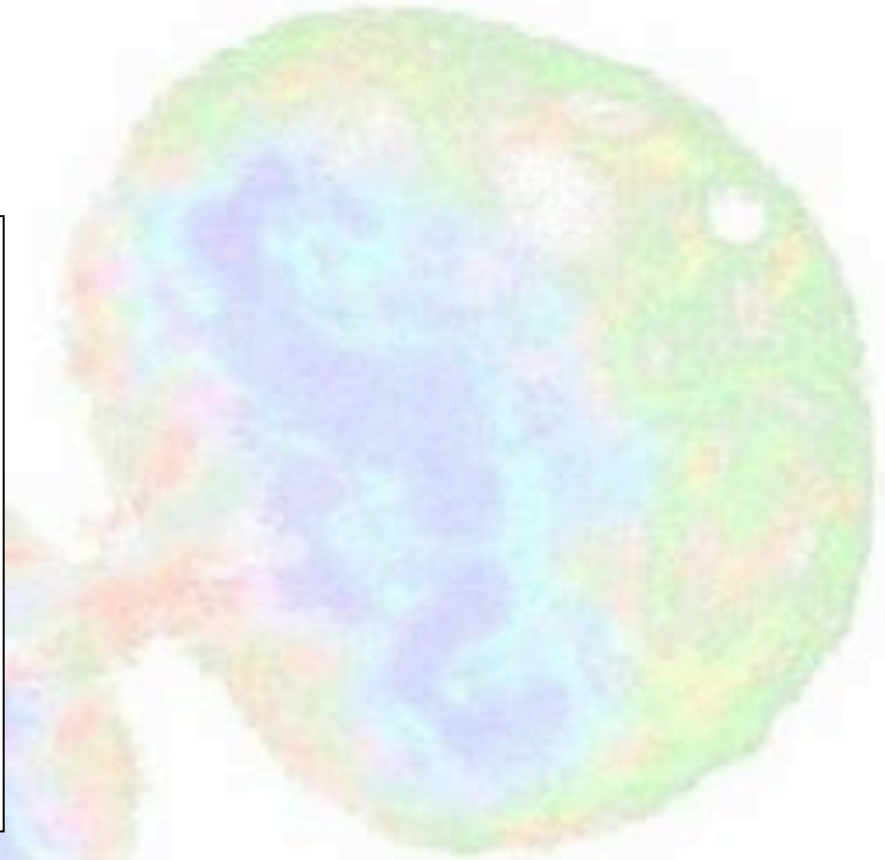
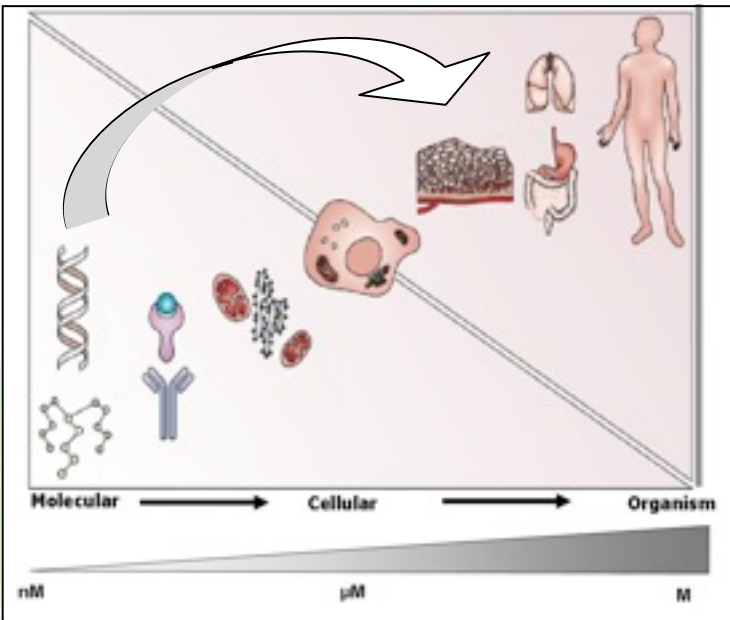
By [NICHOLAS WADE](#)

The era of personal genomic medicine may have to wait. The genetic analysis of common disease is turning out to be a lot more complex than expected.

Since the human genome was decoded in 2003, researchers have been developing a powerful method for comparing the genomes of patients and healthy people, with the hope of pinpointing the DNA changes responsible for common diseases.

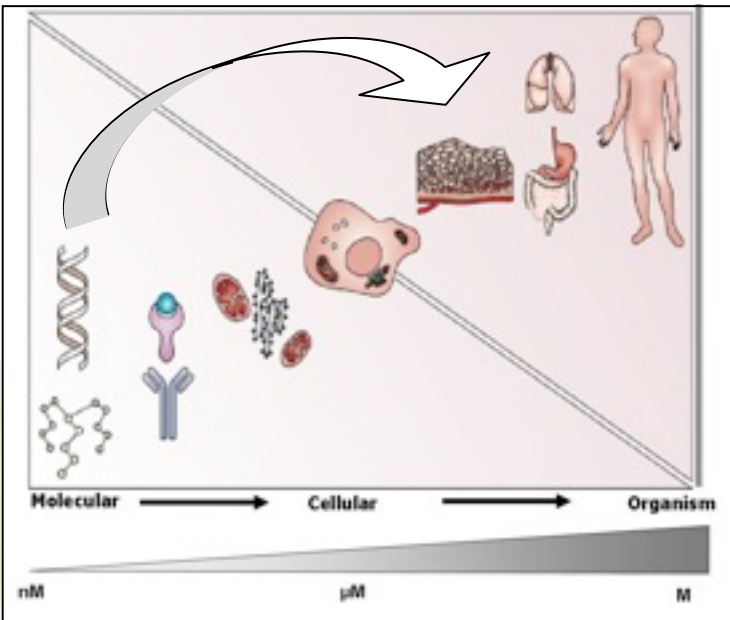
Molecular – Cellular Translational Gap

Nat Rev Cancer 2008



Molecular – Cellular Translational Gap

Nat Rev Cancer 2008

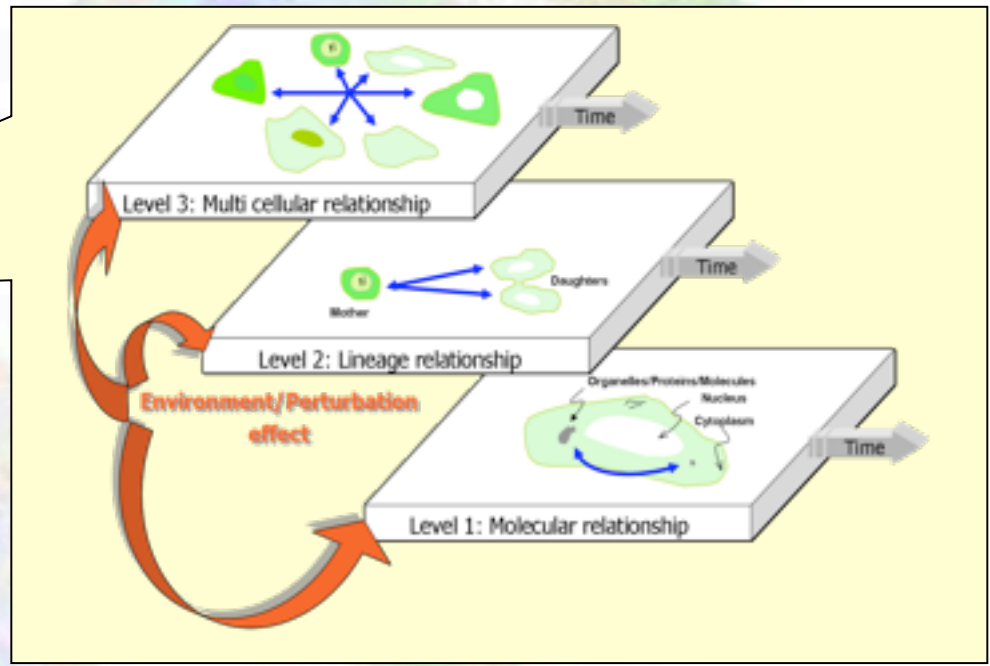
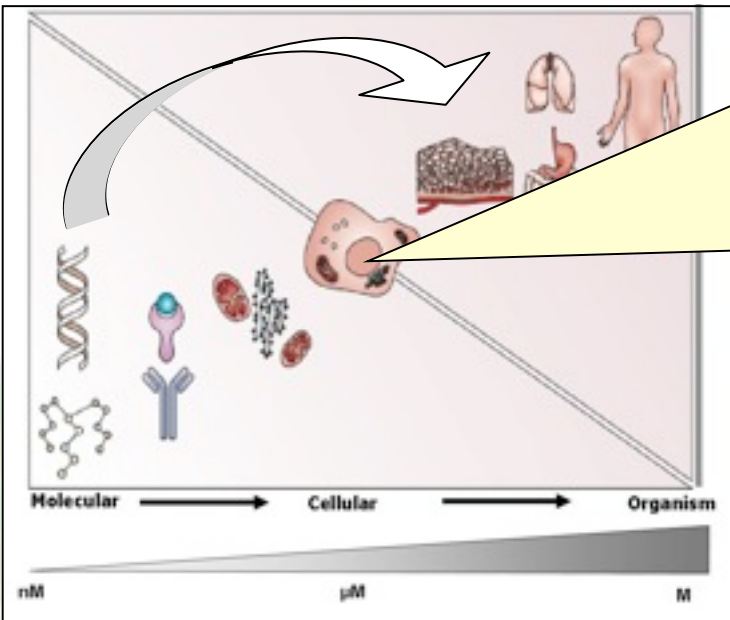


“Meso scale” – the proper perspective for abstraction of knowledge about the dynamic process of life

– Sydney Brenner (Nobel laureate, 2002)

Molecular – Cellular Translational Gap

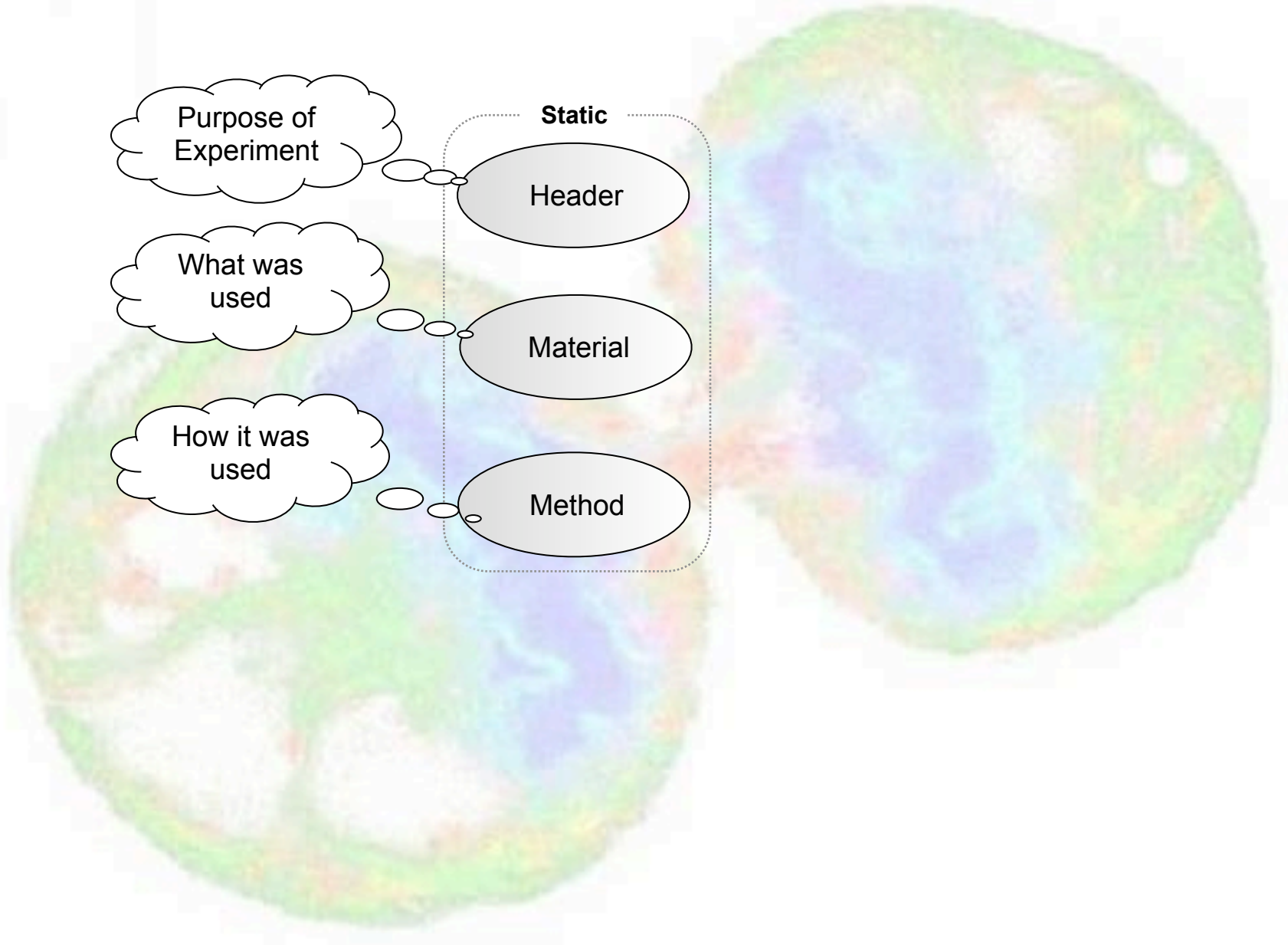
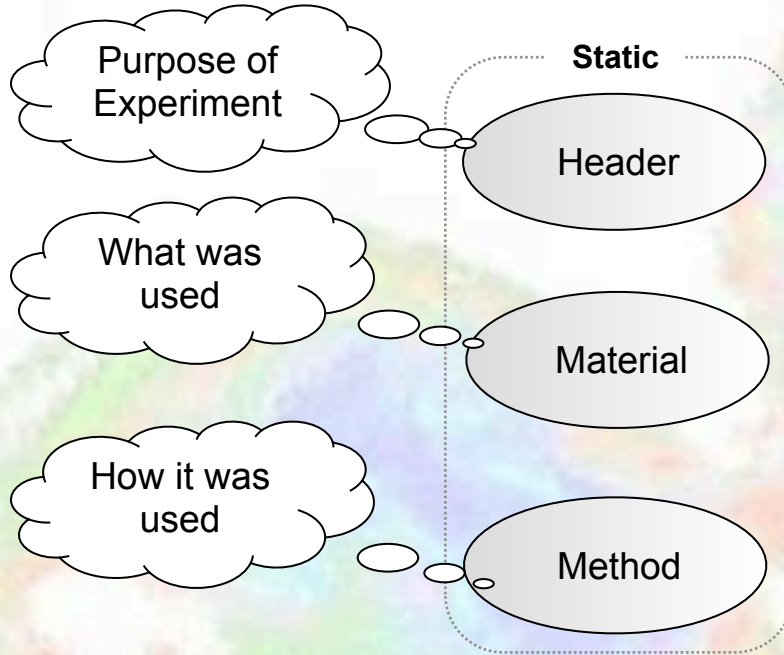
Nat Rev Cancer 2008



