



The Dassault Systèmes  
Developer Conference

**DEVCON**  
**2 0 0 8**

## The digital laboratory

Jean-Marc Gauthier, New York University

Director, Tisch Asia Animation and Digital Arts MFA

Creator, [www.tinkering.net](http://www.tinkering.net)

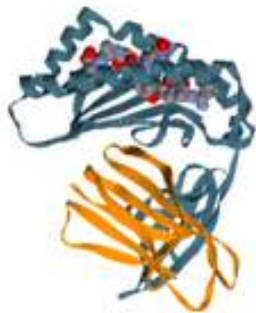
**IMPORTANT NOTE:** All rights are reserved for texts and illustrations found inside this document including names and presentations of the following projects “the Dynamic Virtual Patient”, “Docking of Molecules”, Interactive Map of DNA Barcodes for the World’s 10000 Bird Species”, “Virtual Manhattan”, Jean-Marc Gauthier, 2008. Do not reuse this document or parts of this document without written authorization from Jean-Marc Gauthier [gauthier@tinkering.net](mailto:gauthier@tinkering.net).

# The digital laboratory

- utilizes virtual worlds in order to enable people from different places and spaces to communicate about scientific research



# The digital laboratory / research production



# The digital laboratory / research production

## ● Research and teaching @ New York University

- Tisch School of the Arts, New York City
- Tisch School of the Arts Asia, Singapore



# The digital laboratory / research production

## ● Research and teaching @ New York University

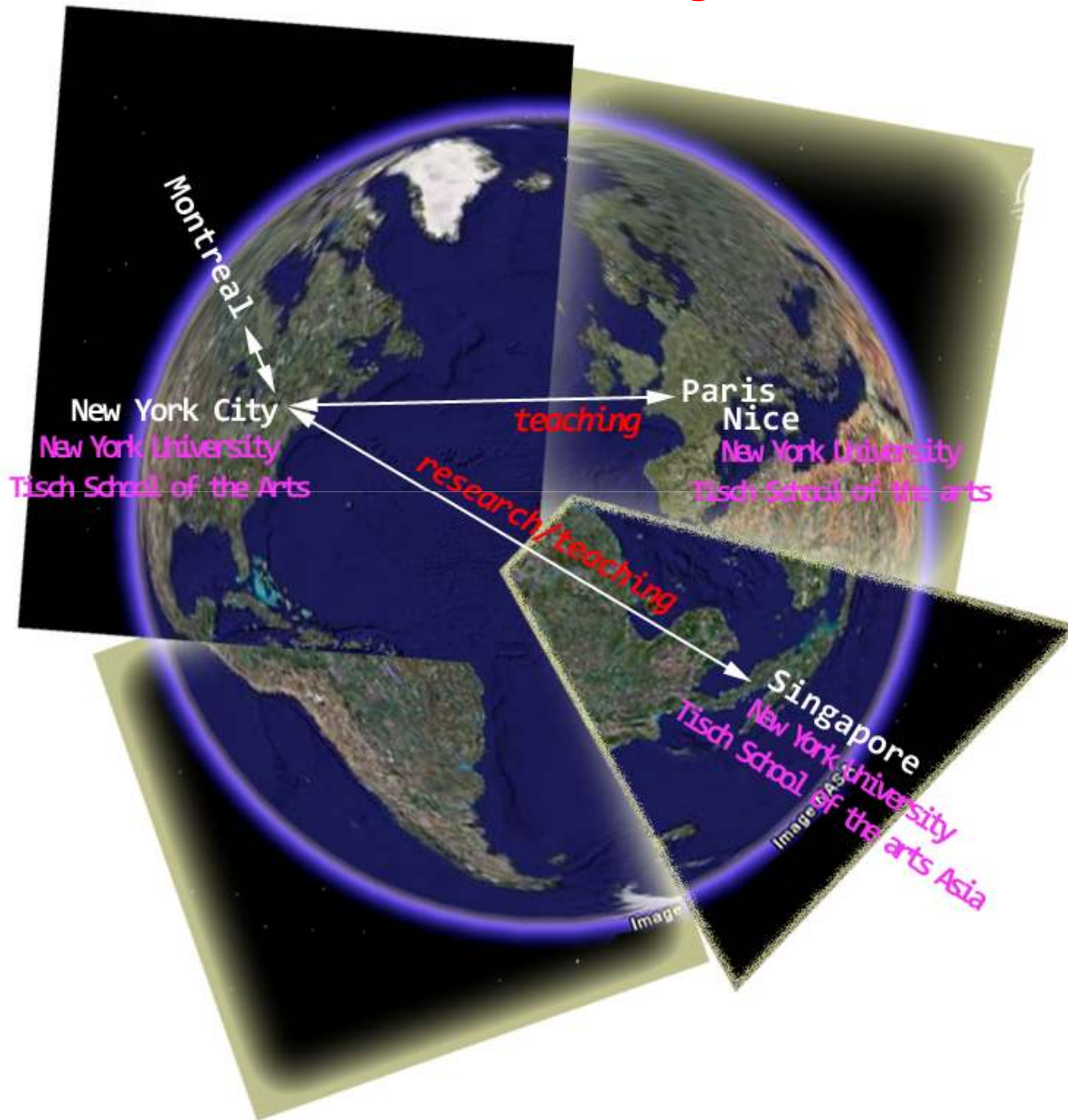
- Tisch School of the Arts, New York City
- Tisch School of the Arts Asia, Singapore

