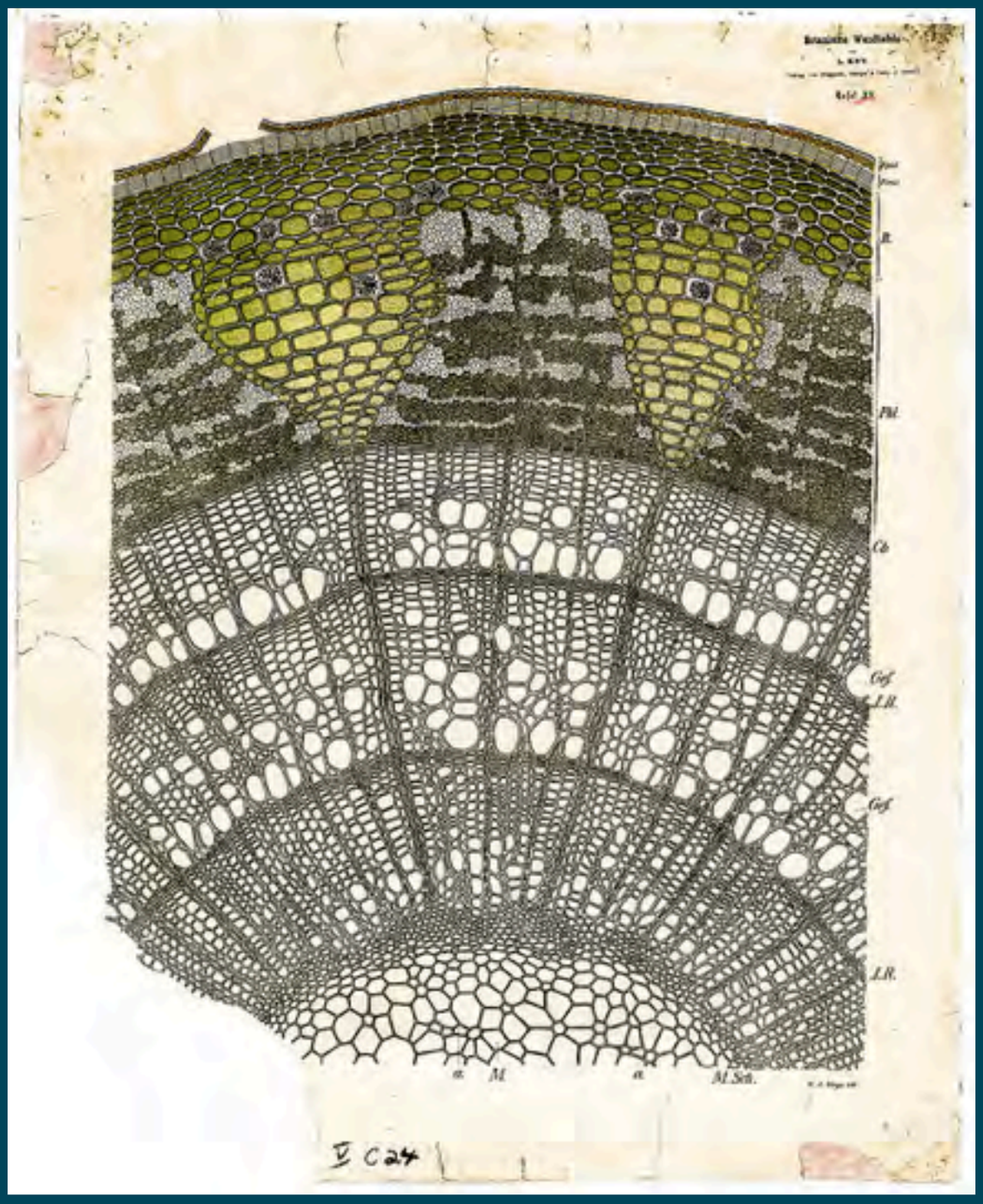


Arnold Dodel

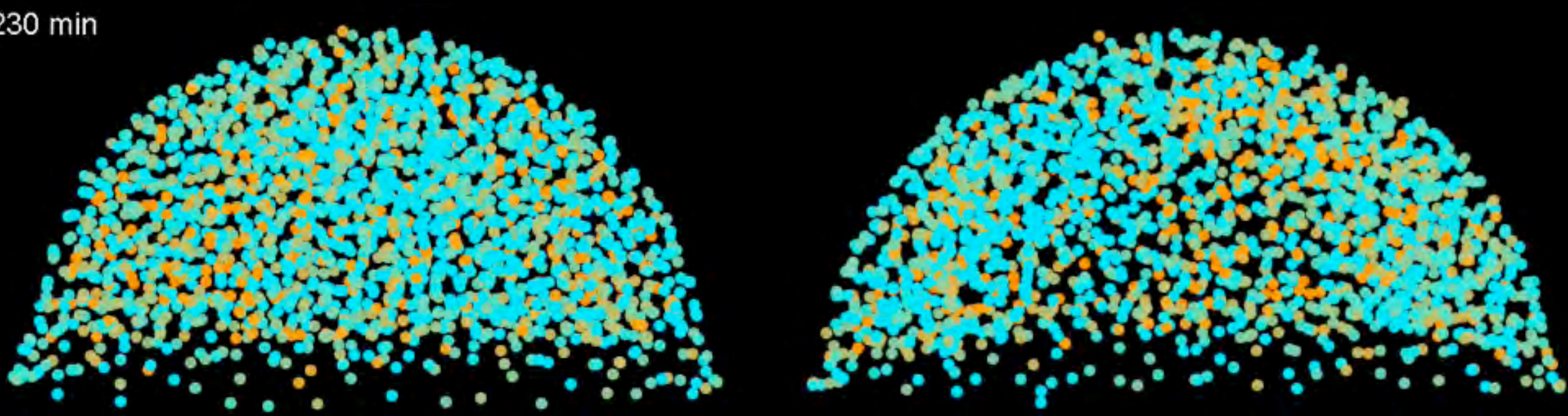
Stem *Tillia* sp.

Networking of Bioimage Analysis Community in EU and Japan

Kota Miura (miura@embl.de)

National Institutes of Natural Sciences, Tokyo
National Institute of Basic Biology, Okazaki
EMBL Heidelberg

Techniques for Tracking (example)



Keller et al. 2008

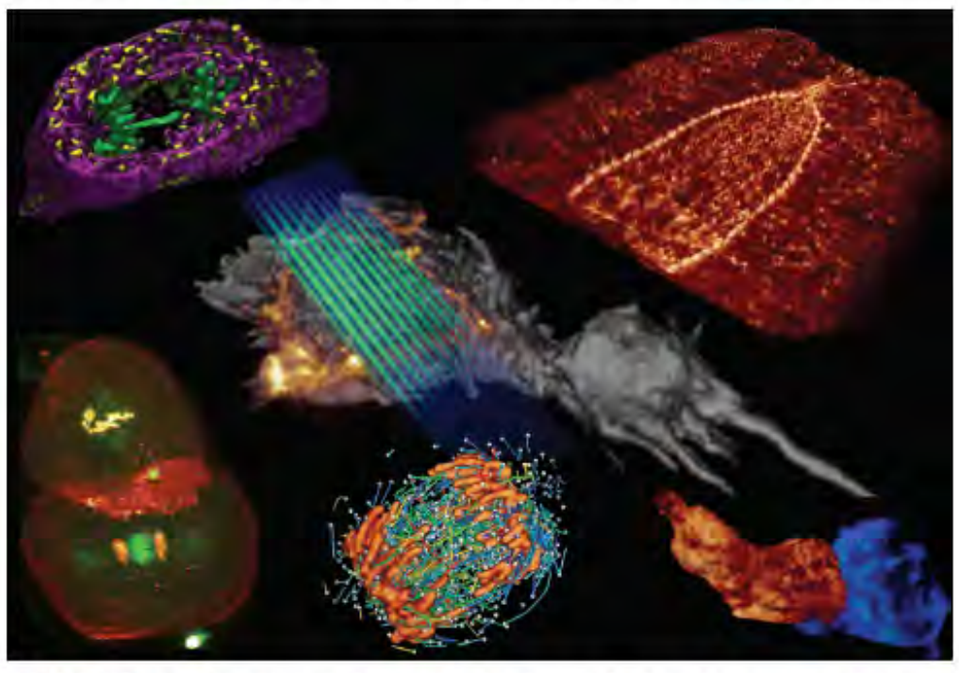
ADVANCED IMAGING

Lattice light-sheet microscopy: Imaging molecules to embryos at high spatiotemporal resolution

Bi-Chang Chen, Wesley R. Legant, Kai Wang, Lin Shao, Daniel E. Milkie, Michael W. Davidson, Chris Janetopoulos, Xufeng S. Wu, John A. Hammer III, Zhe Liu, Brian P. English, Yuko Mimori-Kiyosue, Daniel P. Romero, Alex T. Ritter, Jennifer Lippincott-Schwartz, Lillian Fritz-Laylin, R. Dyche Mullins, Diana M. Mitchell, Joshua N. Bembenek, Anne-Cecile Reymann, Ralph Böhme, Stephan W. Grill, Jennifer T. Wang, Geraldine Seydoux, U. Serdar Tulu, Daniel P. Kiehart, Eric Betzig*

INTRODUCTION: In vivo imaging provides a window into the spatially complex, rapidly evolving physiology of the cell that structural imaging alone cannot. However, observing this physiology directly involves inevitable tradeoffs of spatial resolution, temporal resolution, and phototoxicity. This is especially true when imaging in three dimensions, which is essential to obtain a complete picture of many dynamic subcellular processes. Although traditional in vivo imaging tools, such as widefield and confocal microscopy, and newer ones, such as light-sheet microscopy, can image in three dimensions, they sacrifice substantial spatiotemporal resolution to do so and, even then, can often be used for only very limited durations before altering the physiological state of the specimen.