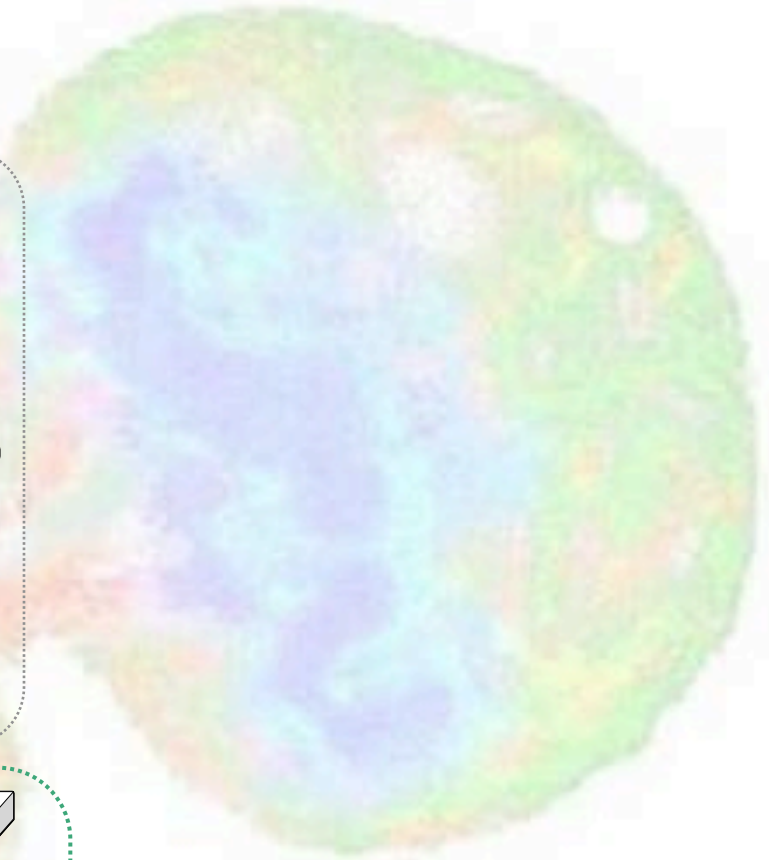
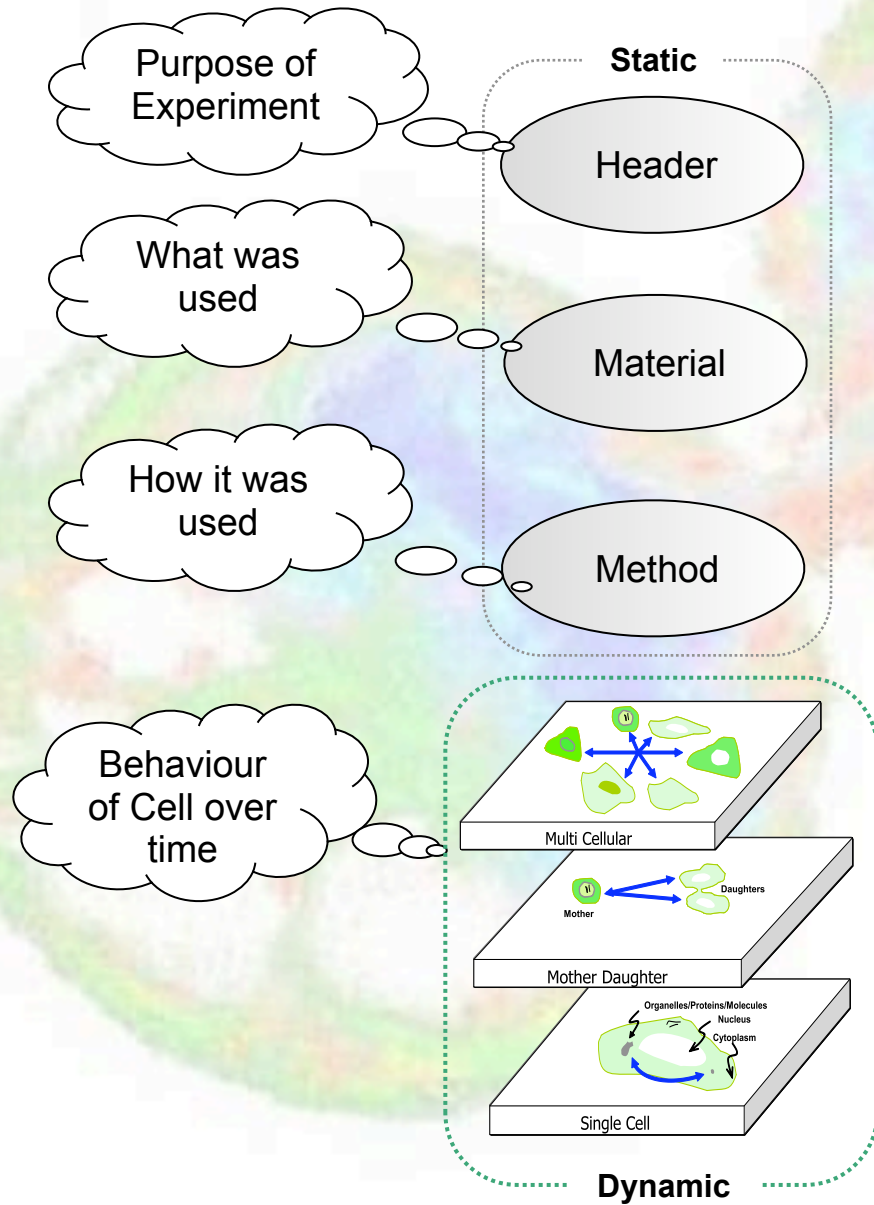
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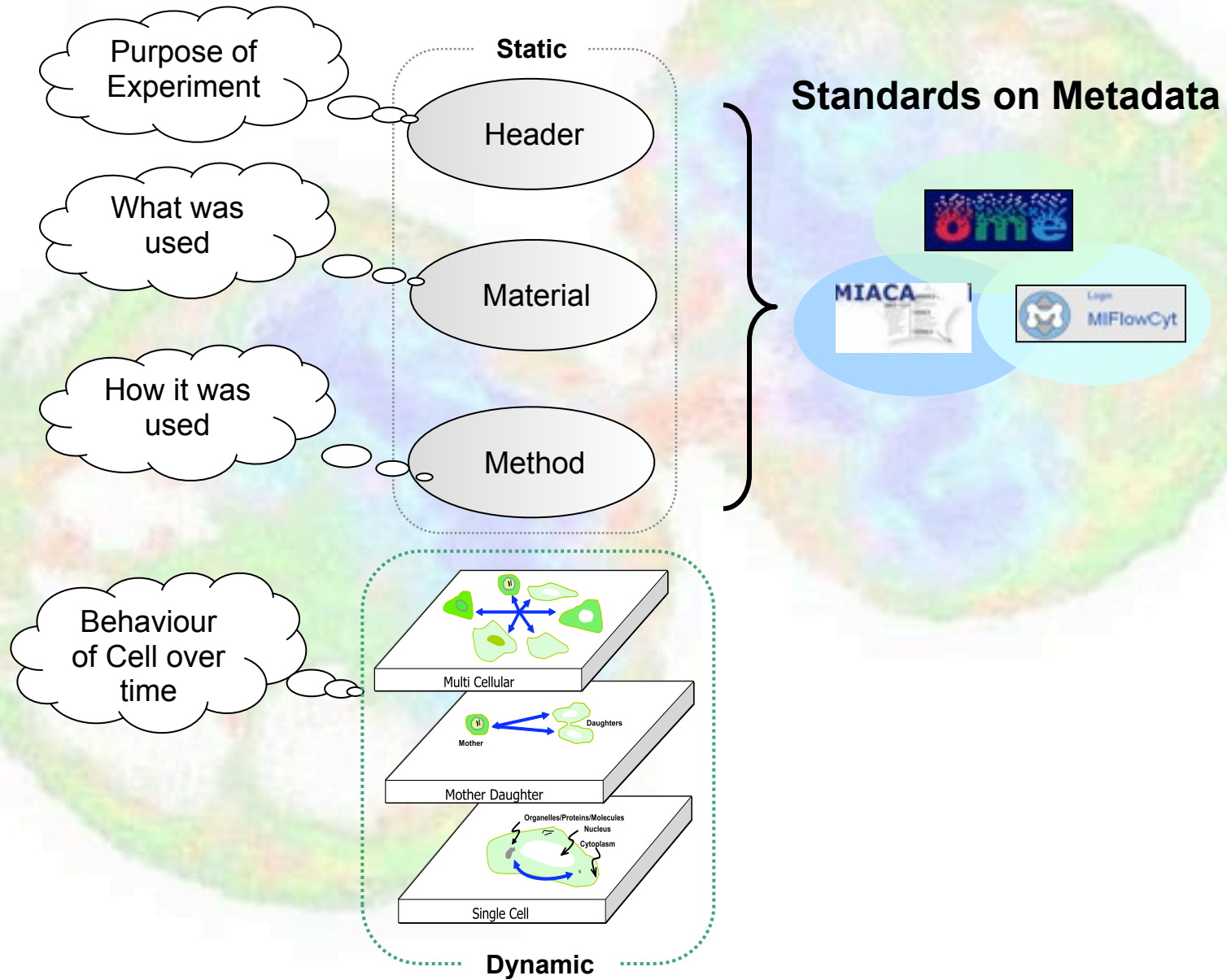
Why MICLAD?



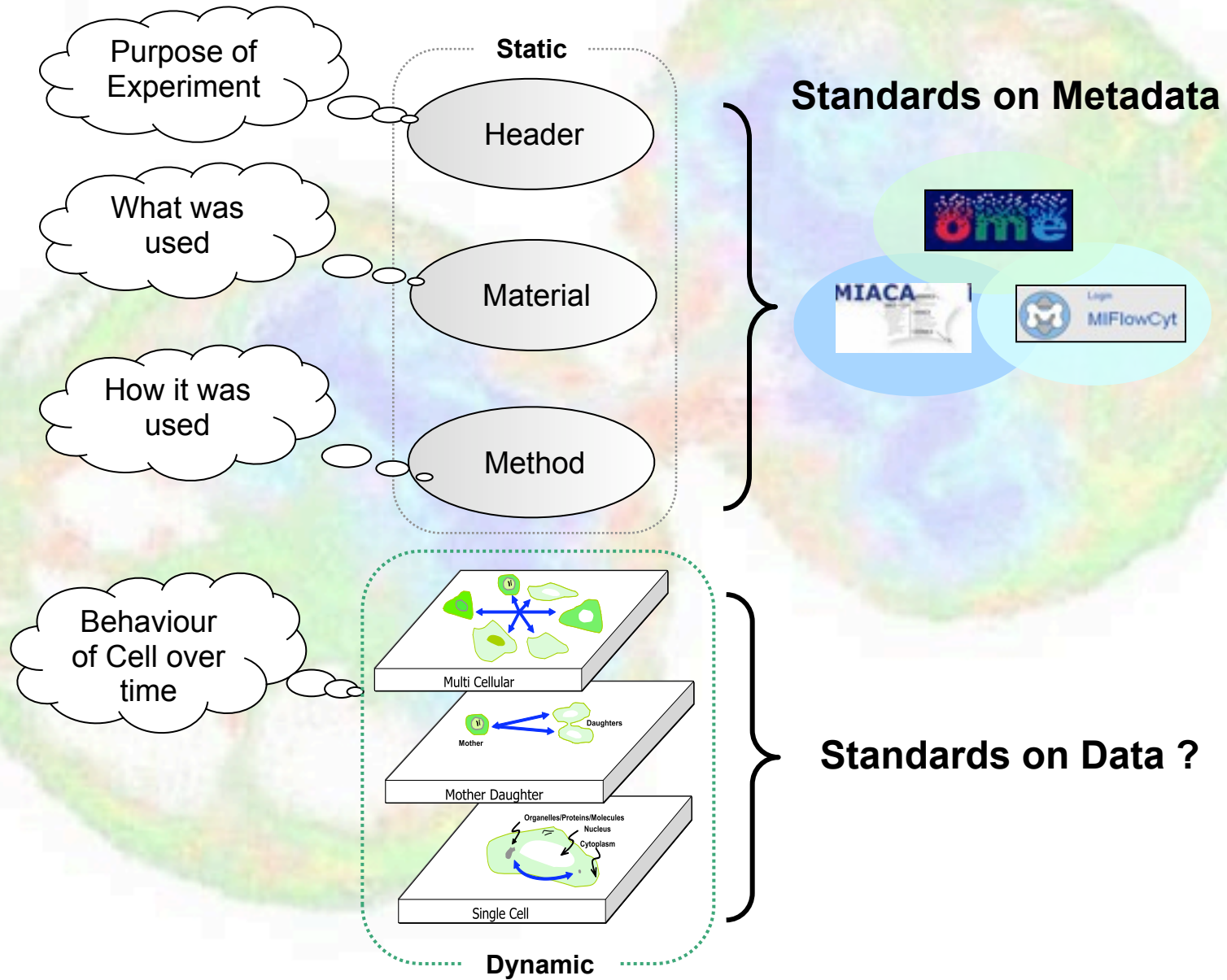
Why MICLAD?



Why MICLAD?