## ● Production @ tinkering.net

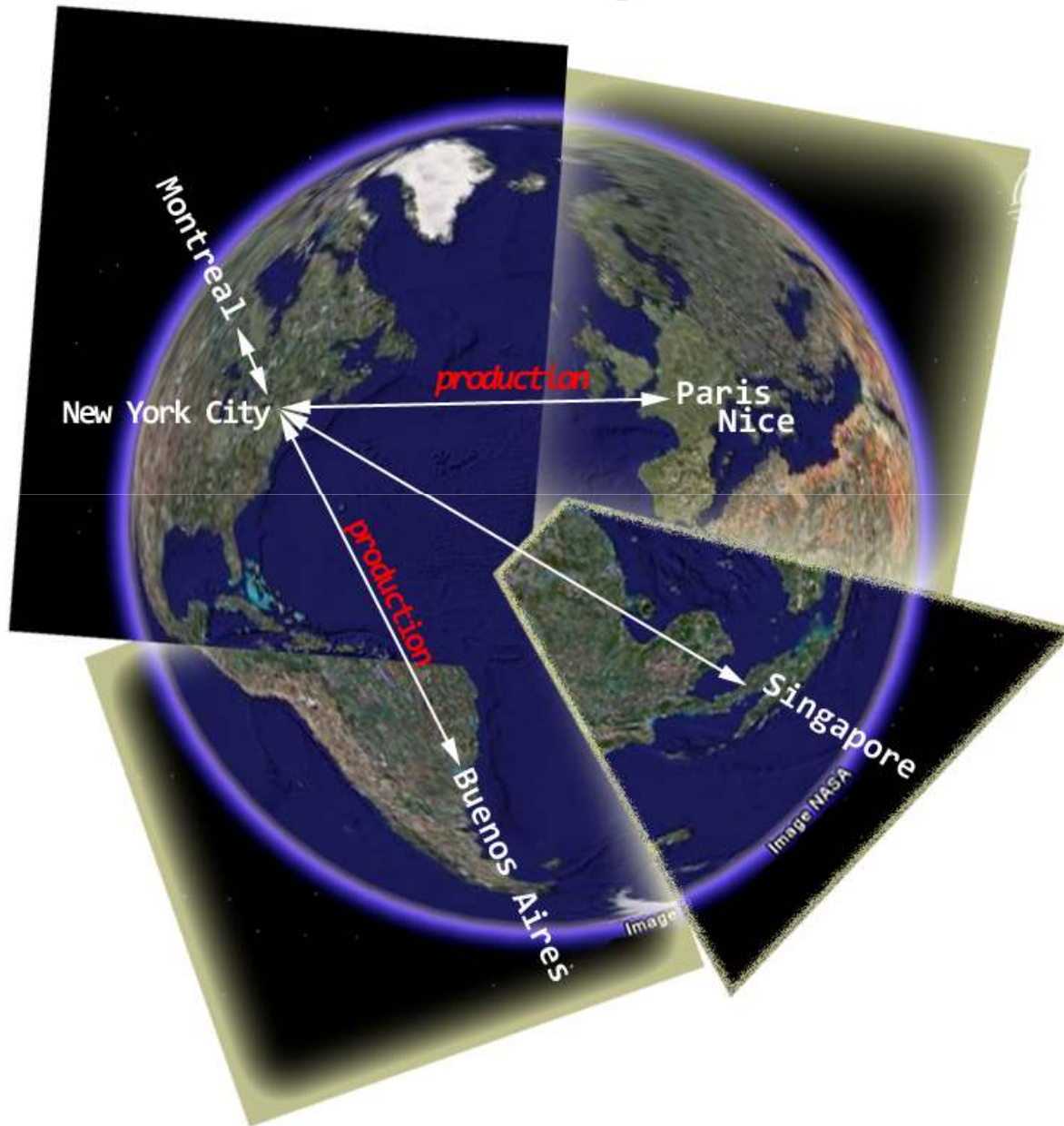
- New York City



# The network / my research @ NYU Tisch

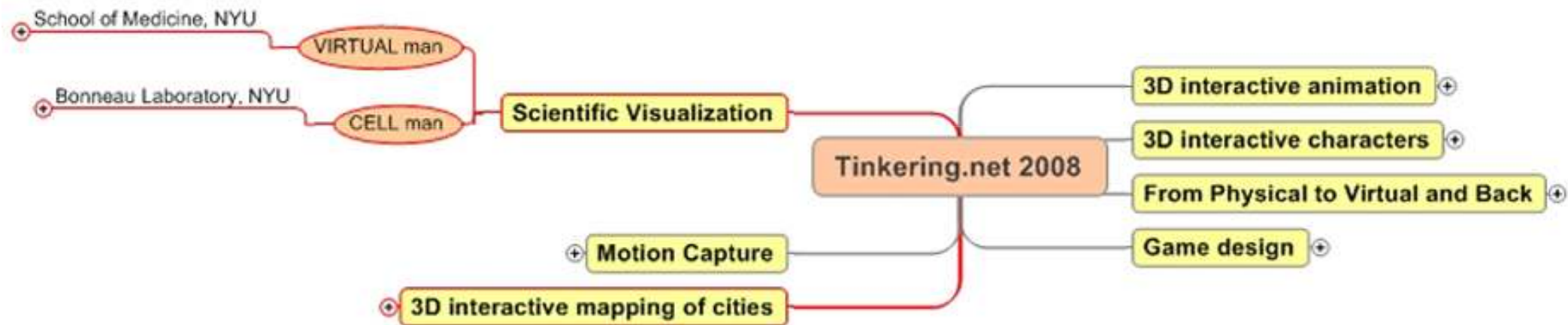


# The network / production @ tinkering.net



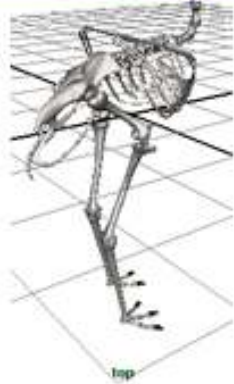
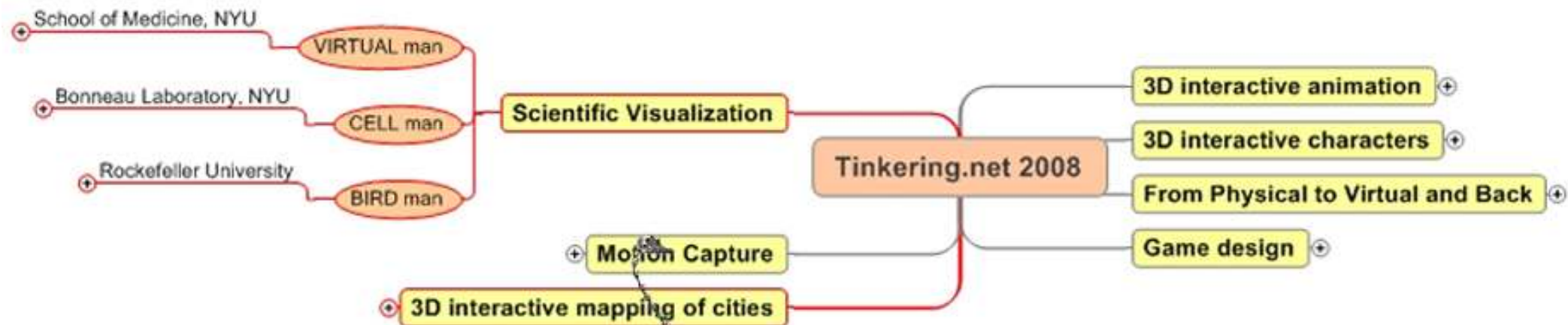
# Evolution of projects @ tinkering.net

● 2007



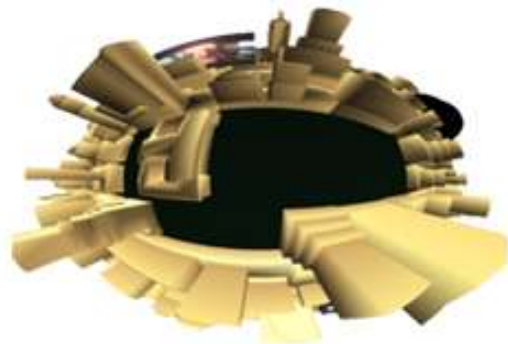
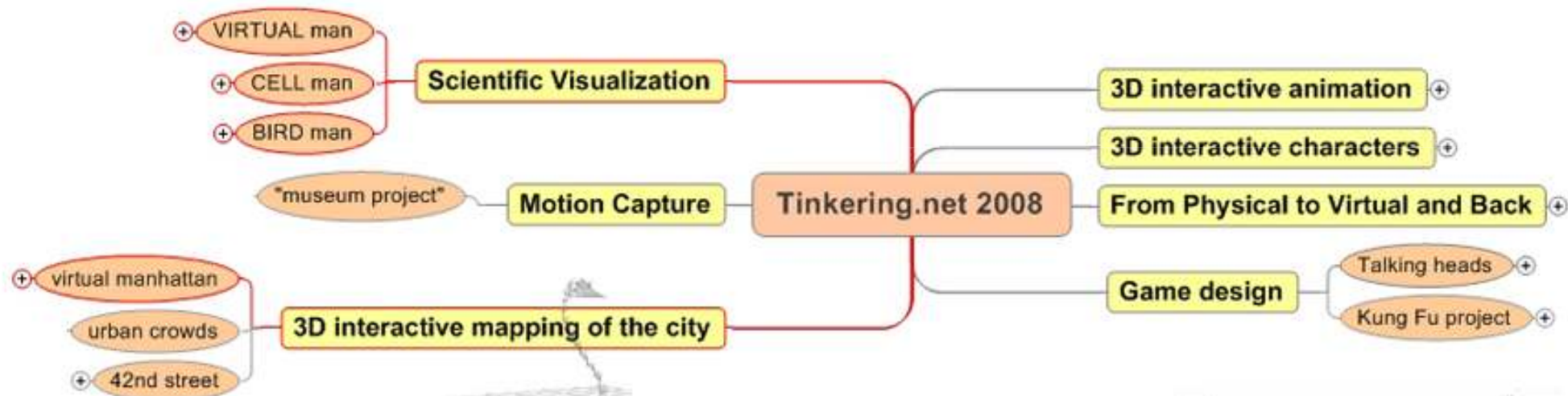
# Evolution of projects @ tinkering.net