RATIONALE: To address these limitations, we developed a new microscope using ultrathin light sheets derived from two-dimensional (2D) optical lattices. These are scanned plane-by-plane through the specimen to generate a 3D image. The thinness of the sheet leads to high axial resolution and negligible photobleaching and background outside of the focal plane, while its simultaneous illumination of the entire field of view permits imaging at hundreds of planes per second even at extremely low peak excitation



Lattice light-sheet microscopy. An ultrathin structured light sheet (blue-green, center) excites fluorescence (orange) in successive planes as it sweeps through a specimen (gray) to generate a 3D image. The speed, noninvasiveness, and high spatial resolution of this approach make it a promising tool for in vivo 3D imaging of fast dynamic processes in cells and embryos, as shown here in five surrounding examples.

Imaging is inevitable in modern biomedical research.

- 70% of high-impact journal biomedical articles uses imaging.

Betzig Science paper, 2014

Workflow of Imaging Based Research

-> Experiments

-> Microscopy

-> Image Processing & Analysis

-> Paper

wet lab

instruments, computation

EURO-BIOIMAGING

Imaging Infrastructure with physical open user access

European life scientists as users

Web-access portal

HUB

NODES

USER TRAINING

MULTIMODAL TECHNOLOGY NODE

MULTIMODAL TECHNOLOGY NODE

FLAGSHIP NODE

FLAGSHIP NODE

FLAGSHIP NODE

FLAGSHIP NODE

STAFF TRAINING

Data storage and analysis infrastructure

User goes home with results for publication

NIBB

EMBL

Start-up of imaging network in Japan (2013 -)

imaging science

TOP RESEARCH INTERESTS MEMBER MISC DOWNLOADS GRANTS EVENTS CONTACT

第二回「全国大学等バイオイメージング連携体制の今後のあり方を考える会」を開催いたしました

12 月 22 日，基礎生物学研究所にて，第二回目となる「全国大学等バイオイメージング連携体制の今後のあり方を考える会」を開催いたしました．

ネットワークの枠組みの将来や，情報提供の拠点となるポータルサイトの設置，そして各施設にて個別に行われているトレーニングコースの合同開催の可能性や大規模画像データストレージなど，ネットワークが果たすべき役割についてより具体的な議論が交わされました．
また，本年 4 月に設立された欧州バイオイメージングネットワーク（EuroBioImaging）と，本ネットワークとの連携についても意見交換を行いました．

NEWS

生物画像データ解析トレーニングコース 2015 開催のお知らせ
平成 27 年度 新分野創成センターイメージングサイエンス研究分野プロジェクト募集開始のお知らせ
バイオイメージ・インフォマティクス　ワークショップ 2015 プログラムを公開しました
バイオイメージ・インフォマティクス ワークショップ2015 開催のお知らせ
「全国大学等バイオイメージング連携体制の今後のあり方を考える会」第2回会議とりまとめを公開いたしました

Global BioImaging project

– funded by Horizon 2020, EC, Sept 2015 – (New!)

… work together with imaging infrastructure experts from

- Australia
- Argentina
- South Africa
- India
- Japan ← NIBB/NINS
- The USA

Imaging Bottleneck

Imaging

-> Experiments

-> Microscopy

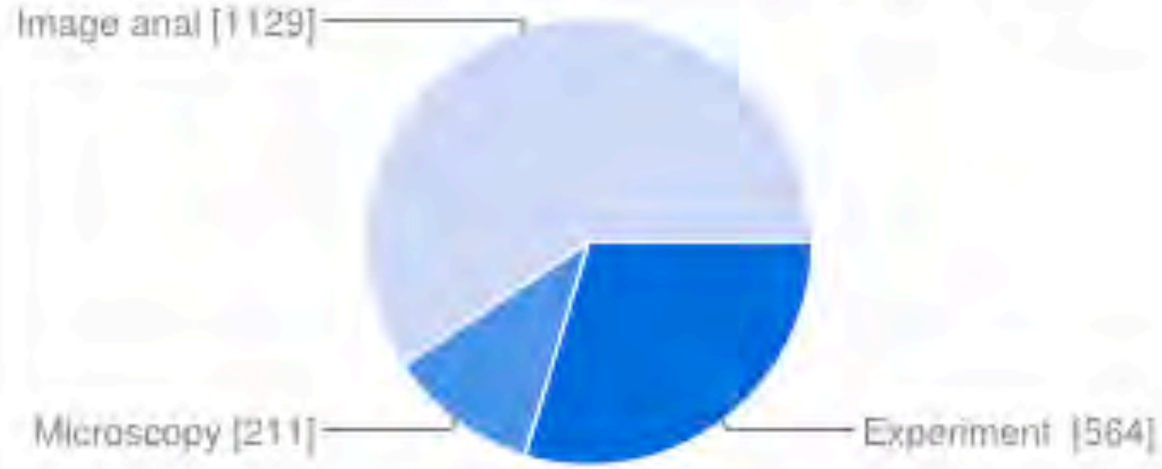
-> Image Processing, Analysis

-> Results

Bottleneck!