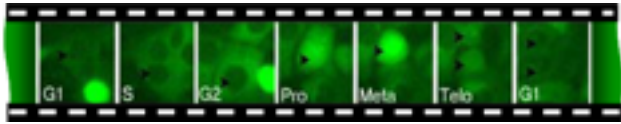


Why MICLAD?

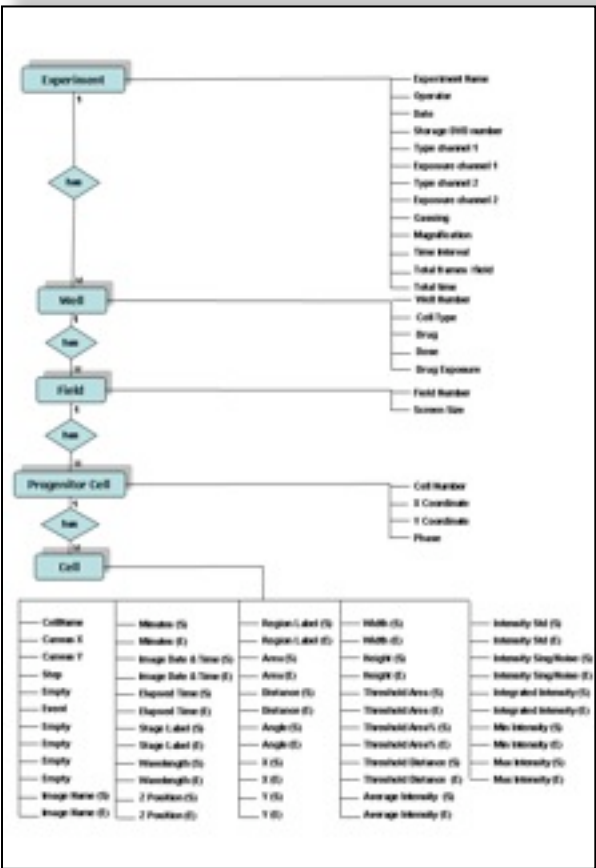
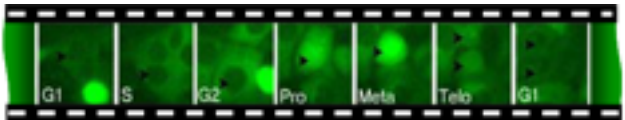


Transforming Images to Knowledge – A Bioinformatics Approach

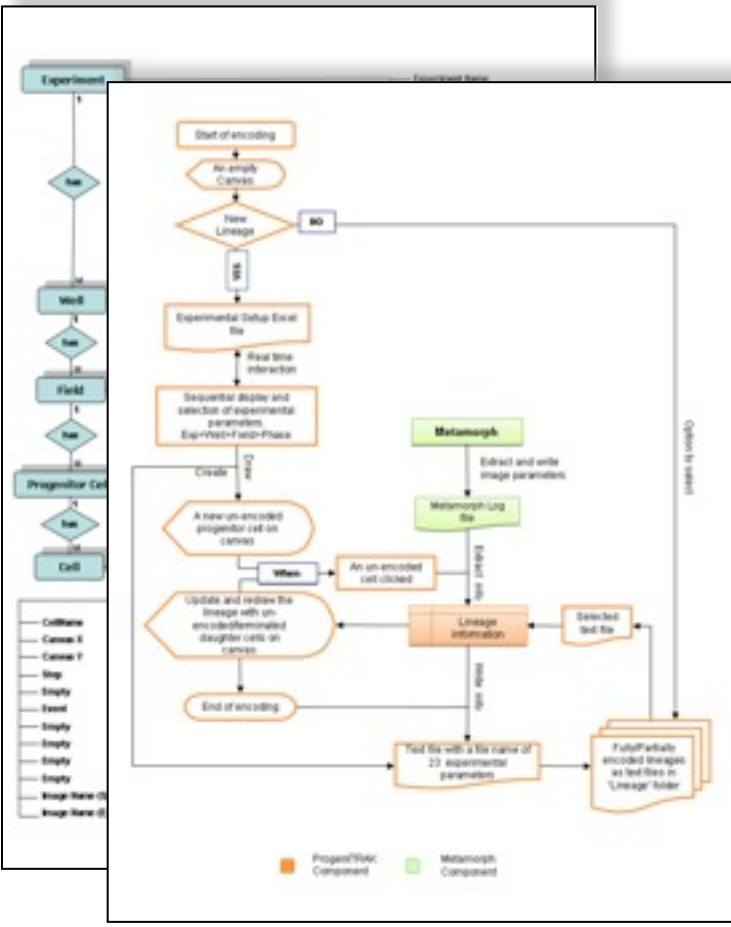
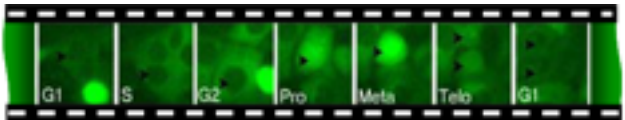
Transforming Images to Knowledge – A Bioinformatics Approach



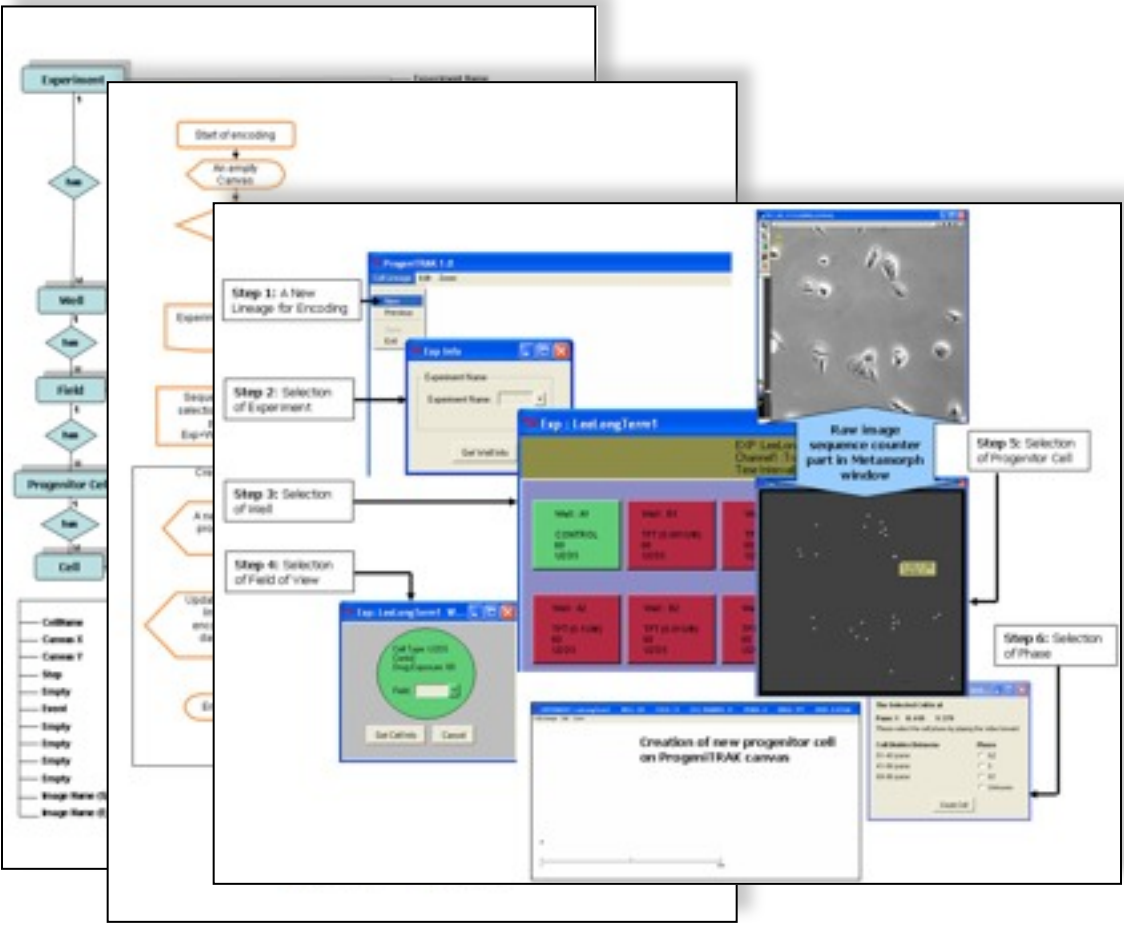
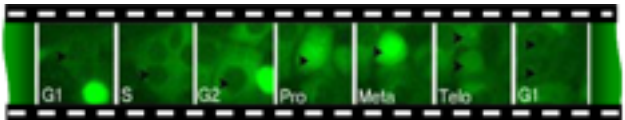
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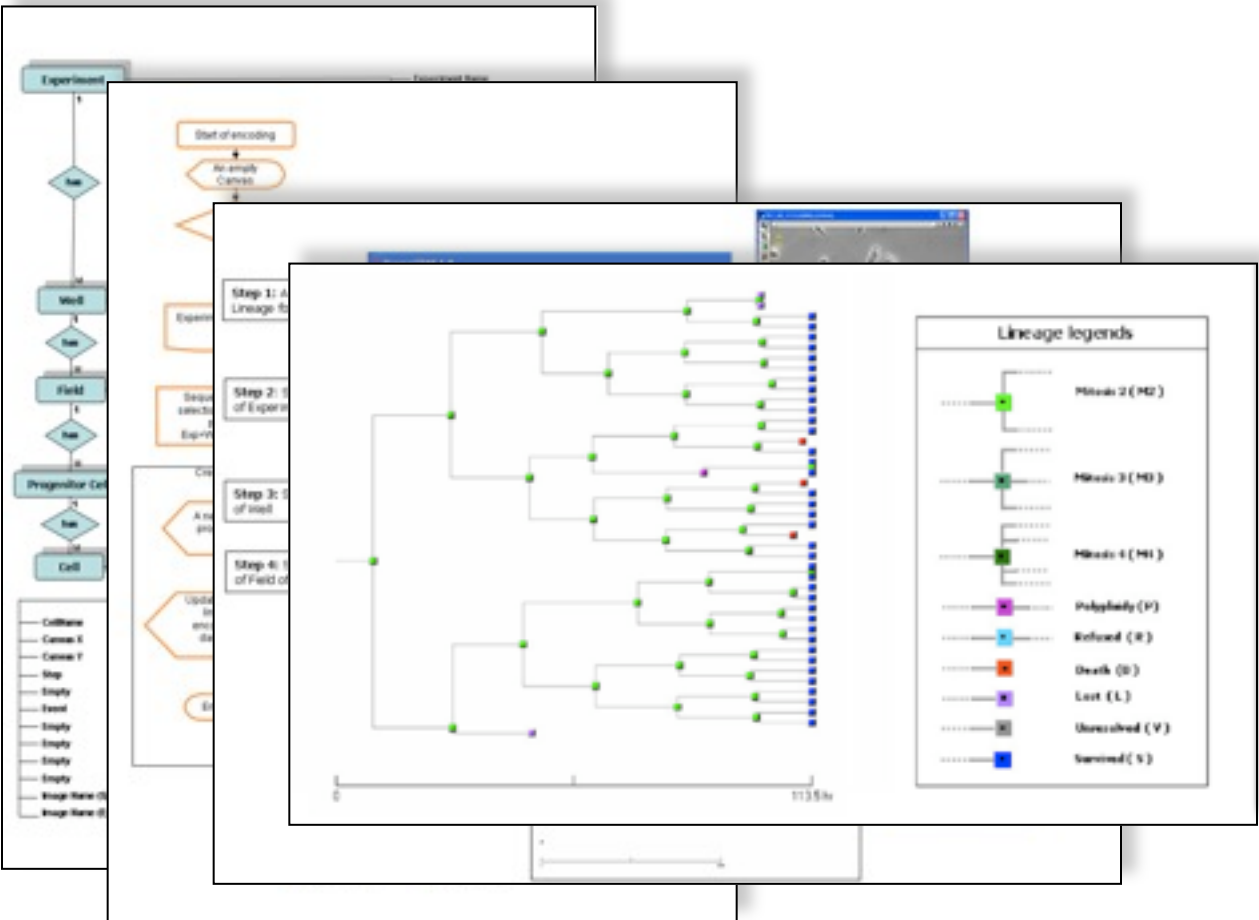
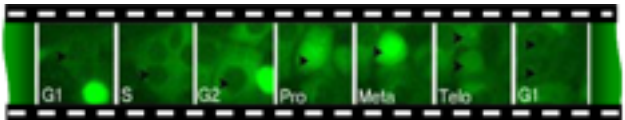
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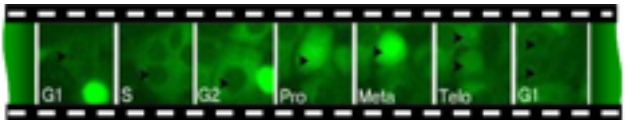
Transforming Images to Knowledge – A Bioinformatics Approach



Transforming Images to Knowledge – A Bioinformatics Approach



Transforming Images to Knowledge – A Bioinformatics Approach



Experiment

```

    graph TD
      Start([Start of encoding]) --> Canvas[An empty Canvas]
      Canvas --> Step1[Step 1: A Lineage tree]
      Step1 --> Step2[Step 2: Sequences of Experiment]
      Step2 --> Step3[Step 3: A new progenitor cell]
      Step3 --> Step4[Step 4: Field of cells]
      Step4 --> Cell[Cell]
  
```

Workflow: Experiment → Yes → Web → Yes → Field → Yes → Progenitor Cell → Yes → Cell

Cell List:

- CellName
- Canvas X
- Canvas Y
- Step
- Empty
- Event
- Empty
- Empty
- Empty
- Image Name (1)
- Image Name (2)

Lineage legends

Mitosis 2 (M2)

ProgeniDB
A progeny based cell lineage database

Layer 1: Experimental + metabolomic selection

Penicillin Agent	Control
Cell Line	Yeast genome cell line Y-2-10
Drug (anti-M2, seen in real)	Control (Mitosis)
Experimental Timeline (to Image range x(t))	00:00
Time Interval	00:00
Sampling	00:00

Layer 2: Progenitor cell integration process

Progenitor cell desc (M2, M3, M4) cells

Results

Download Results generated
Please download the results of the query

ProgeniDB
A progeny based cell lineage database

Layer 1: Experimental + metabolomic selection

Control	Yeast genome cell line Y-2-10
Image ATG	00:00
Population profiling	00:00
M21 cells	00:00