● 2007



# Evolution of projects @ tinkering.net

● 2008



# The digital laboratory

## ● 3 collaborations

- healthcare
- bio-informatics
- genomics



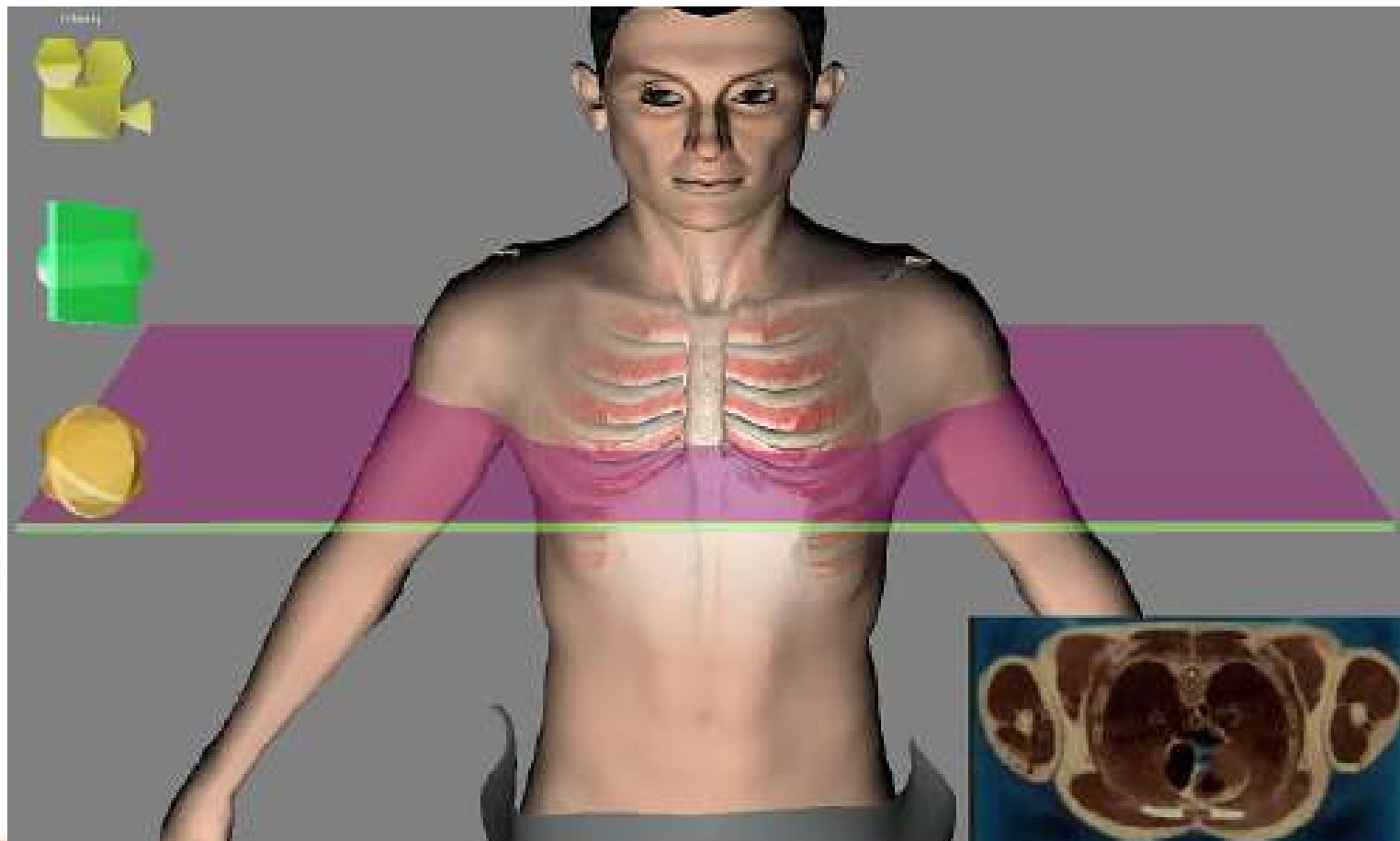
# The digital laboratory

- **3 collaborations = 3 modules for the digital lab**
  - **healthcare** the dynamic virtual patient
  - **bio-informatics** interactive animation of molecules
  - **genomics** interactive map of DNA barcodes for the world's 10,000 bird species



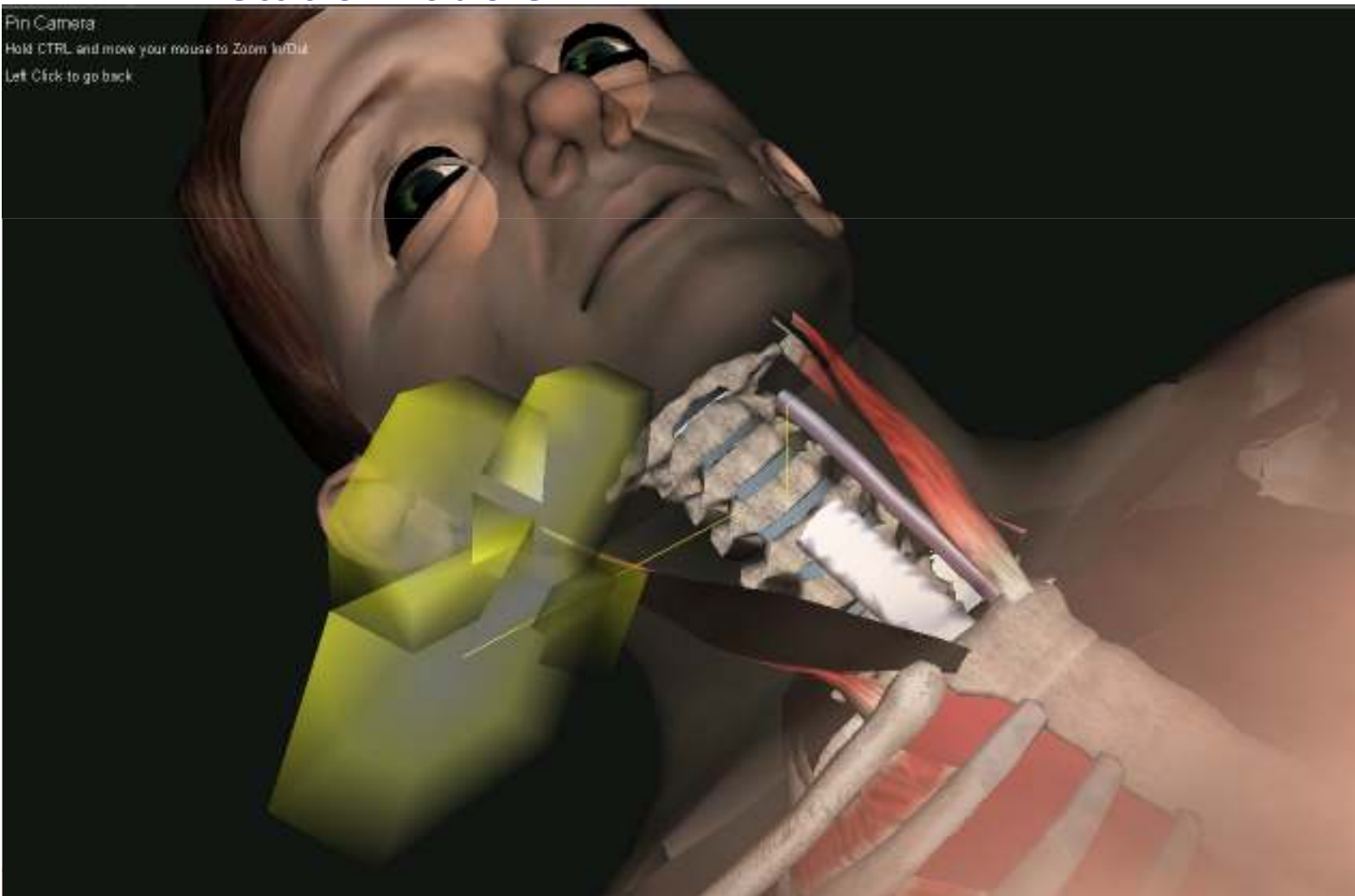
# The digital laboratory

- **healthcare** the dynamic virtual patient
- a universal 3D interface for a person's medical data
- <http://www.youtube.com/watch?v=TU-TRXdSN7s>
- [www.tinkering.net/vp](http://www.tinkering.net/vp)



# Dynamic Virtual Patient / partners & goals

- collaboration with **Martin Nachbar MD School of Medicine NYU**
- “we want to allow a computer user to influence a system of relationships between organs instead of just viewing them as static models”