Survey Mar. 2015

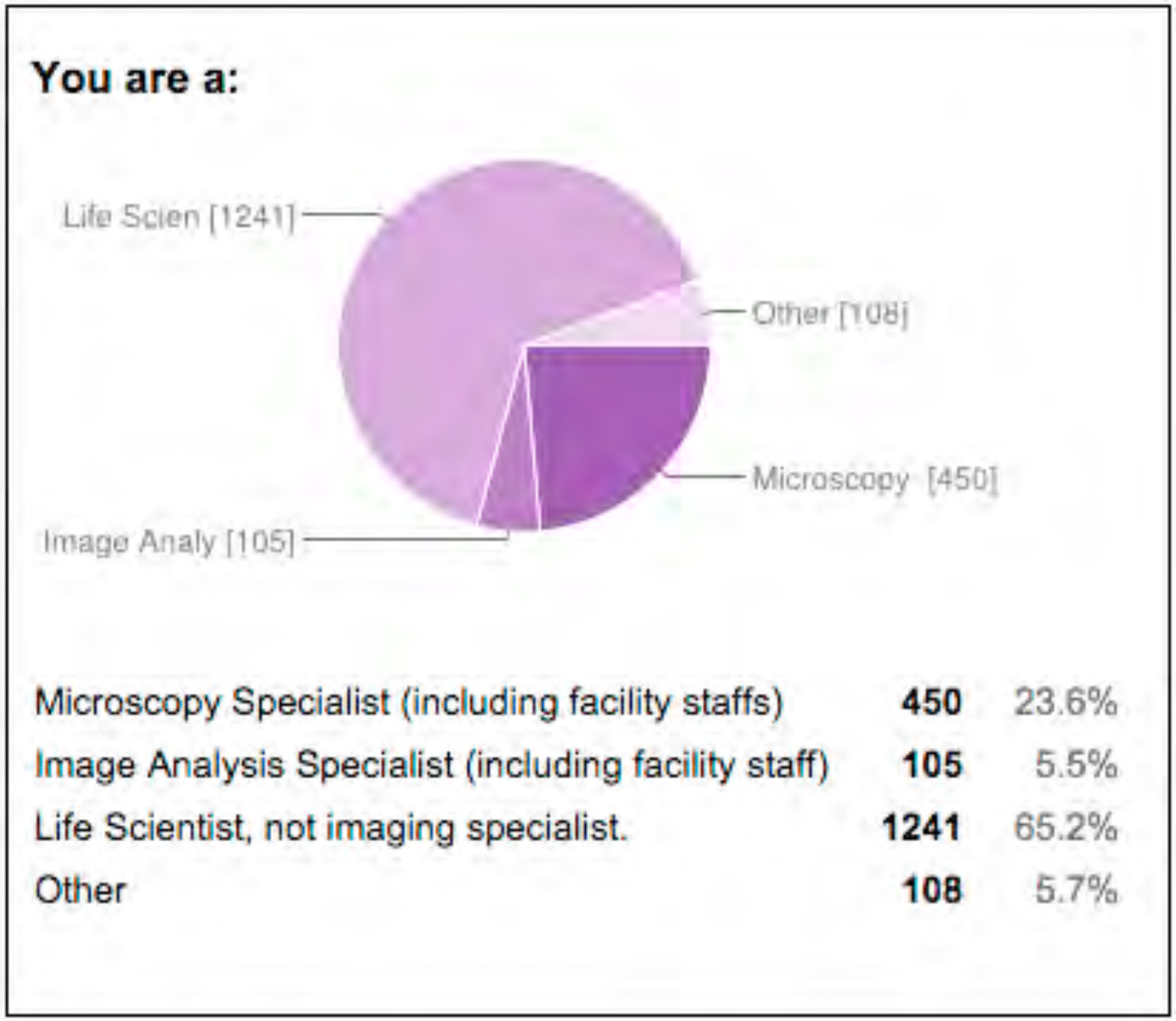
Which step in imaging based research project is the most difficult for you?