ProgeniDB
A progeny based cell lineage database

Layer 1: Experimental + metabolomic selection

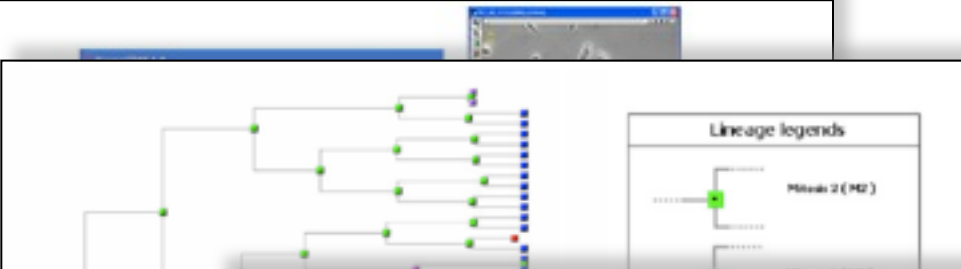
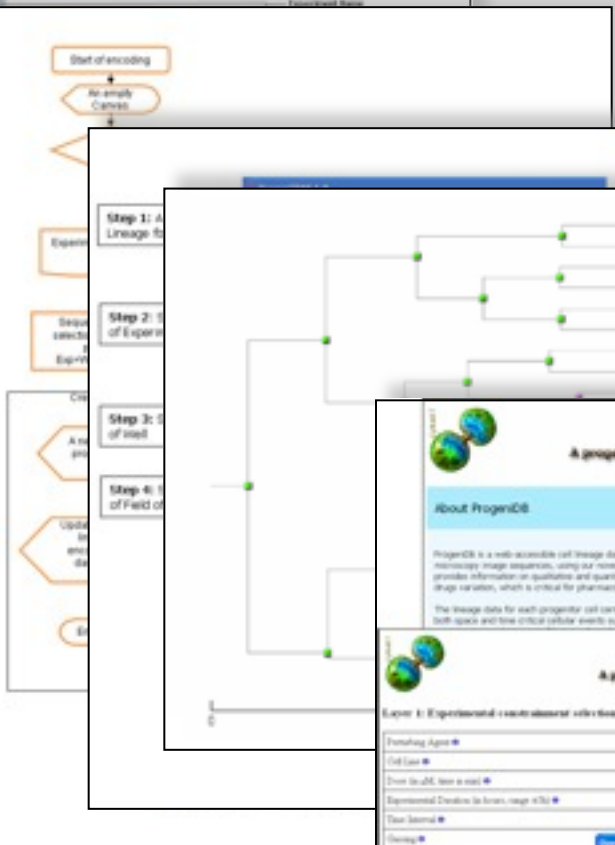
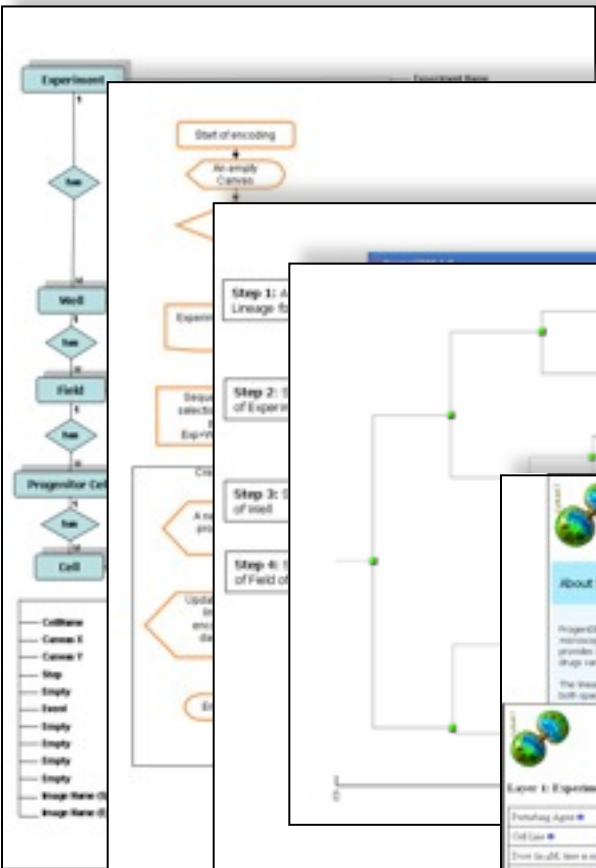
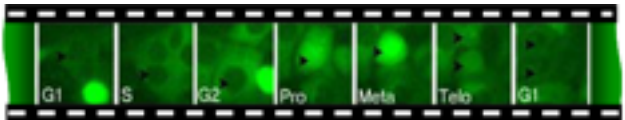
Control	Yeast genome cell line Y-2-10
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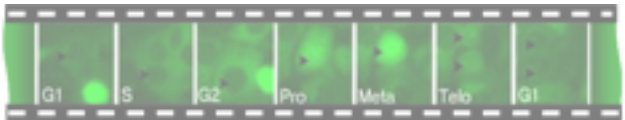
Layer 1: Experimental + metabolomic selection

Control	Yeast genome cell line Y-2-10
Image ATG	00:00
Population profiling	00:00
M21 cells	00:00

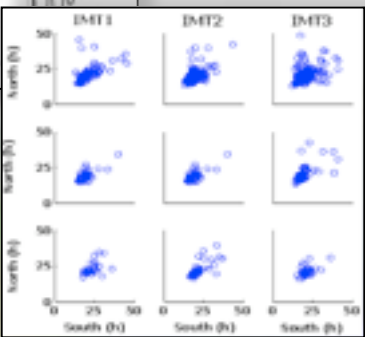
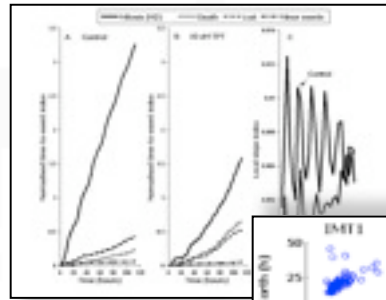
Transforming Images to Knowledge – A Bioinformatics Approach



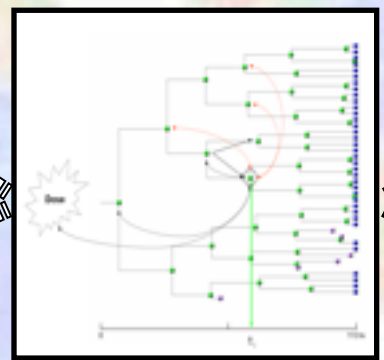

Transforming Images to Knowledge – A Bioinformatics Approach



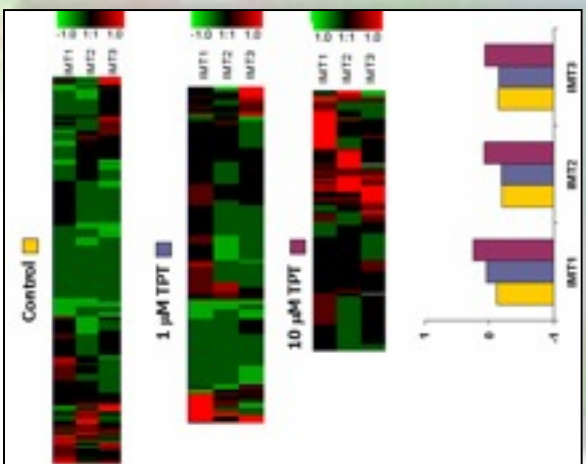
Asymmetry Leading to Population Level Heterogeneity



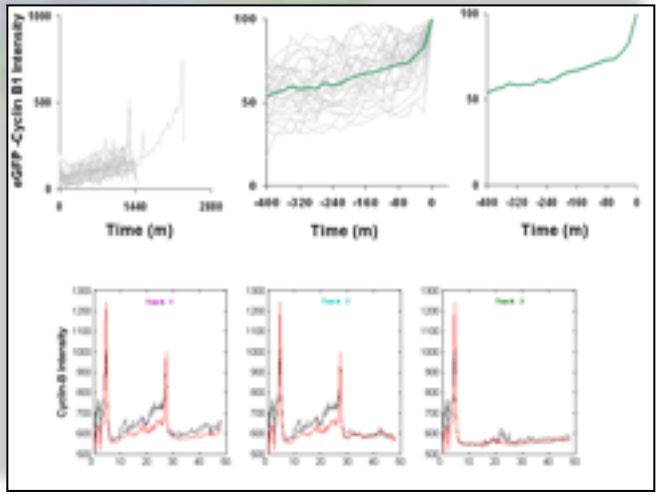
Event asymmetry



Spatial asymmetry

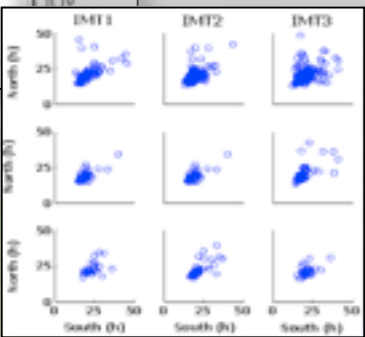
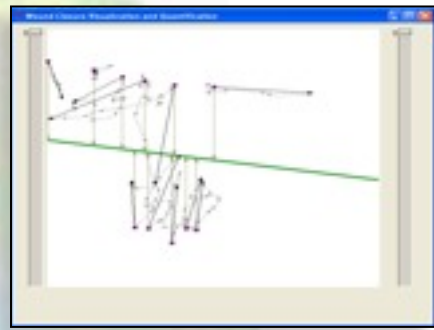
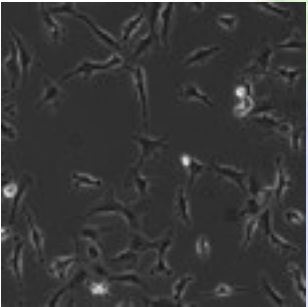
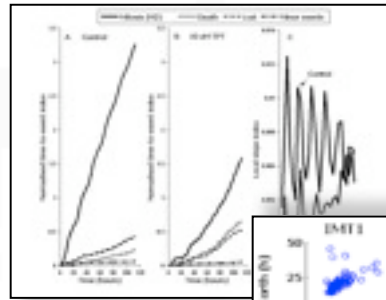


Temporal asymmetry

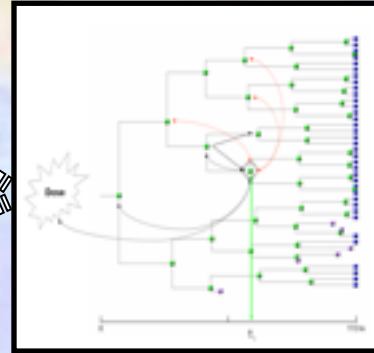


Molecular expression asymmetry

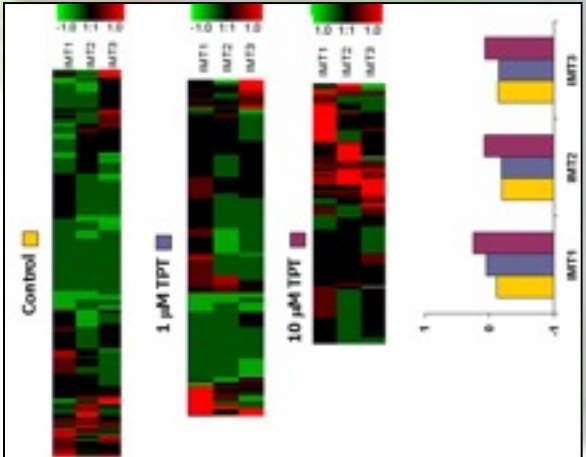
Asymmetry Leading to Population Level Heterogeneity



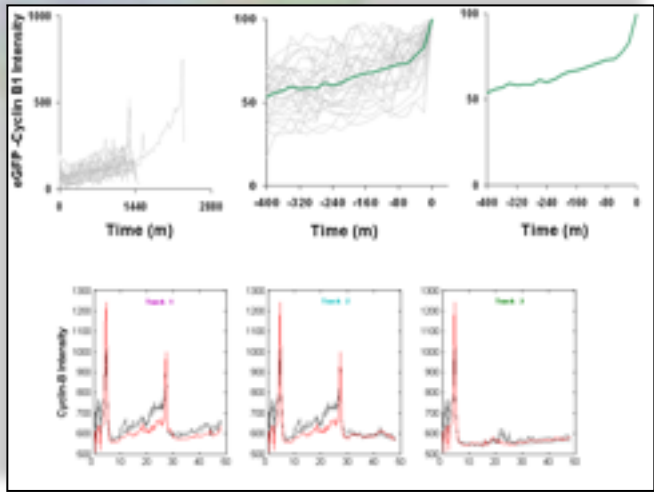
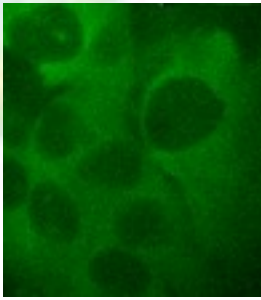
Event asymmetry