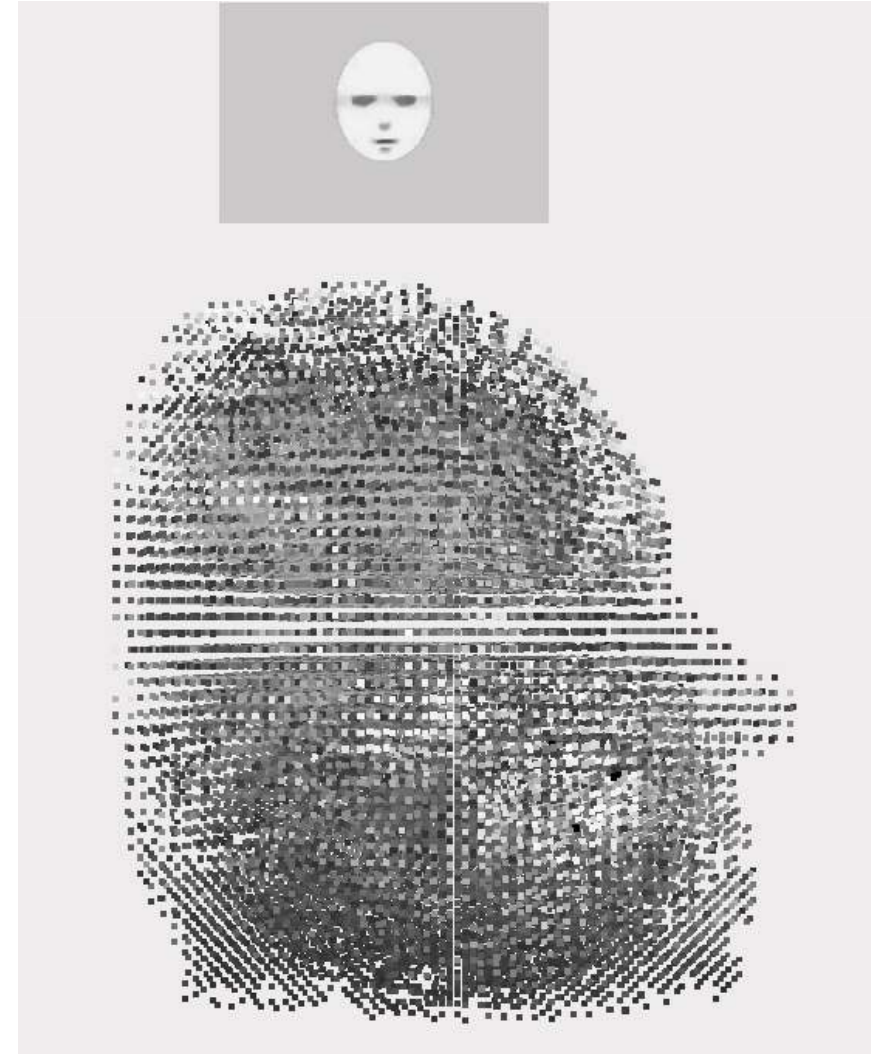
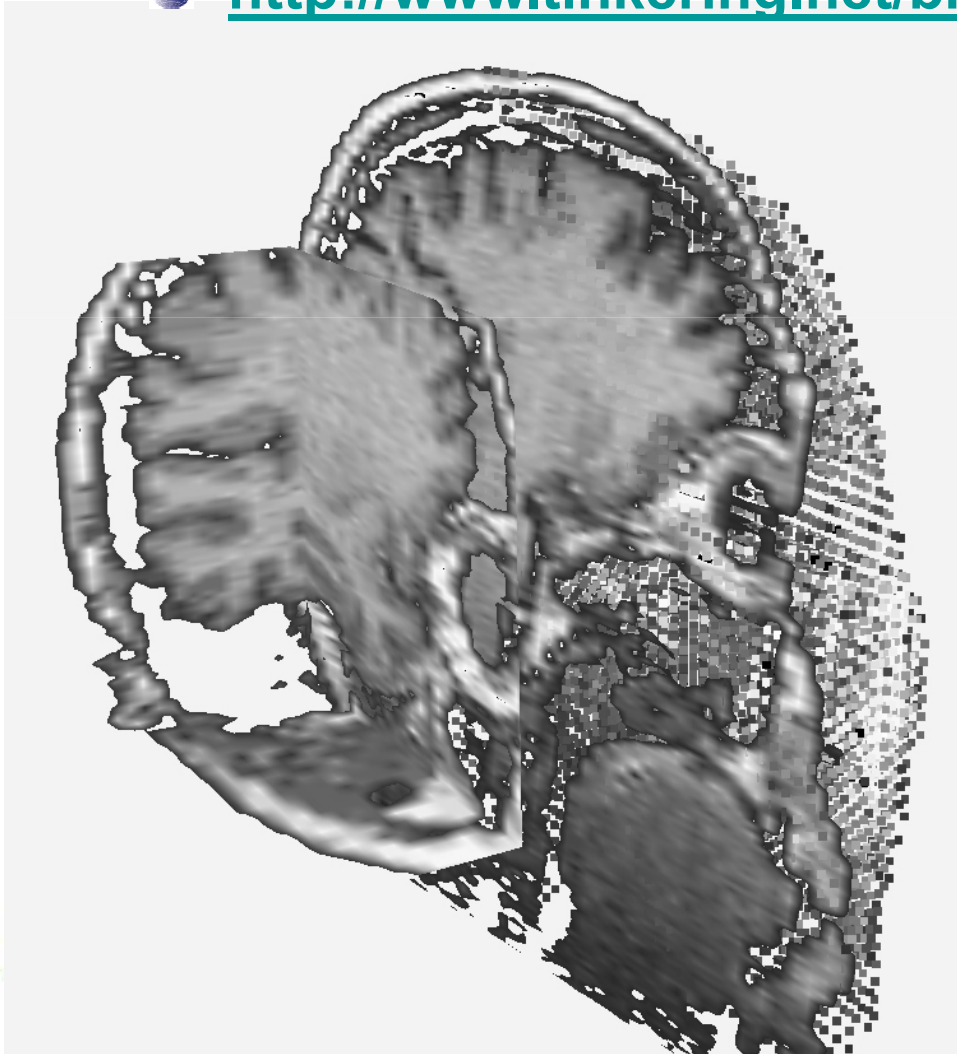
# Dynamic Virtual Patient / intentions

- this project goes beyond just the anatomic representation of the body
- attempting to understand the human body as a whole,
- integrating knowledge from different areas of medical expertise,
- assembling and visually organizing information



# Dynamic Virtual Patient / results

- one real world application: **The brain project**
- 3D visualization and navigation of MRI data
- <http://www.tinkering.net/brain/>



# Dynamic Virtual Patient / **next step**

- reality of the virtual: location of blood vessels in the brain
- need of new tools in order to process user generated content
- status of online access to patient's medical data
- interactive animation of small elements: cutting layers of skin



# The digital laboratory

- **bio-informatics** docking proteins / interactive animation of molecules
- <http://www.tinkering.net/dynamicbio>