Experiment (genetic engineering, labeling, drug treatments)	**564**	29.6%
Microscopy	**211**	11.1%
Image analysis	**1129**	59.3%

1800 people answered in three days

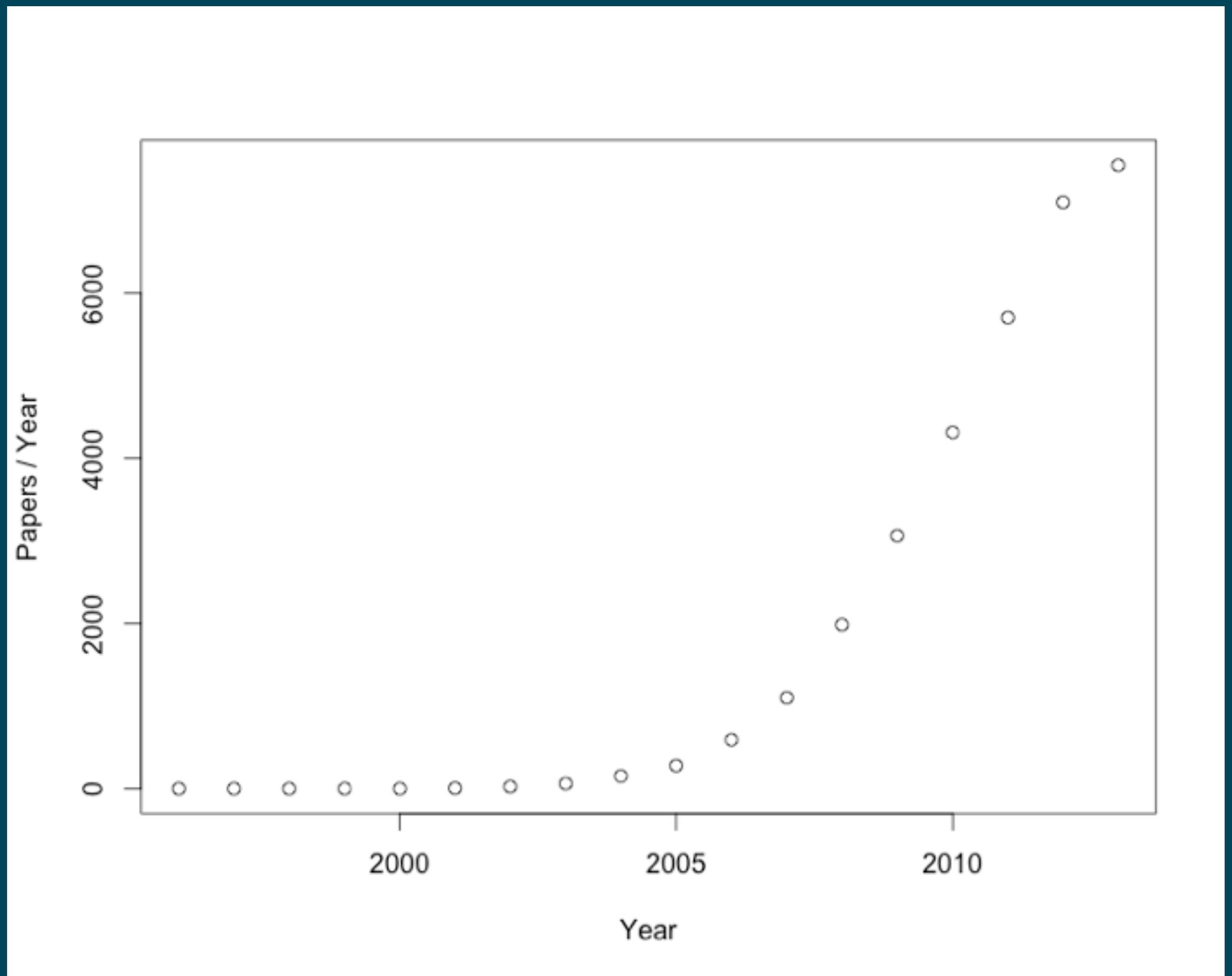
Survey Mar. 2015



Microscopy Specialist (including facility staffs)	**450**	23.6%
Image Analysis Specialist (including facility staff)	**105**	5.5%
Life Scientist, not imaging specialist.	**1241**	65.2%
Other	**108**	5.7%