Spatial asymmetry



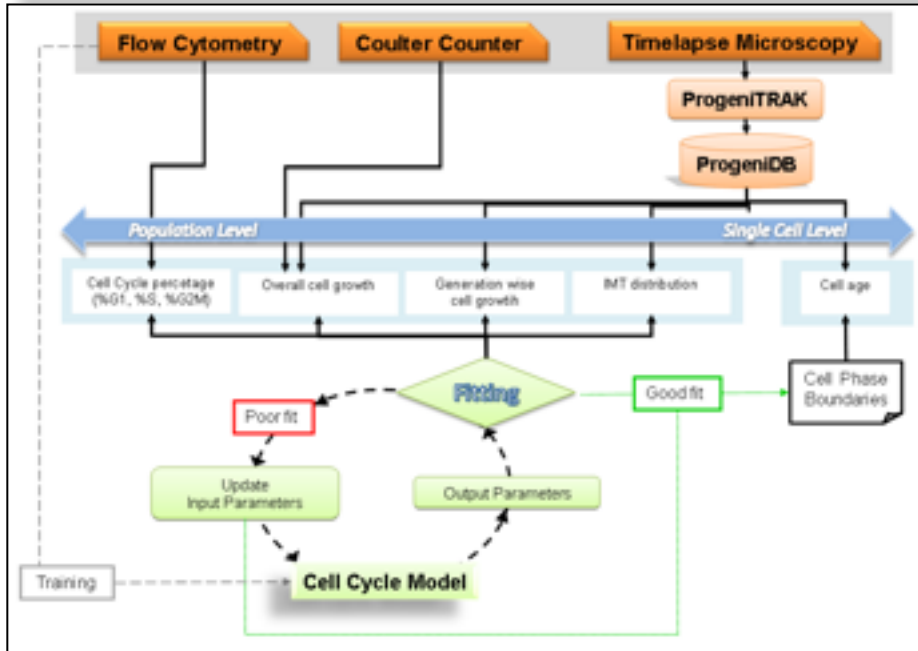
Temporal asymmetry



Molecular expression asymmetry

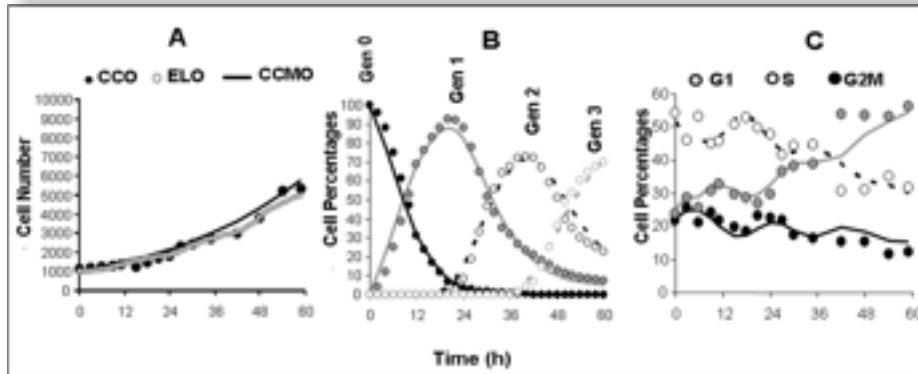
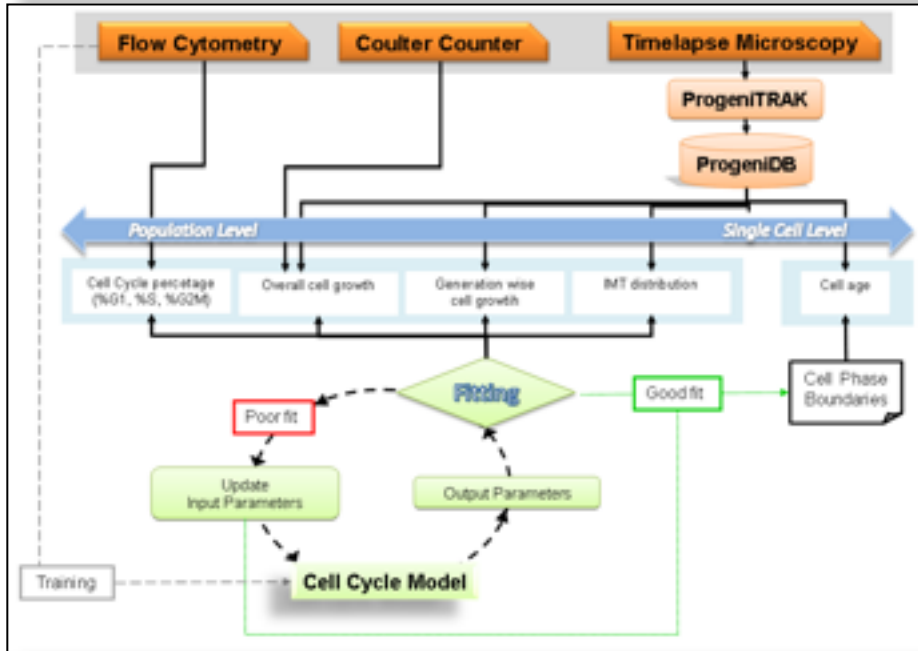
Understanding the system through mathematical modelling

Pharmacodynamics (PD) Model



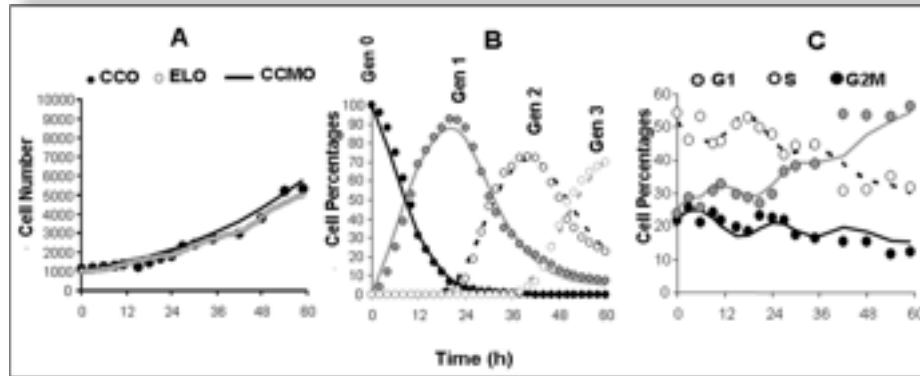
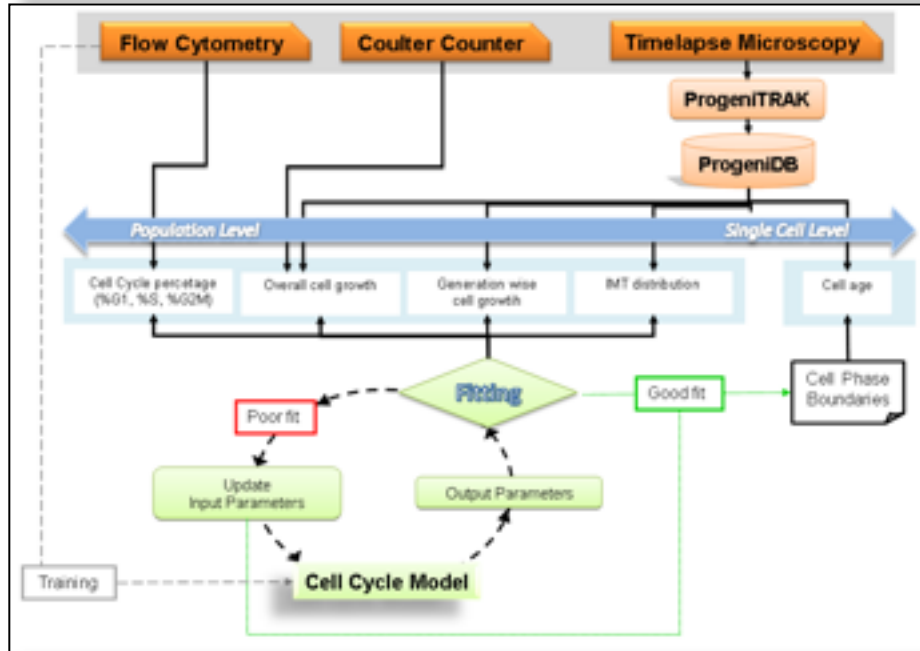
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Pharmacodynamics (PD) Model

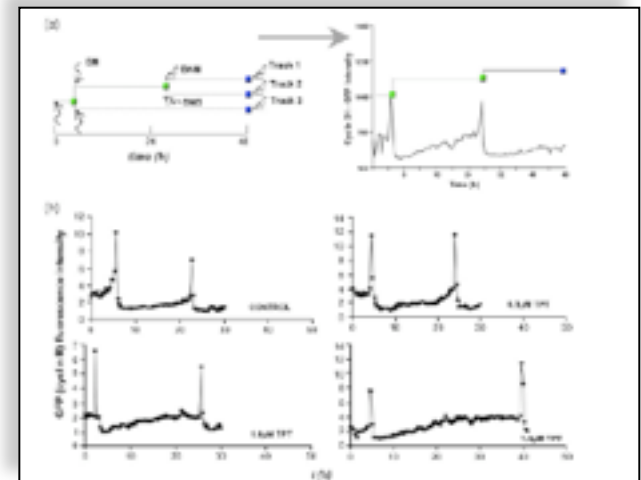
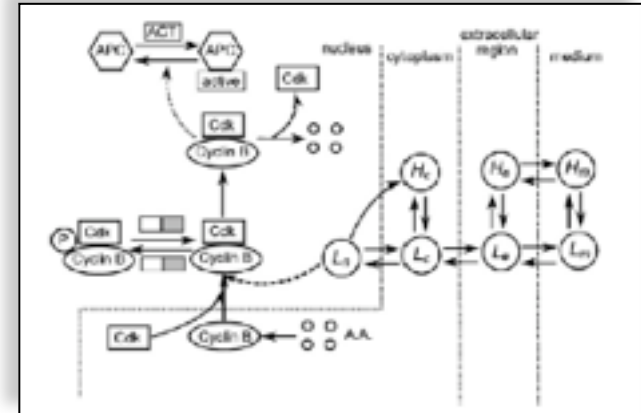


Understanding the system through mathematical modelling

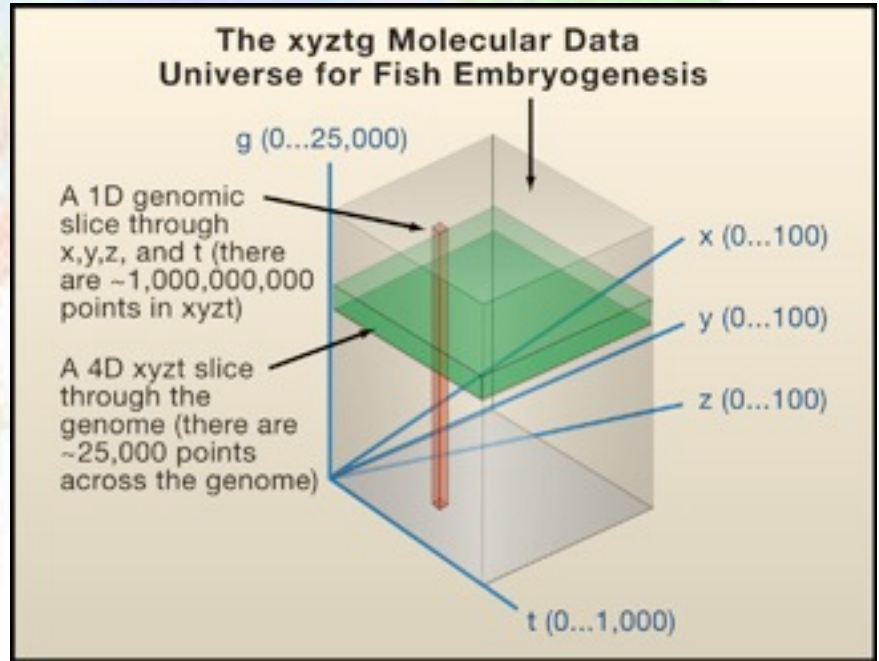
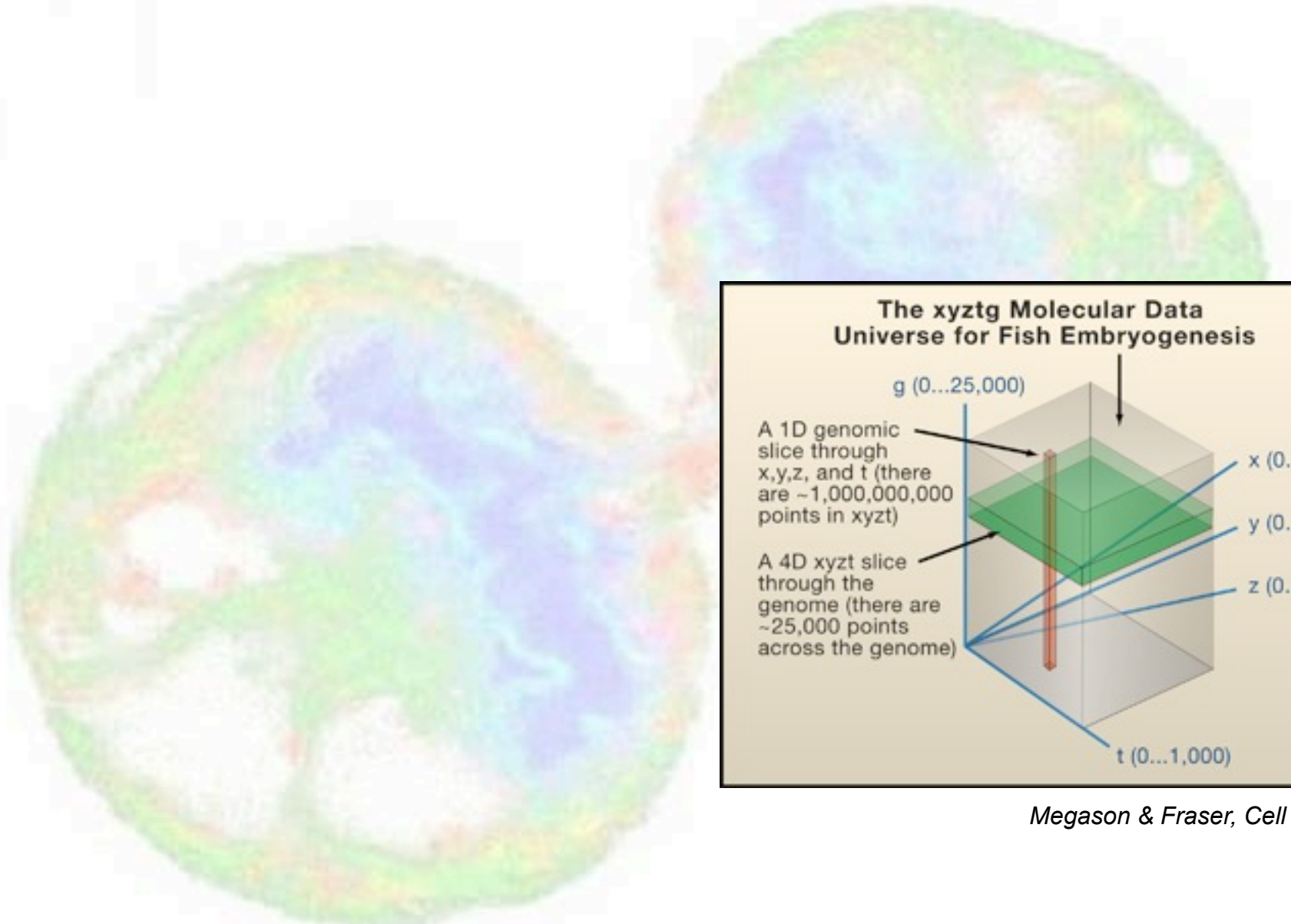
Pharmacodynamics (PD) Model