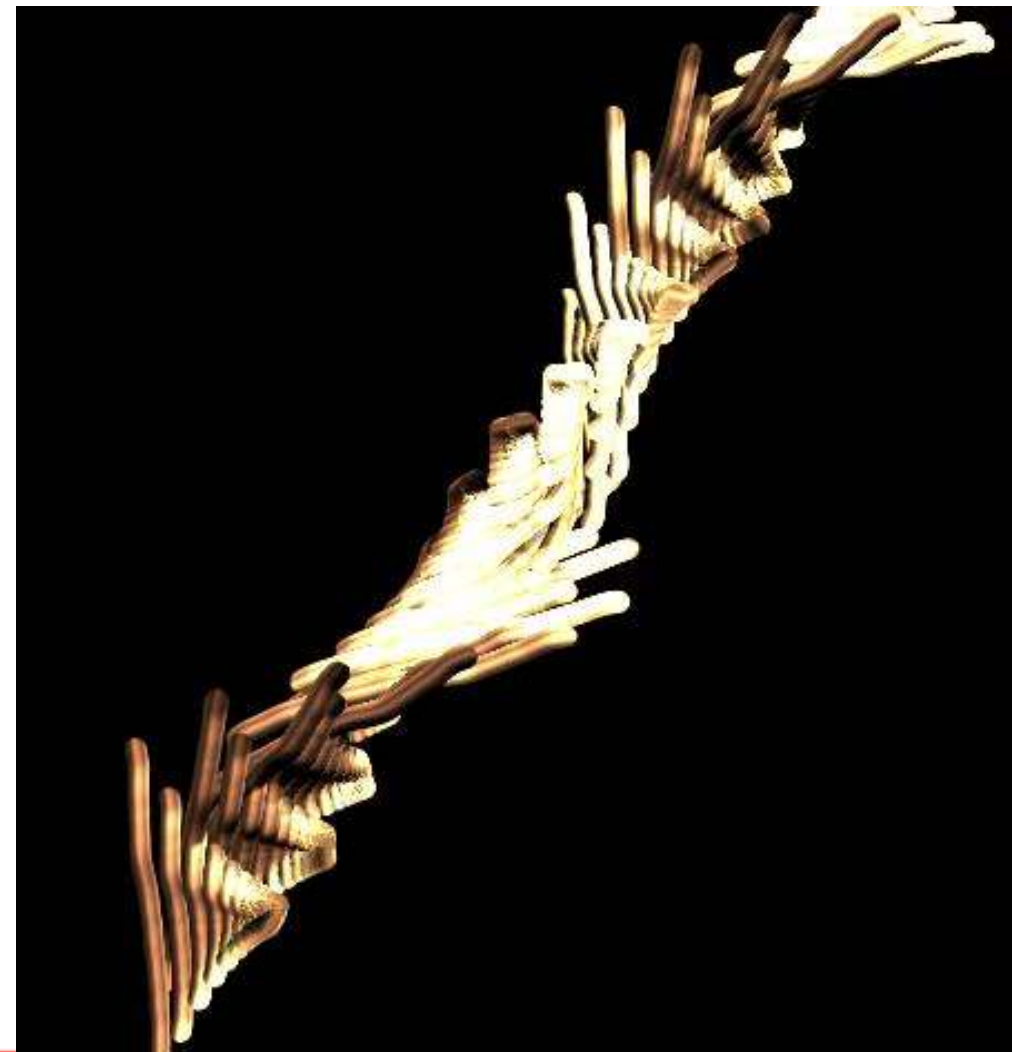
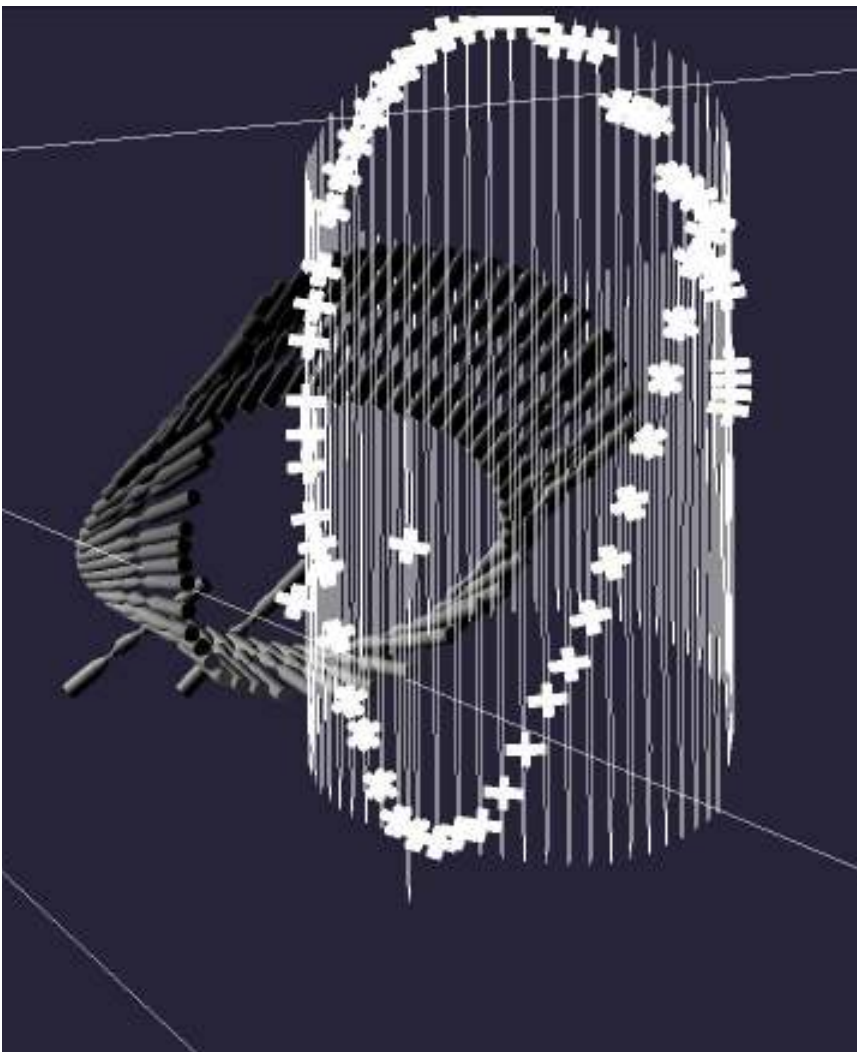
# Docking proteins / partners & goals

- with **Richard Bonneau The Bonneau Laboratory NYU**
- “Building a dynamic model that can predict an organism's interaction with its changing environment”
- “The environment significantly influences the dynamic expression and assembly of all components encoded in the genome of an organism into functional biological networks”



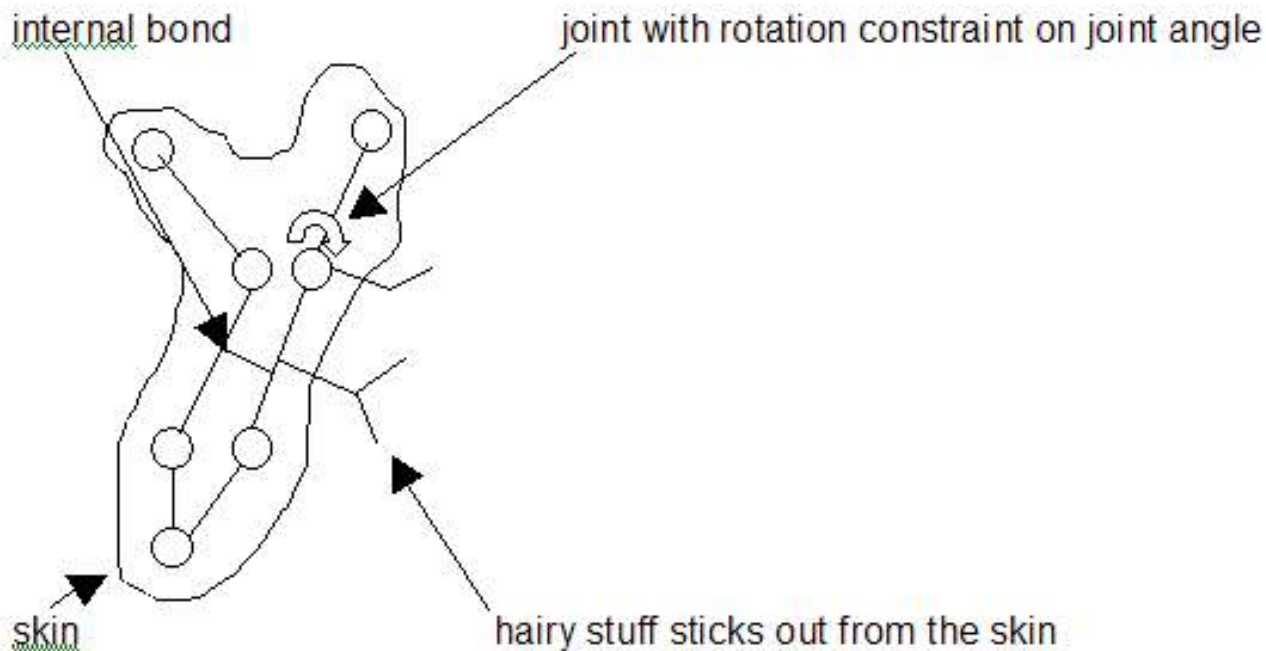
# Docking proteins / intentions

- folding patterns of proteins
- data-driven simulations for folding collapsible proteins



# Docking proteins / next step

- How to create a skin following a threshold of collision detection of molecules of water
- how to script rules governing the docking behavior of the protein



# The digital laboratory

- **genomics** interactive map of DNA barcodes for the world's 10,000 bird species
- <http://www.youtube.com/watch?v=1tCjAQbFklw>



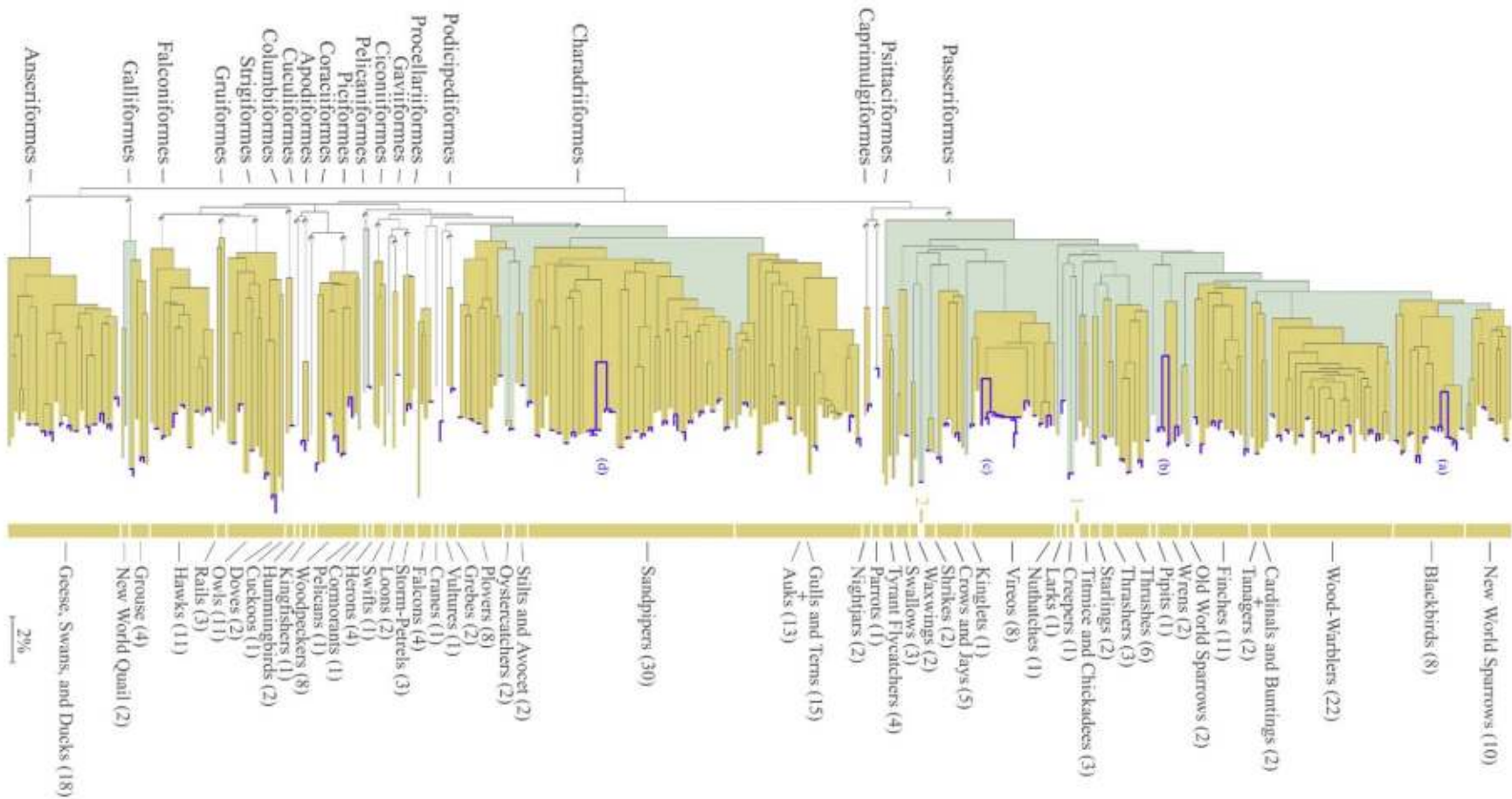
# interactive map of DNA barcodes for the world's bird species / **partners & goals**