... more will be published somewhere

Publications with ImageJ

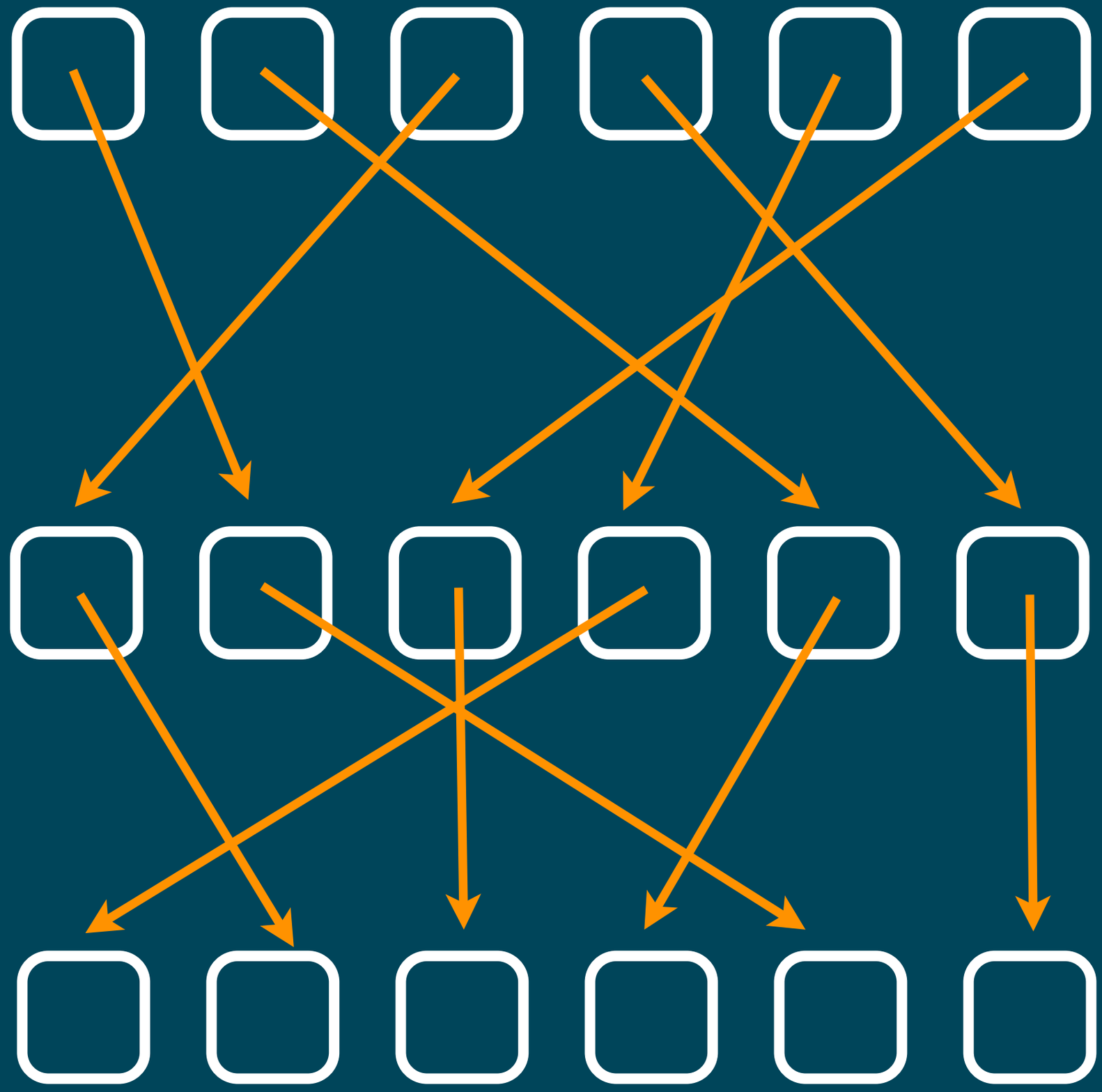


source: pubmed

Fiji: 900 commands

Biological Problems

Image Processing & Analysis Tools, Functions, Libraries



2nd Round...

Which combination should be used?