Pharmacokinetics (PK) Model

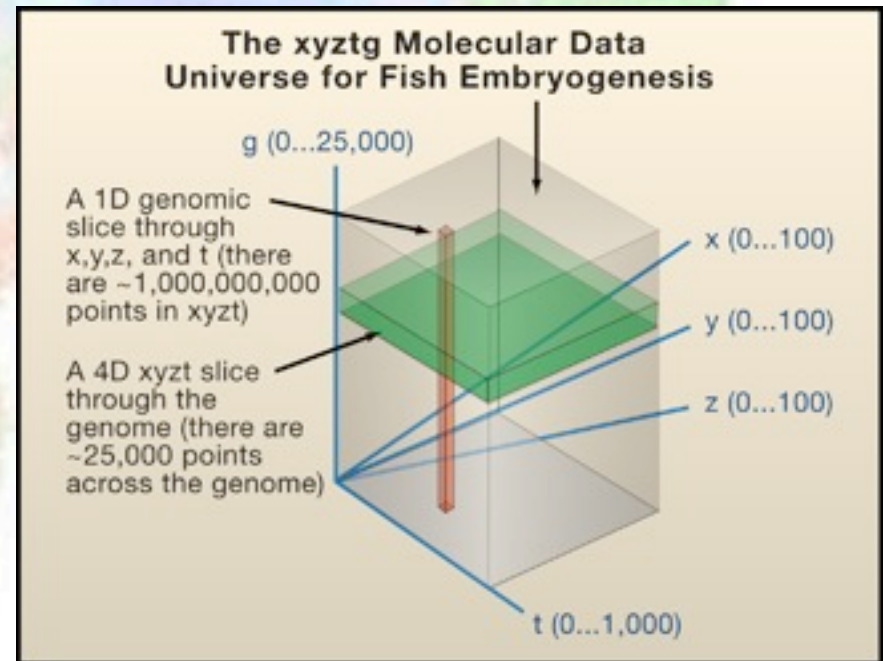
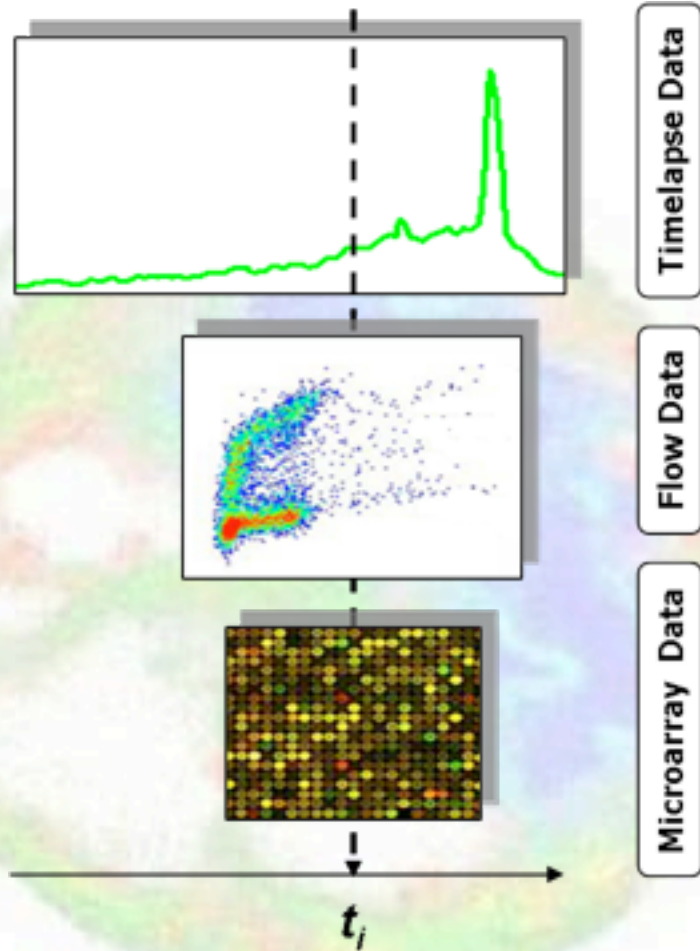


Towards 5D Data: Closing the Translational Gap



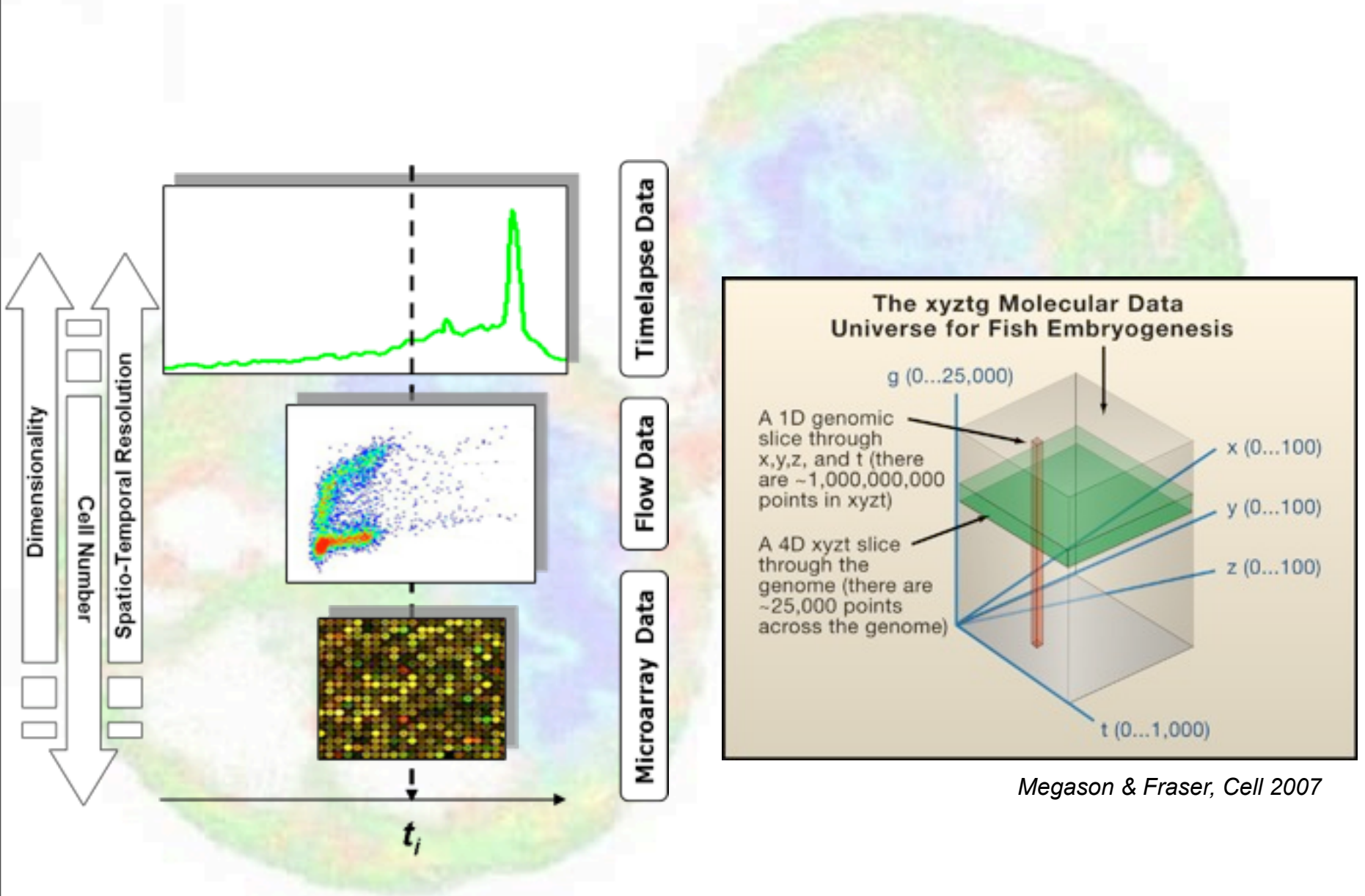
Megason & Fraser, Cell 2007

Towards 5D Data: Closing the Translational Gap

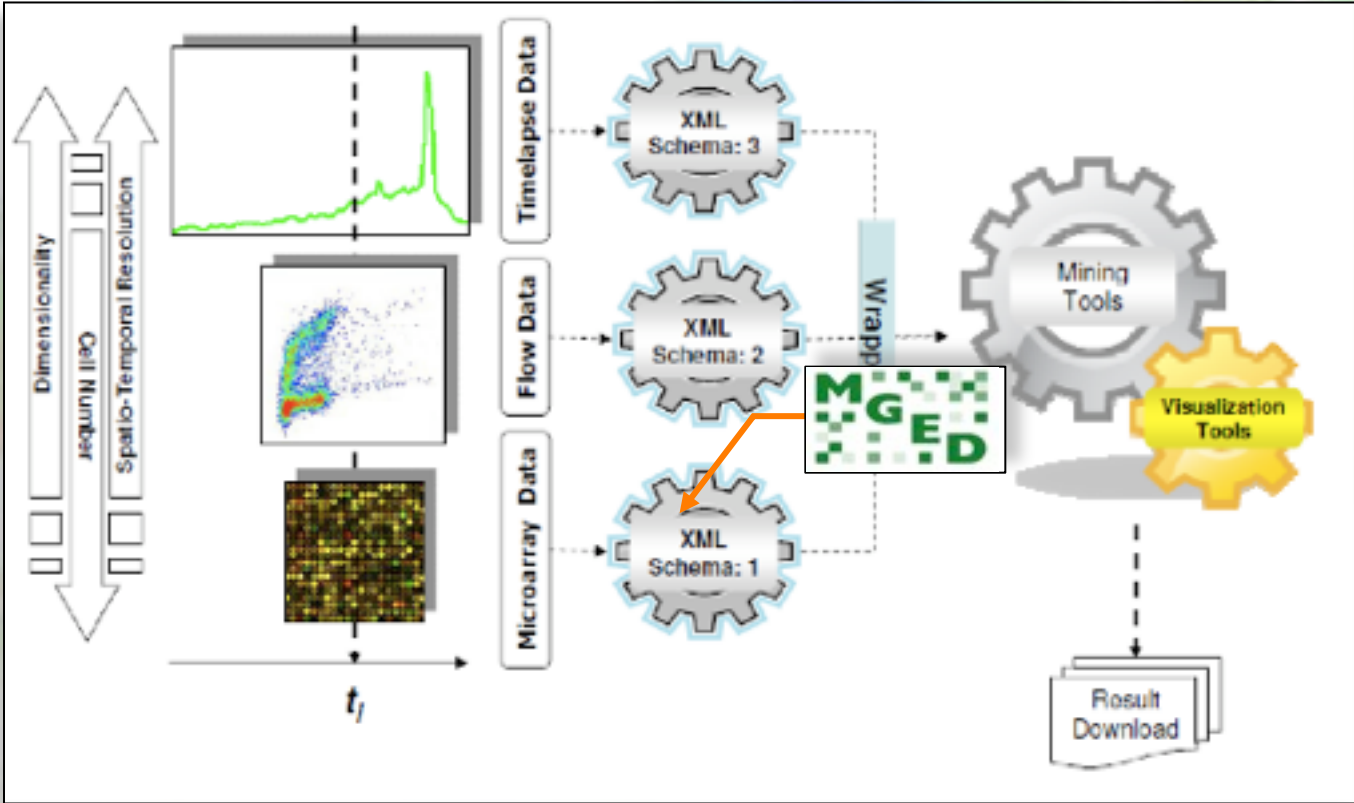


Megason & Fraser, Cell 2007

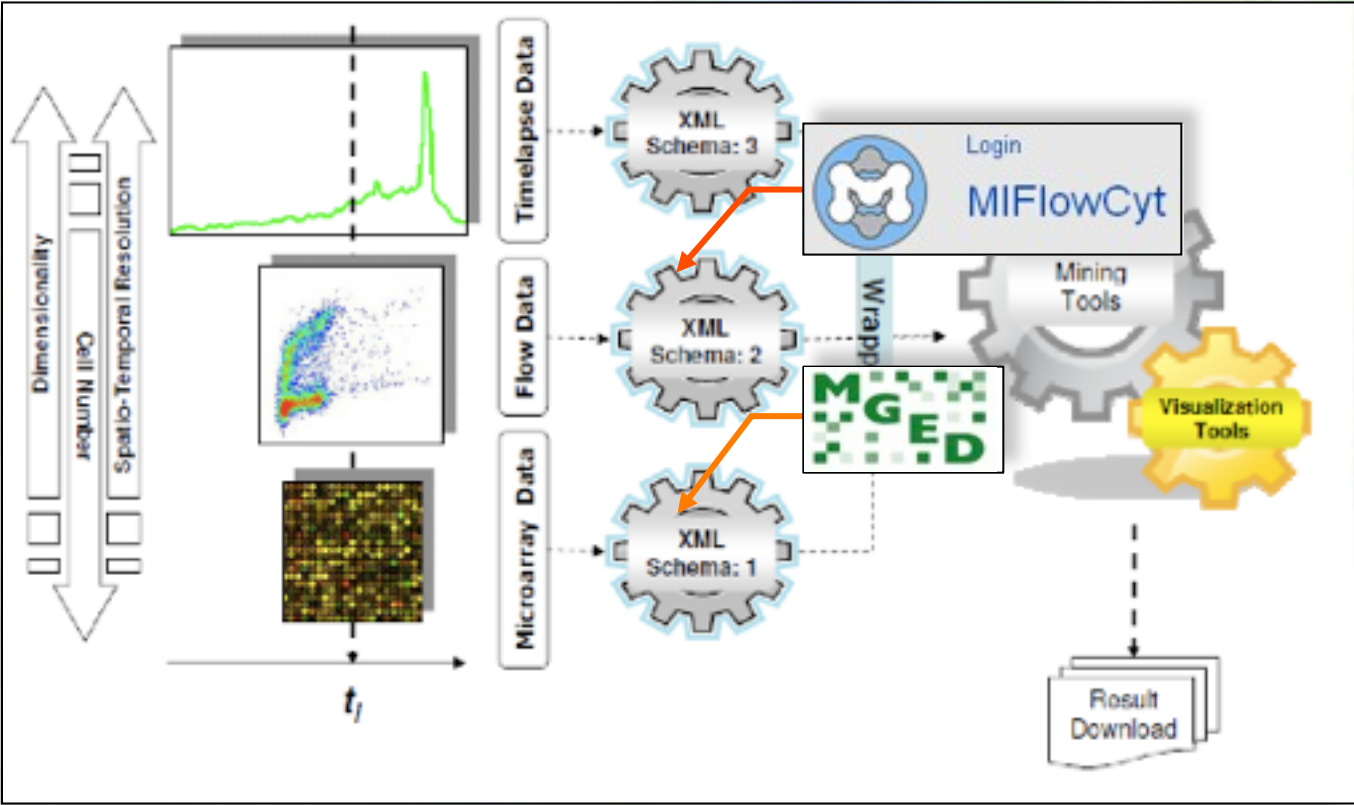
Towards 5D Data: Closing the Translational Gap