- with **Mark Stoeckle Program for the Human Environment at The Rockefeller University**
- “Each of the world’s approximately 10,000 species is assigned a square, using x and y coordinates of a grid. The species are arranged on the grid according to their taxonomic order, which reflects evolutionary history and puts closely-related birds near to each other, starting with the most ancient lineages”



# interactive map of DNA barcodes for the world's 10,000 bird species / intentions

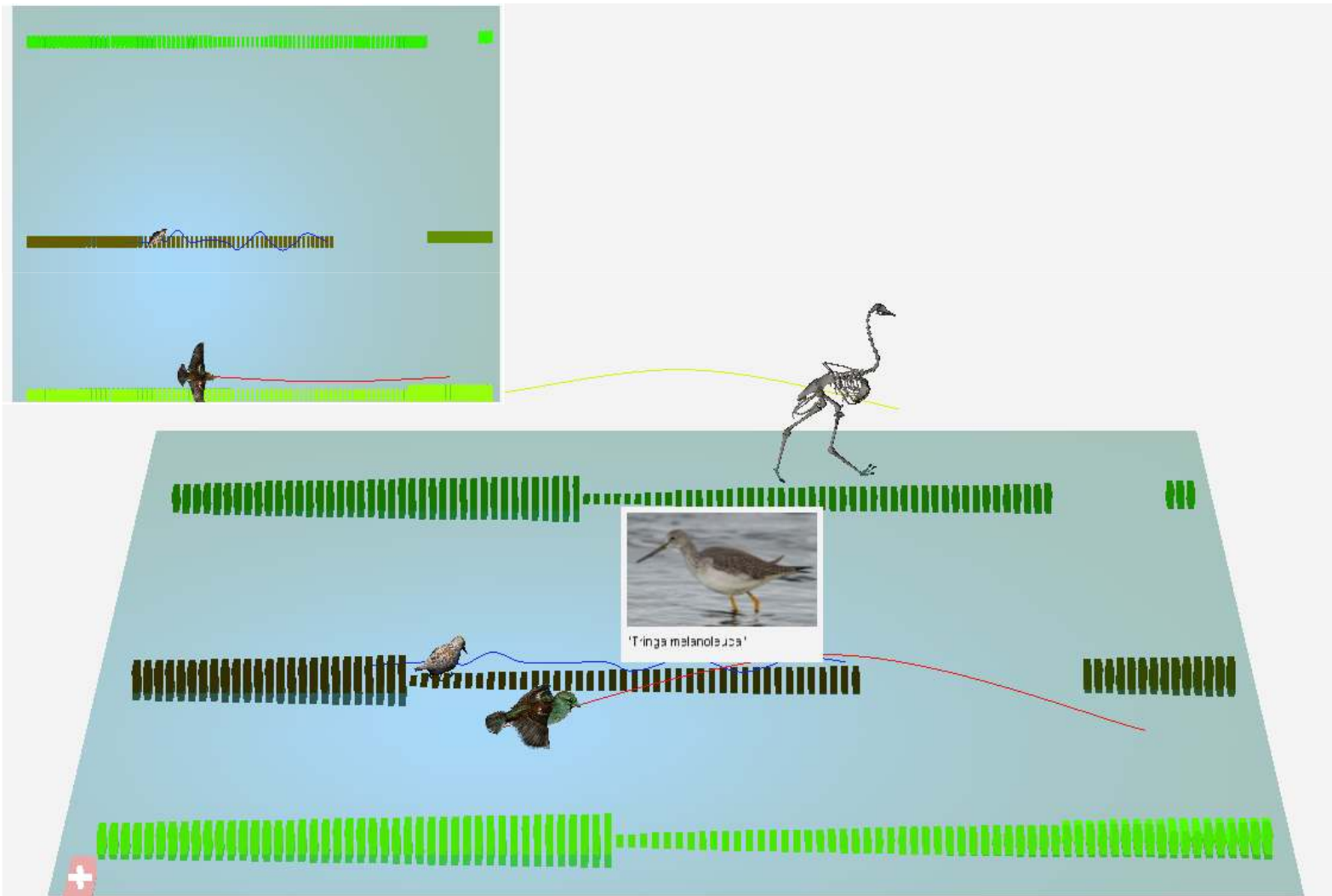
- Researchers around the world are collaborating on constructing a reference library of DNA barcodes





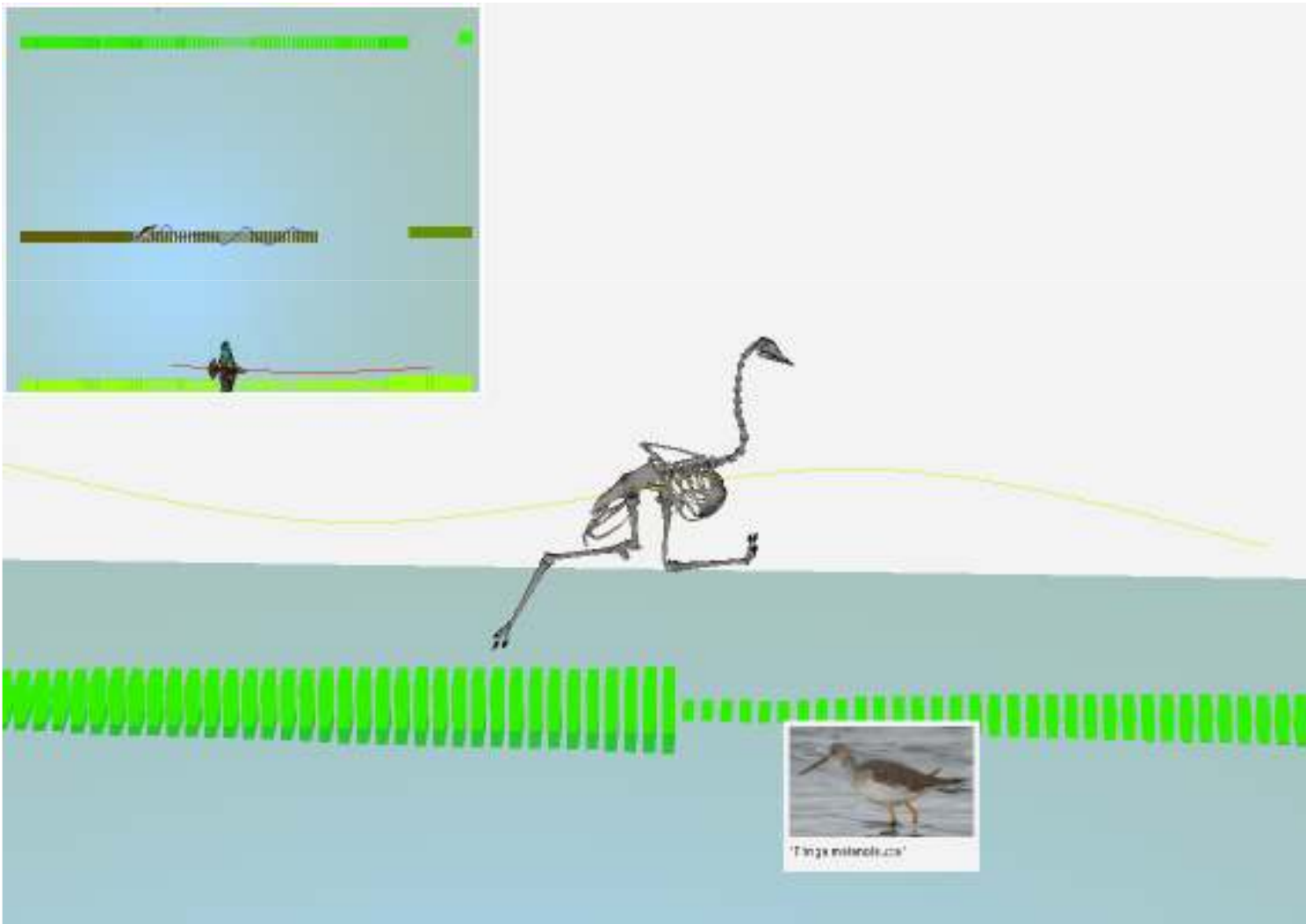
# interactive map of DNA barcodes for the world's 10,000 bird species / **results**