Enlarging the Bottle Neck

Biological Problems

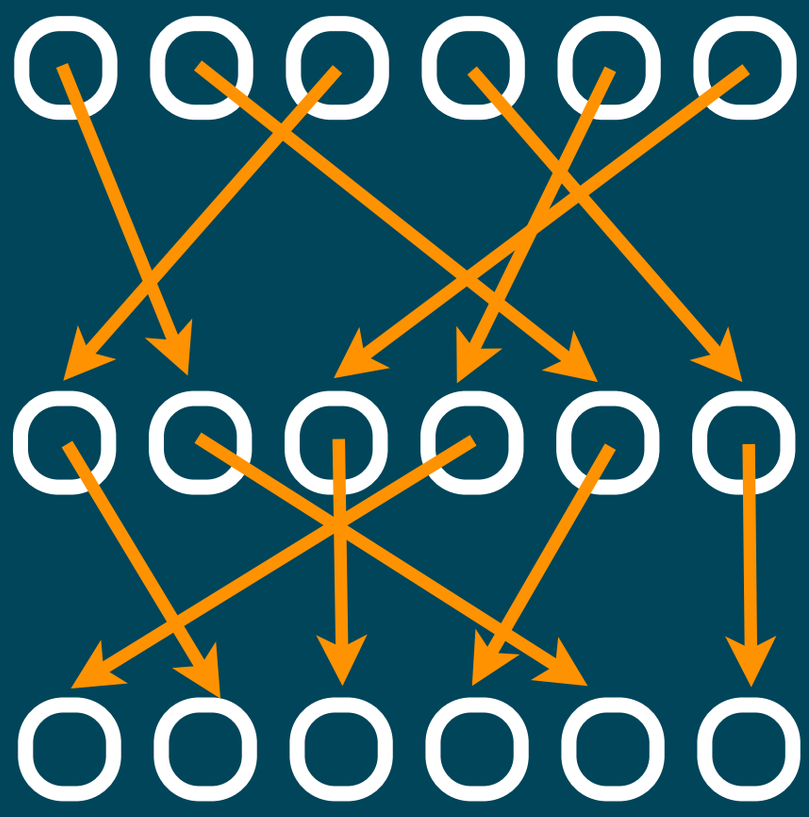


Image Processing and Analysis

BioImage Analysts

Developers
Biologists
Physicists
Electric Engineers
Mathematician
Programmers

So many different knives
from blade smith ...

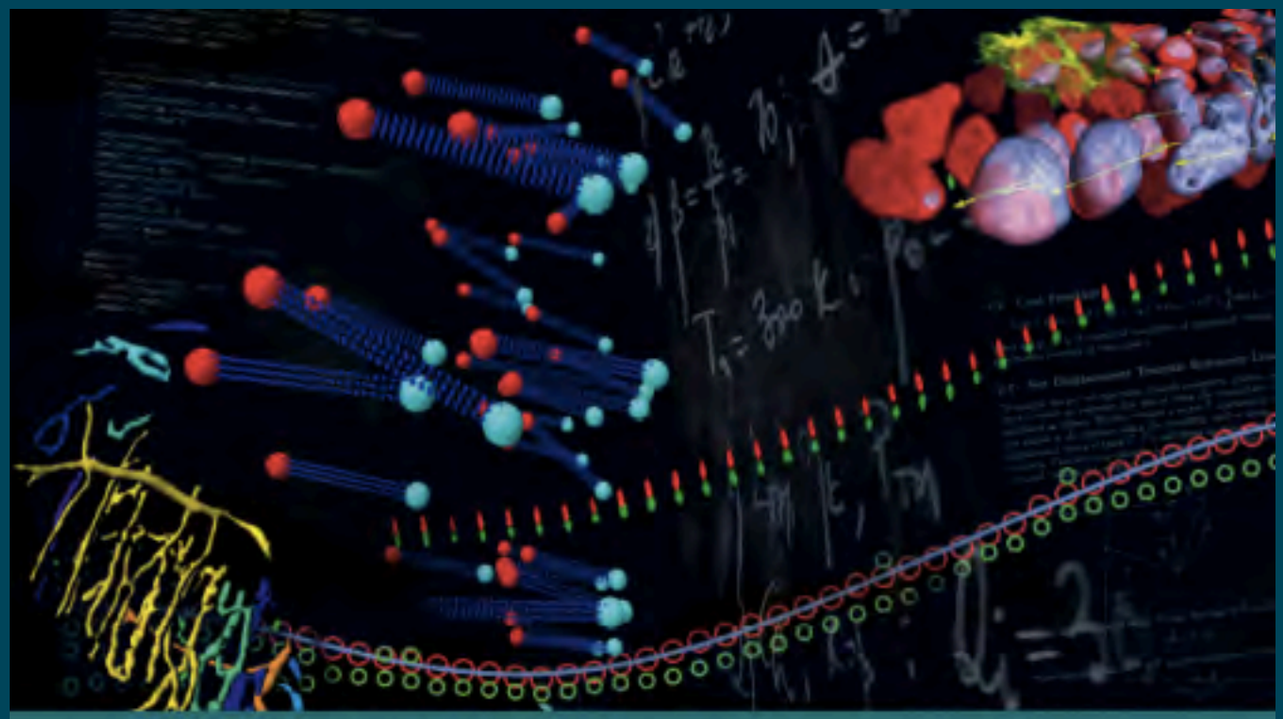
Developers & Software Packages

Sushi master chooses the right
knife at each step...

Image Analysts

... Results in beautiful sushi.

Great Results!



EMBL Master Course

Bioimage Data Analysis

12–16 May 2014

EMBL Heidelberg | Germany

Keynote Speaker

Takeo Kanade
Carnegie Mellon University, USA

Confirmed Speakers

Fred A. Hamprecht
Interdisciplinary Center for Scientific Computing (IWR) and Heidelberg Collaboratory for Image Processing (HCI), Germany

Nadine Peyriéras
CNRS Research Center of Gif-sur-Yvette, France

Ivo F. Sbalzarini
Max Planck Institute of Molecular Cell Biology and Genetics, Germany

Christophe Zimmer
Institut Pasteur, France

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CellNetworks, University of Heidelberg, Germany

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Perrine Paul-Gilloteaux
Institut Curie, France

Sébastien Tosi
Institute for Research in Biomedicine - IRB Barcelona, Spain

ONLINE REGISTRATION ONLY
www.embl.de/bias2014

Registration
deadline is 25 February 2014

Registration fees
Academia 500 Euro
Industry 1000 Euro

Contact
events@embl.de

All participants may present their work in the poster session.

