VIS Presentation Bioinformatics

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Papers

1. Visualizing biological data - now and the future [1]
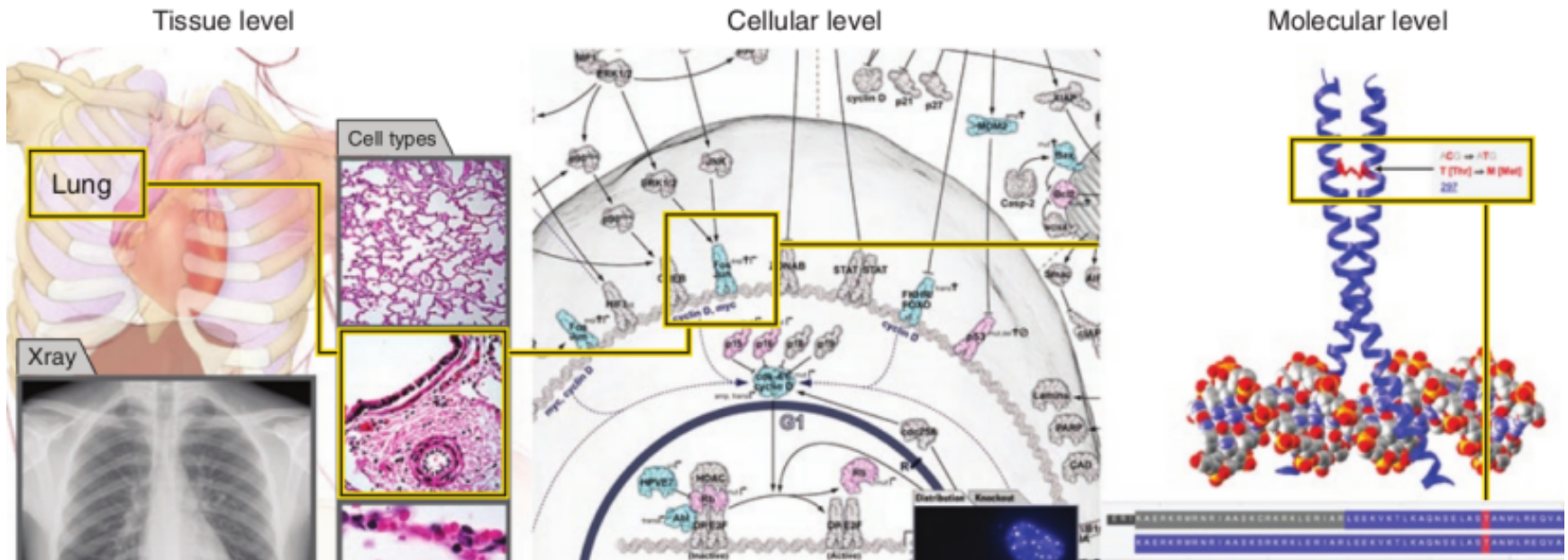2. Visualization of image data from cells to organisms [2]

[1] Visualizing biological data - now and in the future, O'Donoghue et al, Nature Methods Supplement, March 2010
[2] Visualization of image data from cells to organisms, Walter et al, Nature Methods Supplement, March 2010

Biovis today

- Areas
    - Sequencing alignment
    - Image based data
    - Molecular structures

- Custom Solutions
    - Integrated with remote sources
    - Interoperability
    - Trend to allow reuse (VTK [2], Cytoscape [3])

[3] Visualization Toolkit (VTK), http://www.vtk.org/
[4] Cytoscape App Store, http://apps.cytoscape.org/

The user-interface challenge

Tissue level · Cellular level · Molecular level

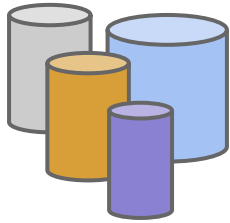*Possible integrated vis-environment [1]*

"Be able to seamlessly move between the data"

Focus elements

- Reward usability

- Balance automation and visualization

- Standards!

- New forms of augmented interaction

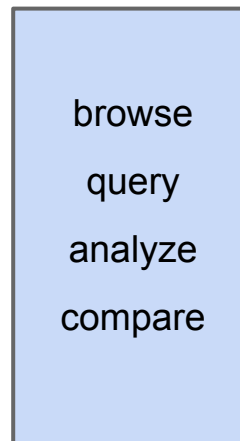- Computational problems

Image based data

Image data resources

Methods

browse

query

analyze

compare

Complex, large and increasing

"Visualizations useful to the immediate research group and more broadly to the scientific community"

Overview 2nd Paper

1. Issues related to digital images

2. High-dim image data

3. Collaboration & sharing

High-dim image data (1)

- Additional dimensions
  - Space (3D imaging)
  - Time (functional MRI)
  - Channels (fluorescent markers)

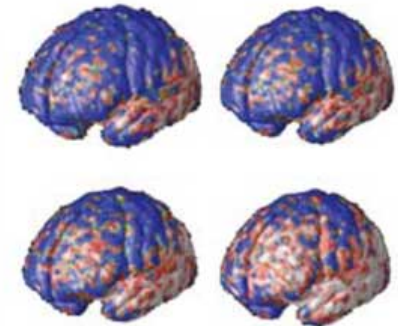- Combination!

High-dim image data (2)

- 3D
  - Volume + Transparency + Slicing
  - Coupled with virtual reality environments
  - Navigate through biological entities

- Time
  - Static gallery of images
  - Movies discard too much data
  - Alternatively heatmaps
  - Tracking algorithms

What to do with extra dimensions?

- Dimensionality reduction
- Color-coding

"This, however, only partially alleviates the problem"

"... in this challenging field, there is still room for new, sophisticated visualization tools"

Perspectives

- Apply methods from sequencing
  - Tools like BLAST (http://blast.ncbi.nlm.nih.gov/)

- Adopt MRI-vis for microscopy applications

- Image data integration
  - statistical tests
  - mathematical modeling
  - automated reasoning

- Key elements
  - database federation
  - data storage in semantic web formats

Examples

- Visible Cell
  - http://www.visiblecell.com/illoura

- BioSPICE
  - http://biospice.sourceforge.net/