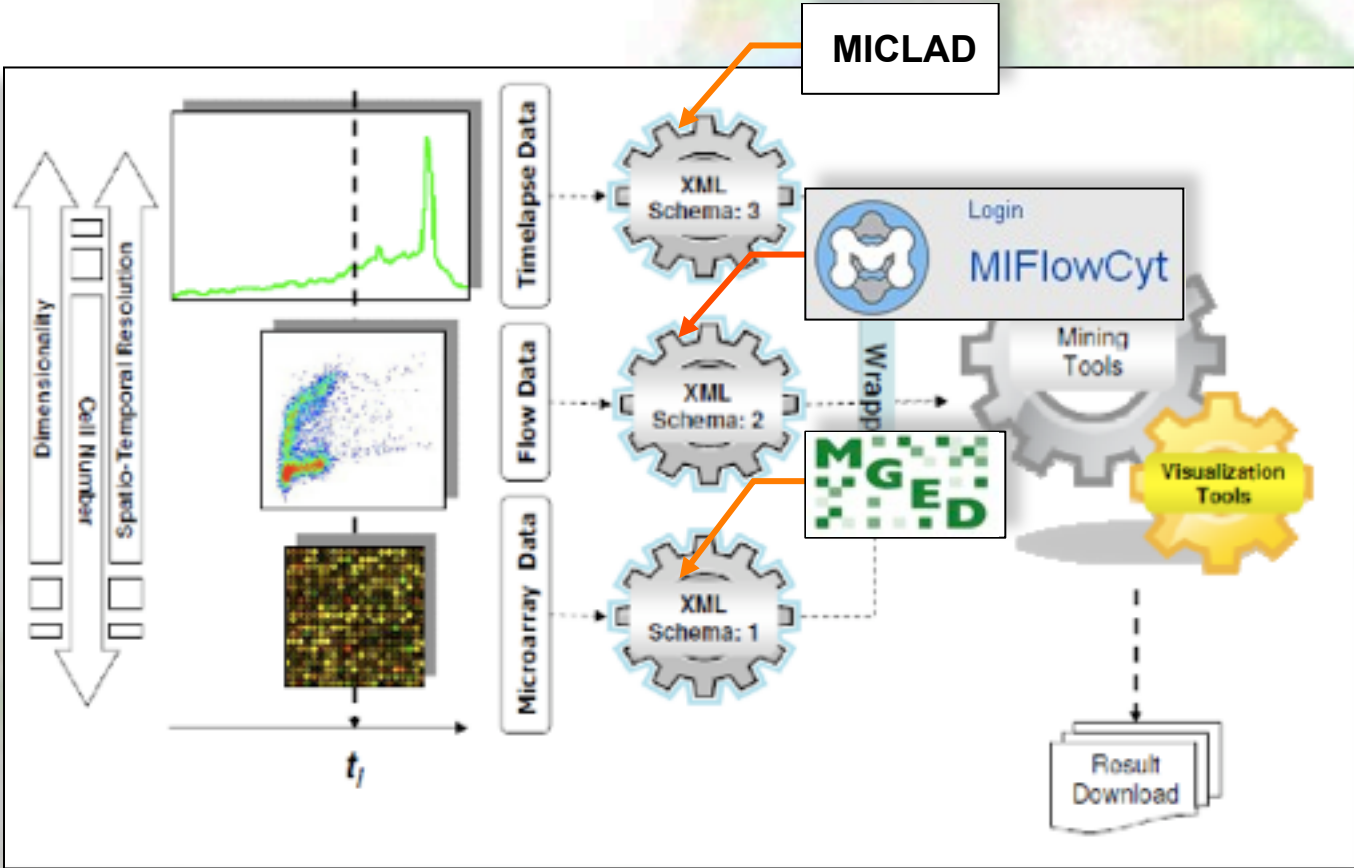
Contribution to Systems Biology



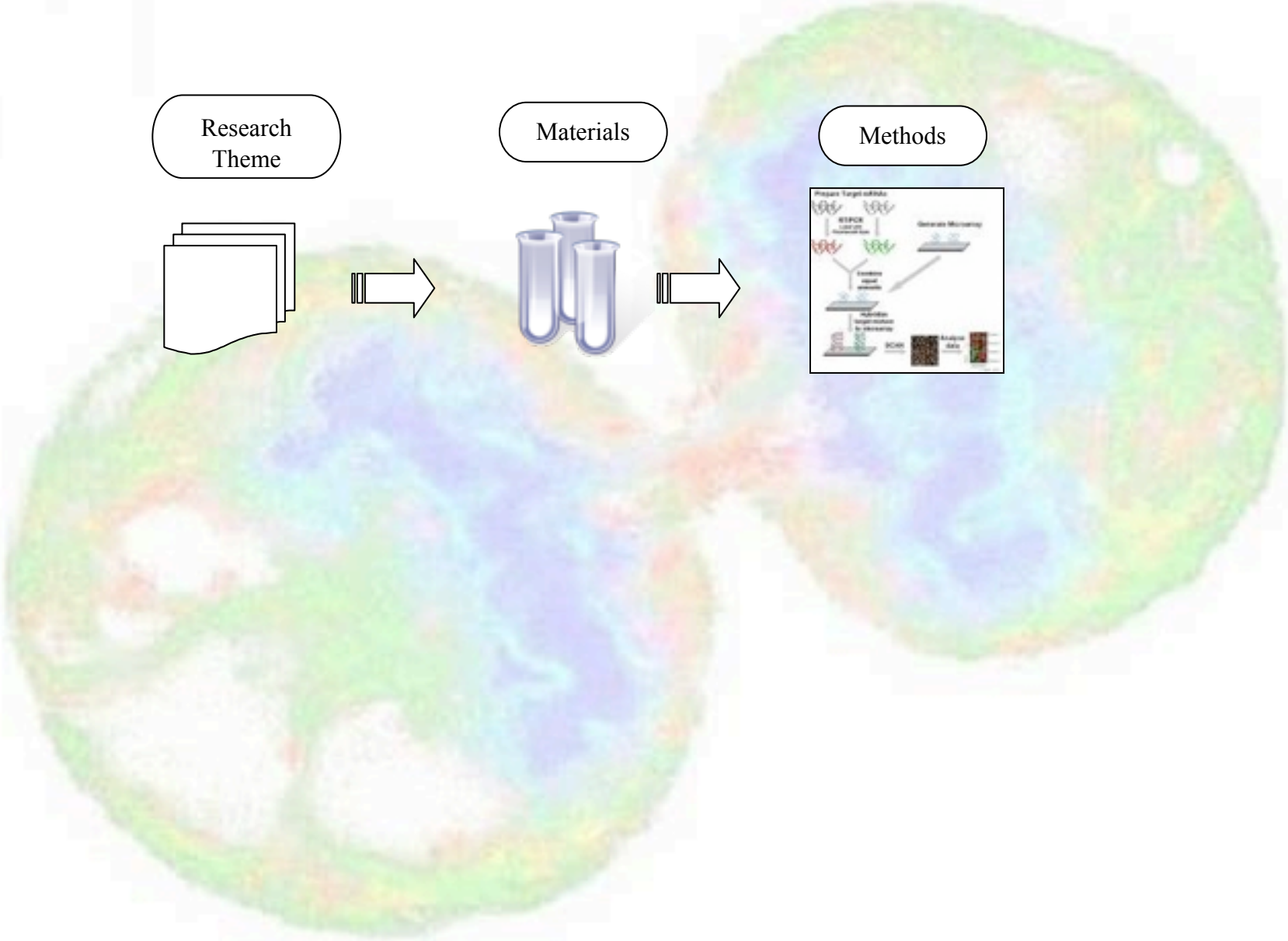
Contribution to Systems Biology



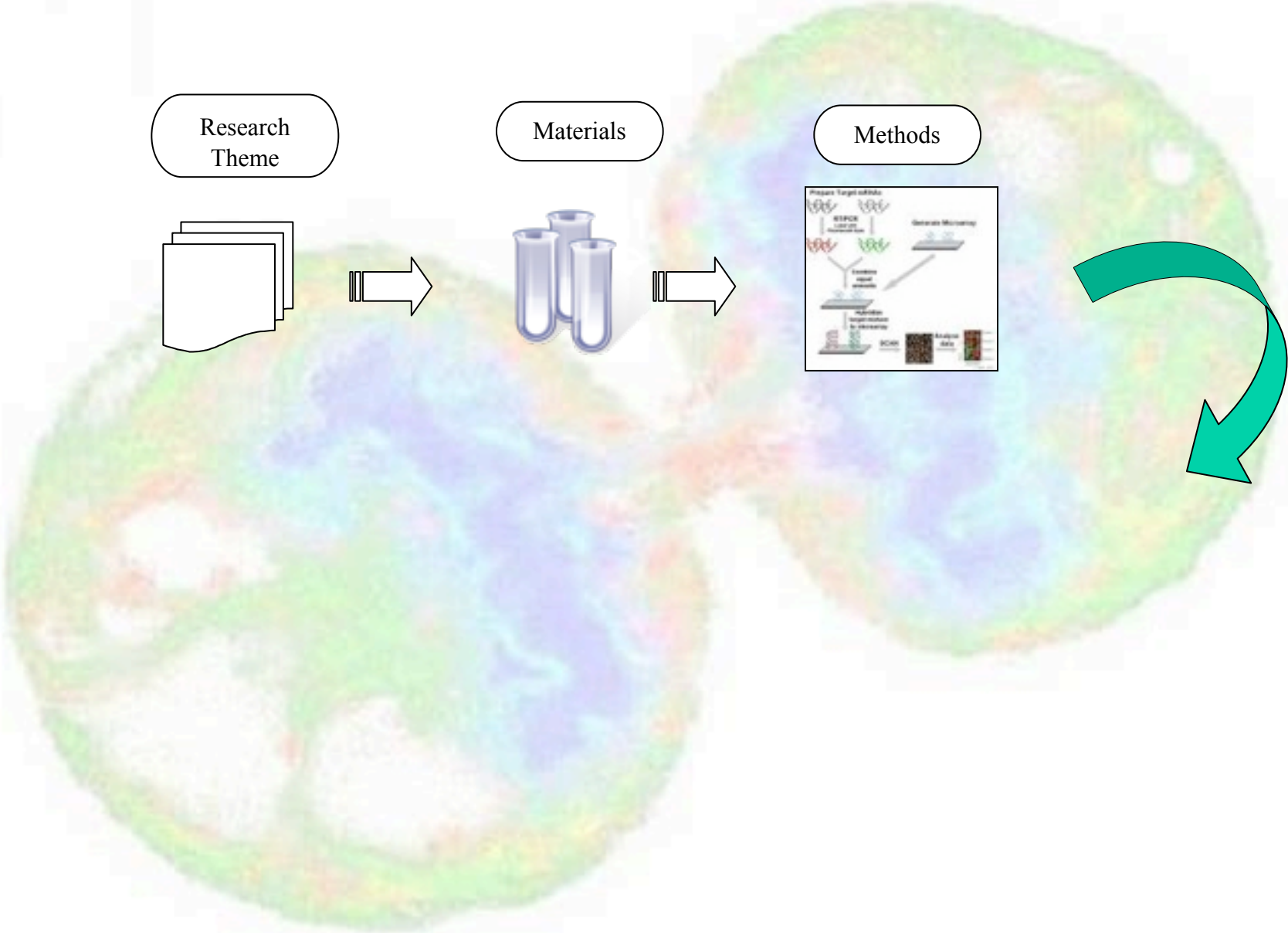
Contribution to Systems Biology



Integrated view of the biological system



Integrated view of the biological system



Integrated view of the biological system

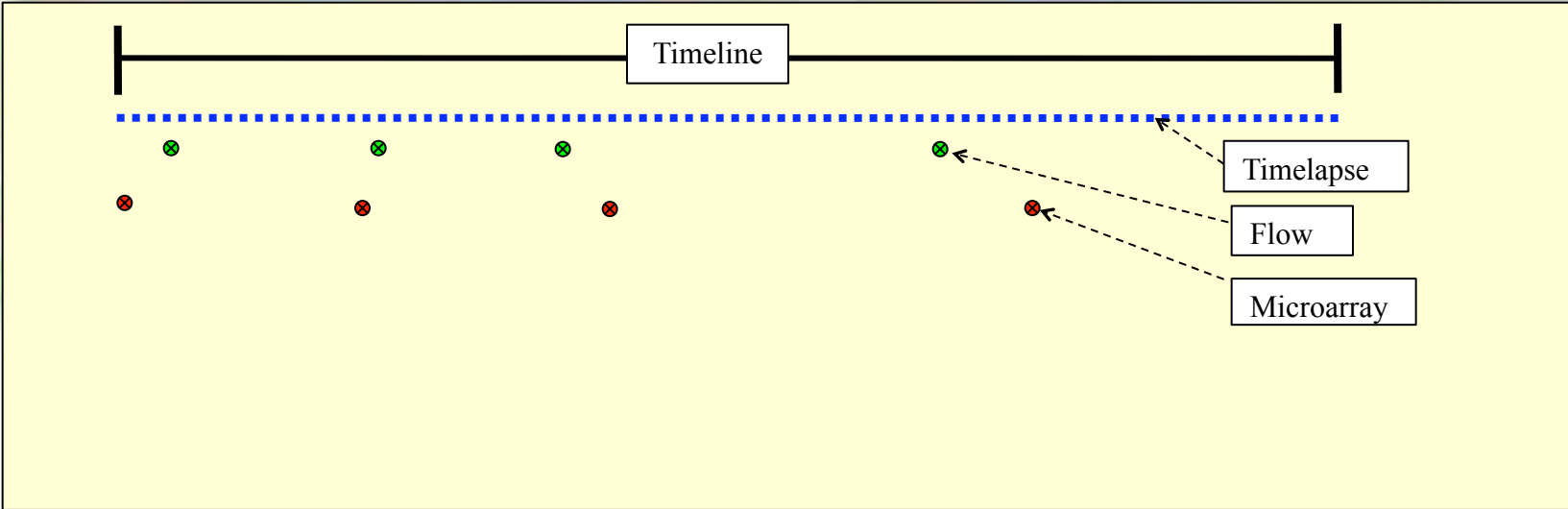
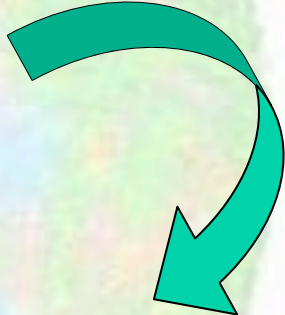
Research Theme