Co-funded by the EMBL Corporate Partnership Programme

www.embl.org

EMBL 40

Euro-BioImage Analysis Symposium (**EuBIAS**)

Barcelona, Oct 9 – 11, 2013

2014/2015 EuBIAS

Showcase

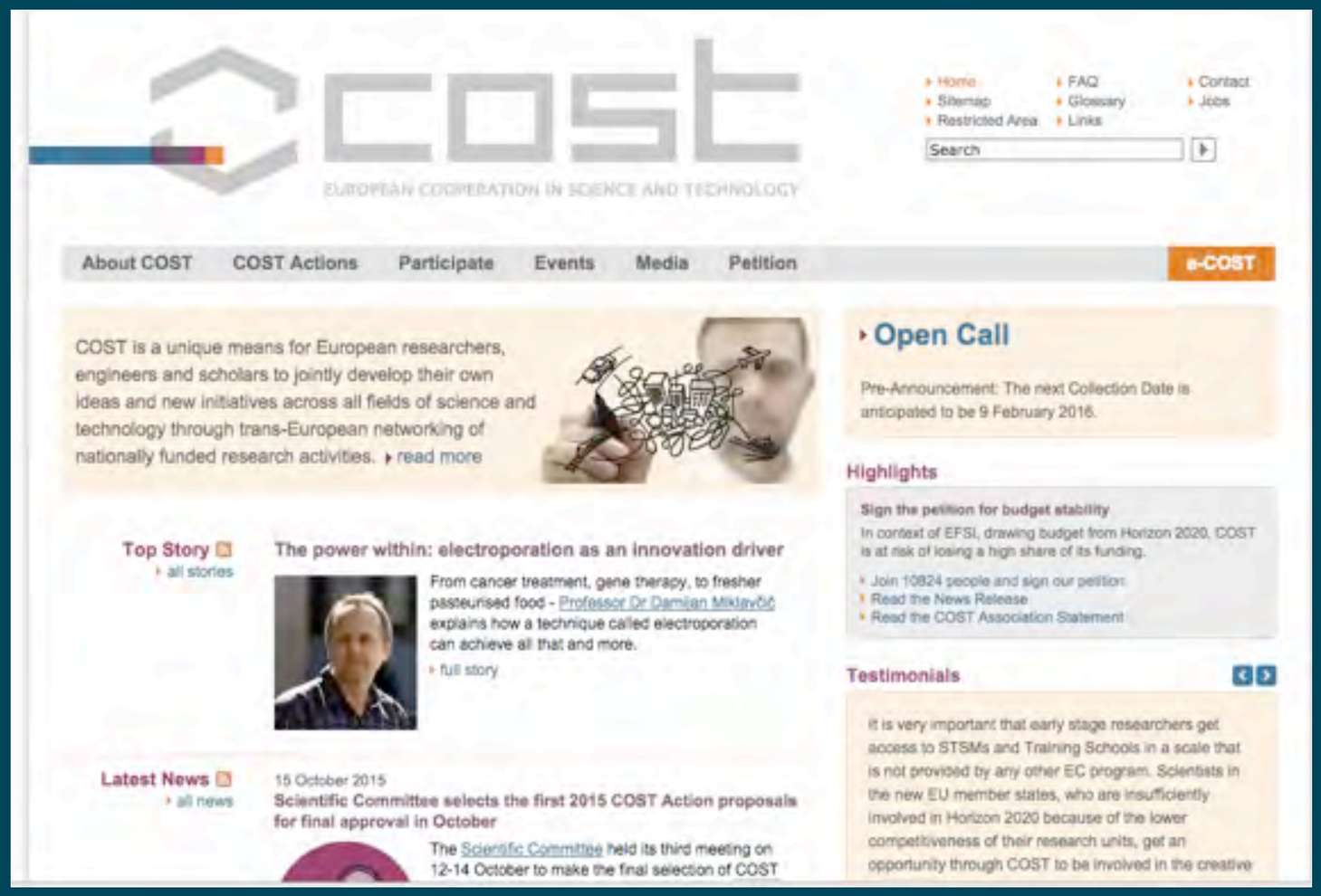
Jan. 5-6, 2015

Taggathon

Dec. 8-9, 2014

Institut Curie, Paris, Sponsored by FBI

EuBIAS proposal accepted as a COST Action project (Oct. 2015)



Patner program of Horizon 2020. Focused on funding networking between researchers across Europe,and partner countries (including Japan)

People

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Thomas Walter, Mines Paris
Johannes Schindelin, LOCI, Univ. Madison (Fiji / ImageJ)
Fabrice de Chaumont, Pasteur, Paris (ICY)
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Lee Kamentsky, Broad Institute, Boston (CellProfiler)
Christoph Sommer, IMBA Vienna (CellCognition)
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