- ABBI is a testing ground for DNA barcoding for the larger initiative to barcode all animal and plant life



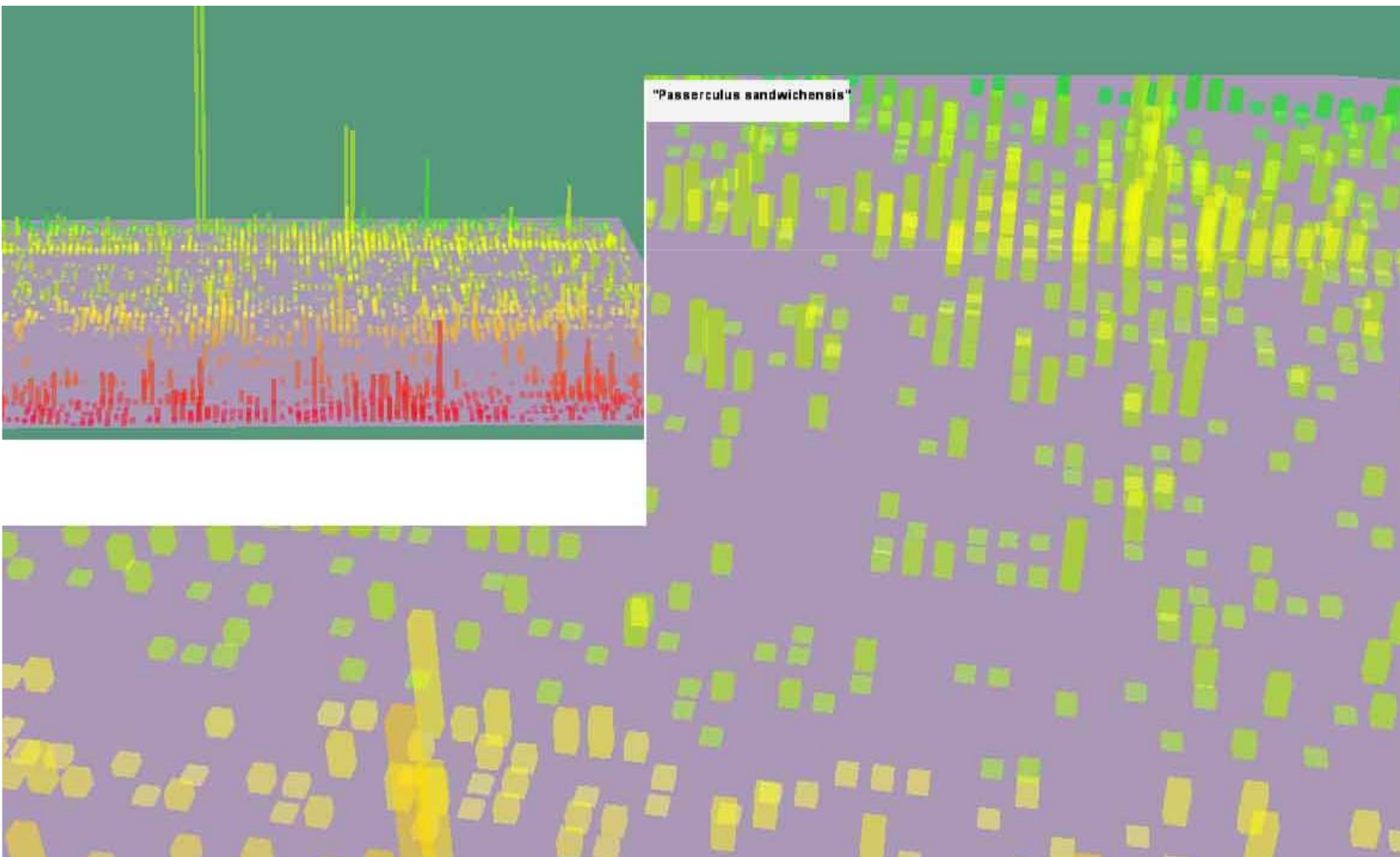
# interactive map of DNA barcodes for the world's 10,000 bird species / results

- The zoomable 3-D map is for displaying data in a small space in order to show its relationship to surrounding data



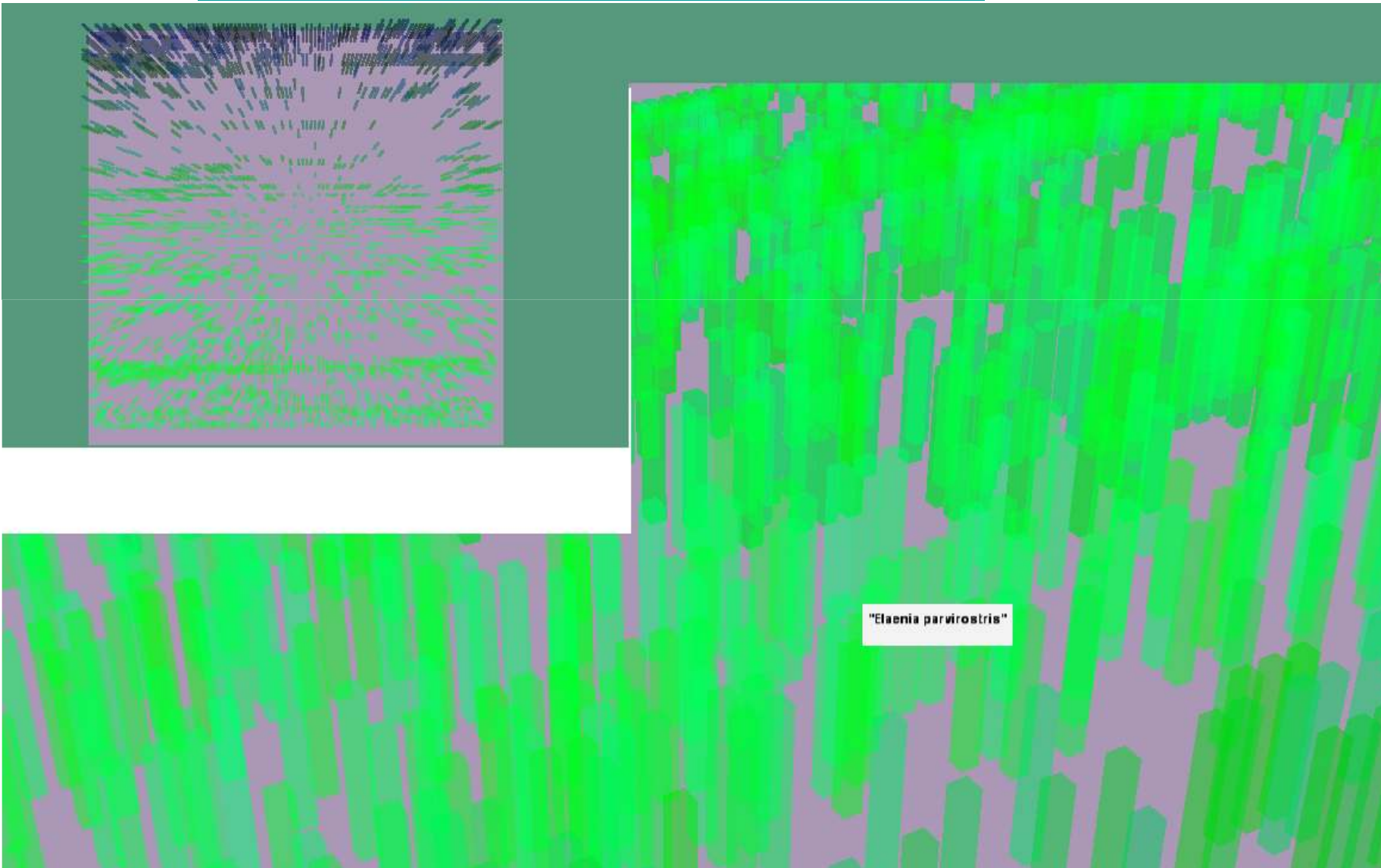
# interactive map of DNA barcodes for the world's 10,000 bird species / results