Materials

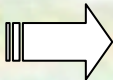


Methods

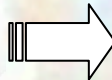


Integrated view of the biological system

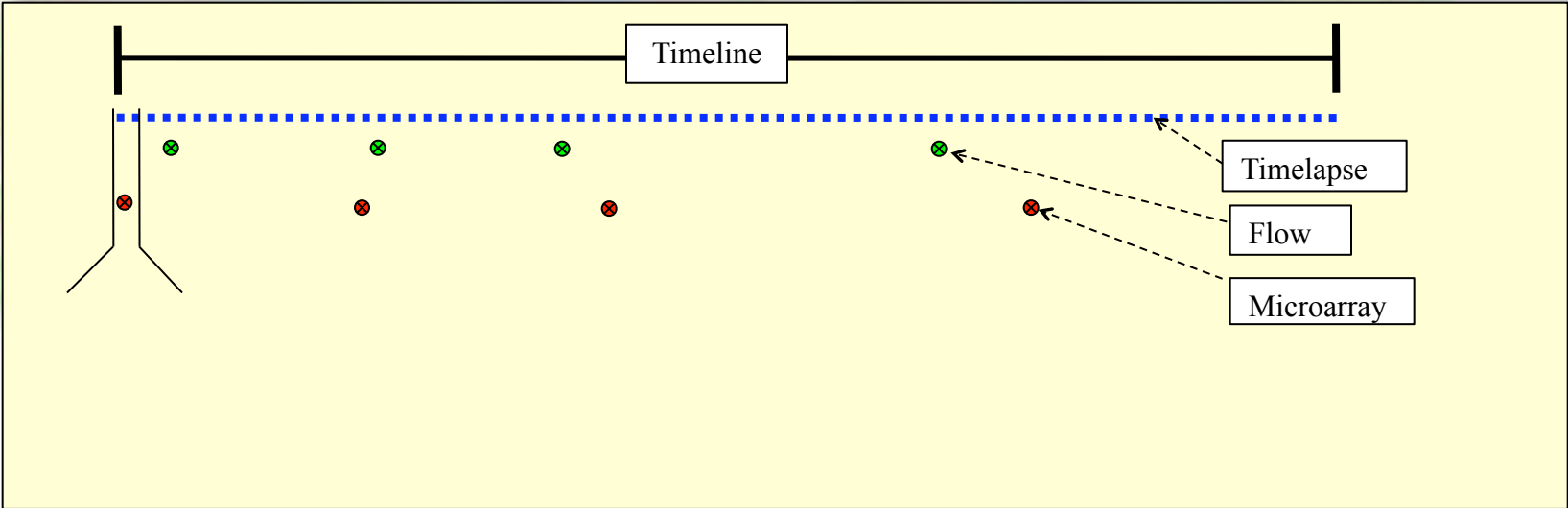
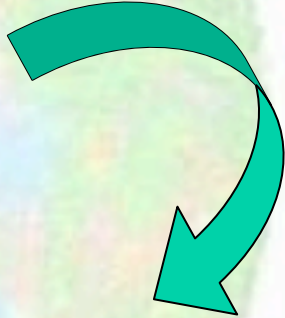
Research Theme



Materials



Methods



Integrated view of the biological system

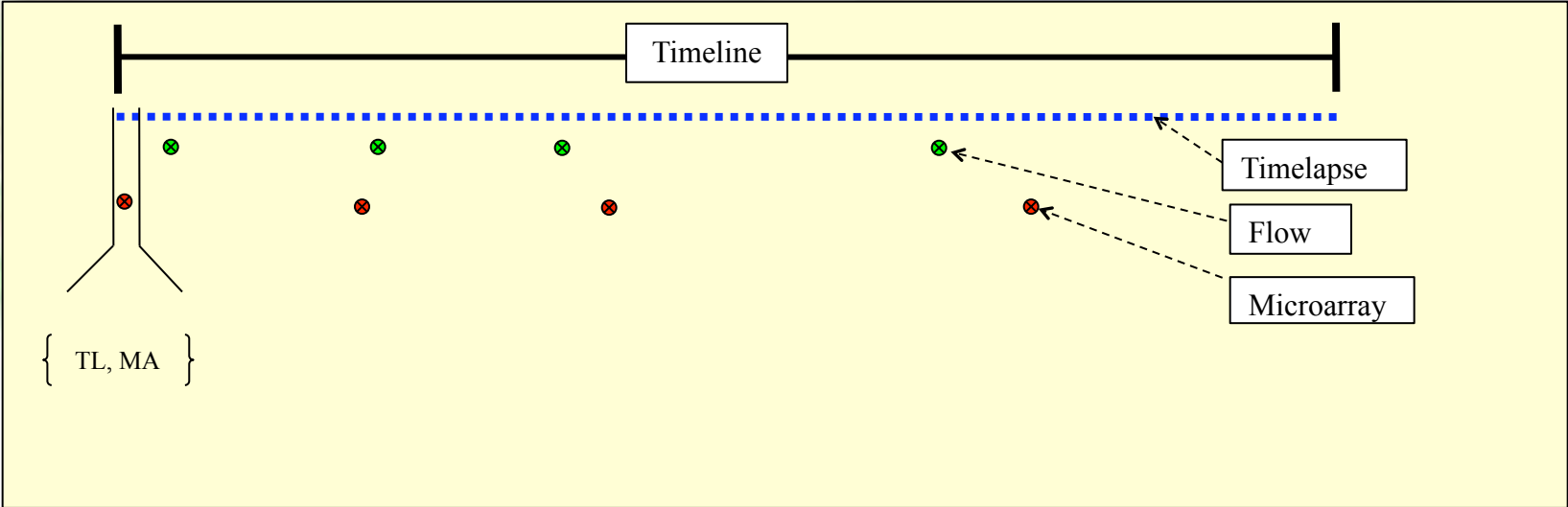
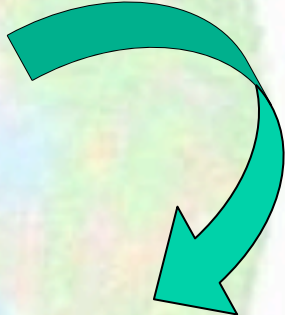
Research Theme



Materials



Methods



Integrated view of the biological system

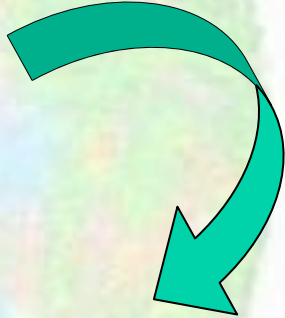
Research Theme



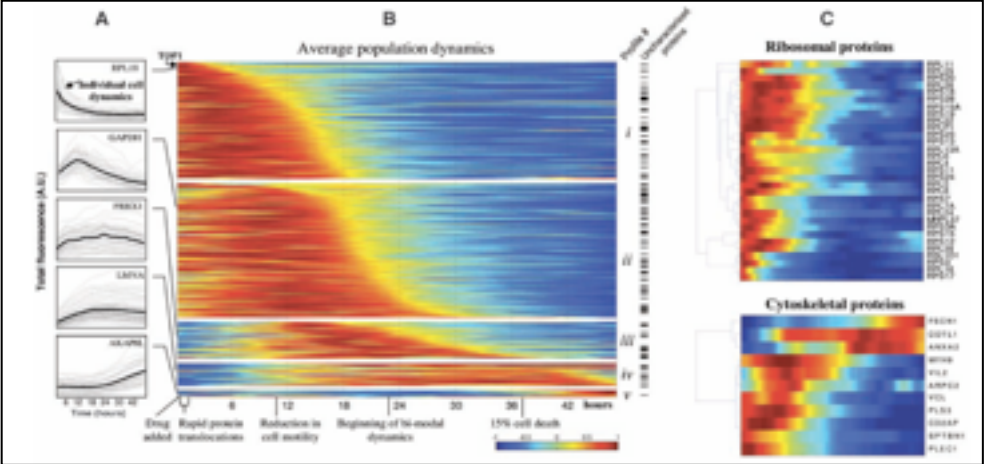
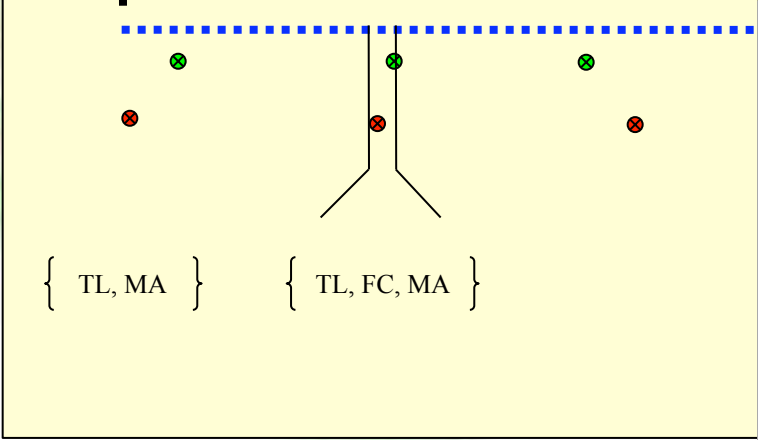
Materials



Methods



Timeline



Dynamic Proteomics of Individual Cancer Cells in Response to a Drug

Cohen et al., Science 2008

Rules & Language of Engagement

Biomedical Informatics Without Borders:
From Collaboration to Implementation



- HOME
- MEETING PROGRAMME
- REGISTRATION
- ABSTRACT SUBMISSION
- ABOUT NCRI INFORMATICS
- ABOUT caBIG
- VENUE & DIRECTIONS
- CONTACTS
- FEEDBACK

MEETING PROGRAMME

Provisional Programme

THURSDAY 10 SEPTEMBER

9:30am – 10:00am	REGISTRATION AND COFFEE	
10:00am – 10:15am	WELCOME ADDRESS	
10:15am – 11:00am	OPENING PLEBARY - PROGRESS UPDATE	
	The caBIG initiative	Ken Buetow, PhD Associate Director for Bioinformatics and Information Technology, U.S. National Cancer Institute (NCI)
	The NCRI Informatics Initiative	Sir Kenneth Calman, FRSE, PhD, BSc, FRCP, FRCS(Ed), FRCGP Chair, National Cancer Research Institute
11:00am – 12:30pm	ISSUES FOR IMPLEMENTATION - INTEGRATION & COMMUNICATION	
	Data Standards - Title to be confirmed	Brian Davis, PhD caBIG® - VCDE Workspace Lead, 3rd Millennium®
	Certification & Security - Title to be confirmed	J. Max Wilkinson, PhD Scientific IT Analyst, NCRI Informatics Initiative
	Semantic Queries - Title to be confirmed	Alejandra Gonzalez-Beltran, PhD & Research Associate, University College London & NCRI Informatics Initiative
	The caBIG Enterprise Support Network	Joshua Phillips SemanticBits Leslie Derr, PhD NCI Center for Bioinformatics and Information Technology (CBIT)



Rules & Language of Engagement

Biomedical Informatics Without Borders:
From Collaboration to Implementation



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MEETING PROGRAMME

Provisional Programme

THURSDAY 10 SEPTEMBER

9:30am – 10:00am REGISTRATION AND COFFEE

10:00am – 10:15am WELCOME ADDRESS

10:15am – 11:00am OPENING PLEBARY - PROGRESS UPDATE

The caBIG® initiative

Ken Buetow, PhD

Associate Director for Bioinformatics and Information Technology, U.S. National Cancer Institute (NCI)

The NCRi Informatics Initiative

Sir Kenneth Calman, FRSE, PhD, BSc, FRCP, FRCS(Ed), FRCGP

Chair, National Cancer Research Institute

11:00am – 12:30pm ISSUES FOR IMPLEMENTATION - INTEGRATION & COMMUNICATION

Data Standards - Title to be confirmed

Brian Davis, PhD

caBIG® - VCDE Workspace Lead, 3rd Millennium®

Certification & Security - Title to be confirmed

J. Max Wilkinson, PhD

Scientific IT Analyst, NCRi Informatics Initiative

Semantic Queries - Title to be confirmed


Alejandra Gonzalez-Beltran, PhD & Research Associate, University College London & NCRi Informatics Initiative

The caBIG® Enterprise Support Network


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Cardiff University

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Rachel Errington
Paul Smith
David Kipling

School of Computer Sciences

Alex Gray
Richard White
Alex Hardisty

School of Biosciences

Alan Clarke

School of Dentistry

Phil Stevens

School of Optometry

Nick White

Swansea University

Paul Rees
Huw Summers
Paul Lewis

Warwick University

Judith P´erez-Vel´azquez
Michael Chappell

Glasgow Caledonian University

Patricia Martin
Scott Jonson

Oxford University

Nick White

University of Dundee

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