- The zoomable 3-D map is for displaying data in a small space in order to show its relationship to surrounding data



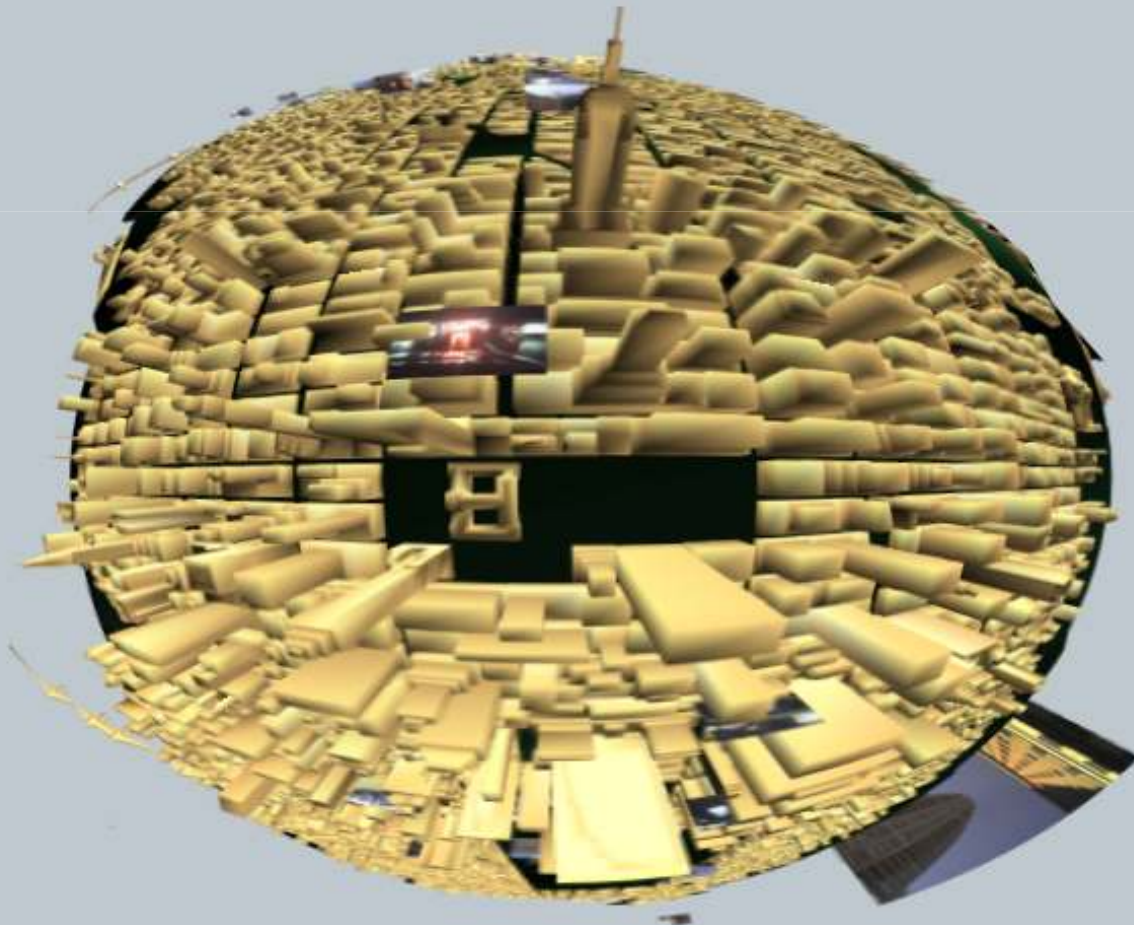
# interactive map of DNA barcodes for the world's 10,000 bird species / **results**

- <http://www.tinkering.net/3DMapBirds/>



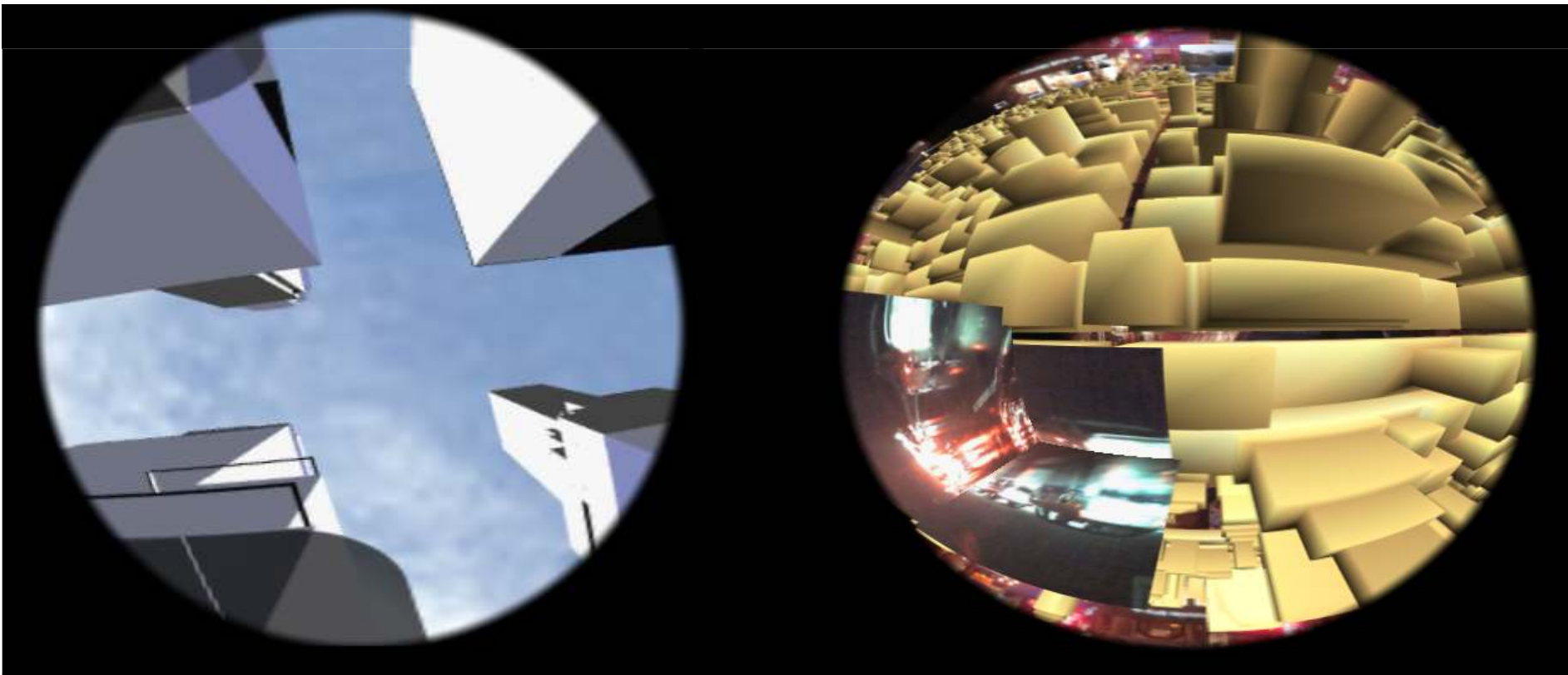
## **Next step / Virtual Manhattan, interactive spherical map using the Wii**

- a virtual ecosystem: experiencing a virtual world driven by social networks
- <http://www.youtube.com/watch?v=4fv7fbpHFfk>



## **Next step / Virtual Manhattan, interactive spherical map using the wiimote**

- “While working on 3D interactive maps of Manhattan JMG was grappling with the amount of 3D details requested when moving the virtual camera”.



# The digital laboratory

- thanks to our partners and to
  - Fabien Barati
  - Peter Birdsall
  - Guillaume Langlois
  - Antoine Schmitt
  - Sia Interactive
  - Zach Rosen
- More info [www.tinkering.net](http://www.tinkering.net)

