

Martin Vetterli – President EPFL

The Role of **Open in Digital Switzerland**

OpenData.ch/2017, June 27



ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Martin Vetterli | Présidence EPFL

1. **Open Science and Digitalisation**
2. The Power (and challenges) of Open
3. EPFL: Missions and Actions



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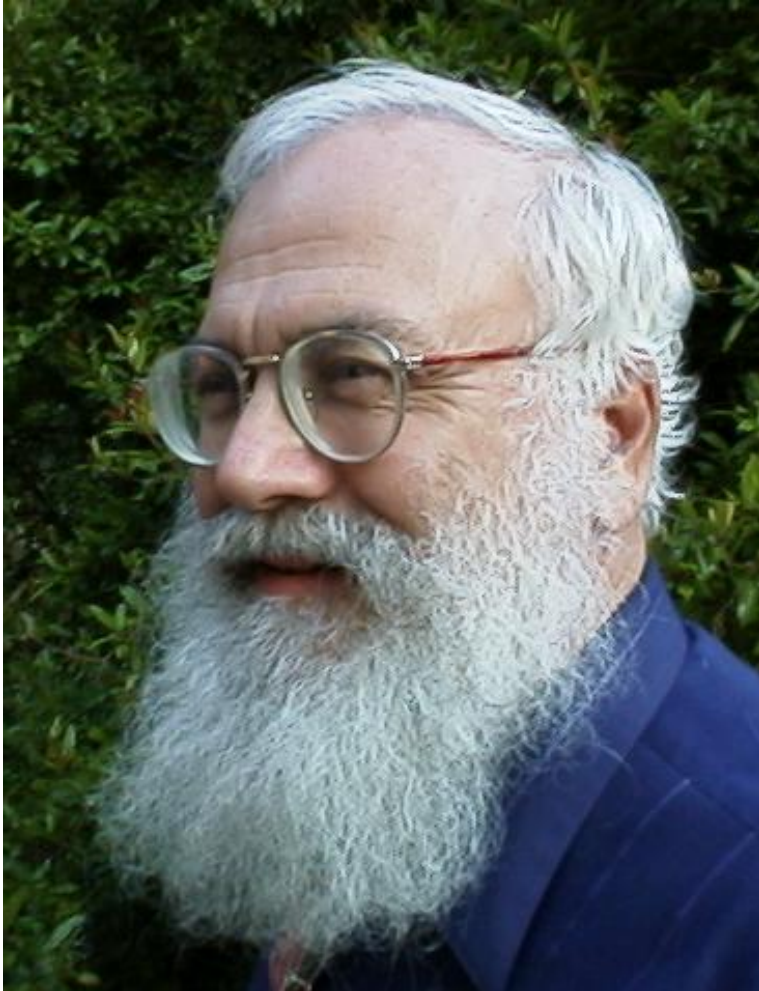
What is Open Science?



Image credits: © 2016 Annette Unser

“Open Science is at a stage where no-one is quite sure what it is, but they think it’s a good idea.”

Why I support Open Science



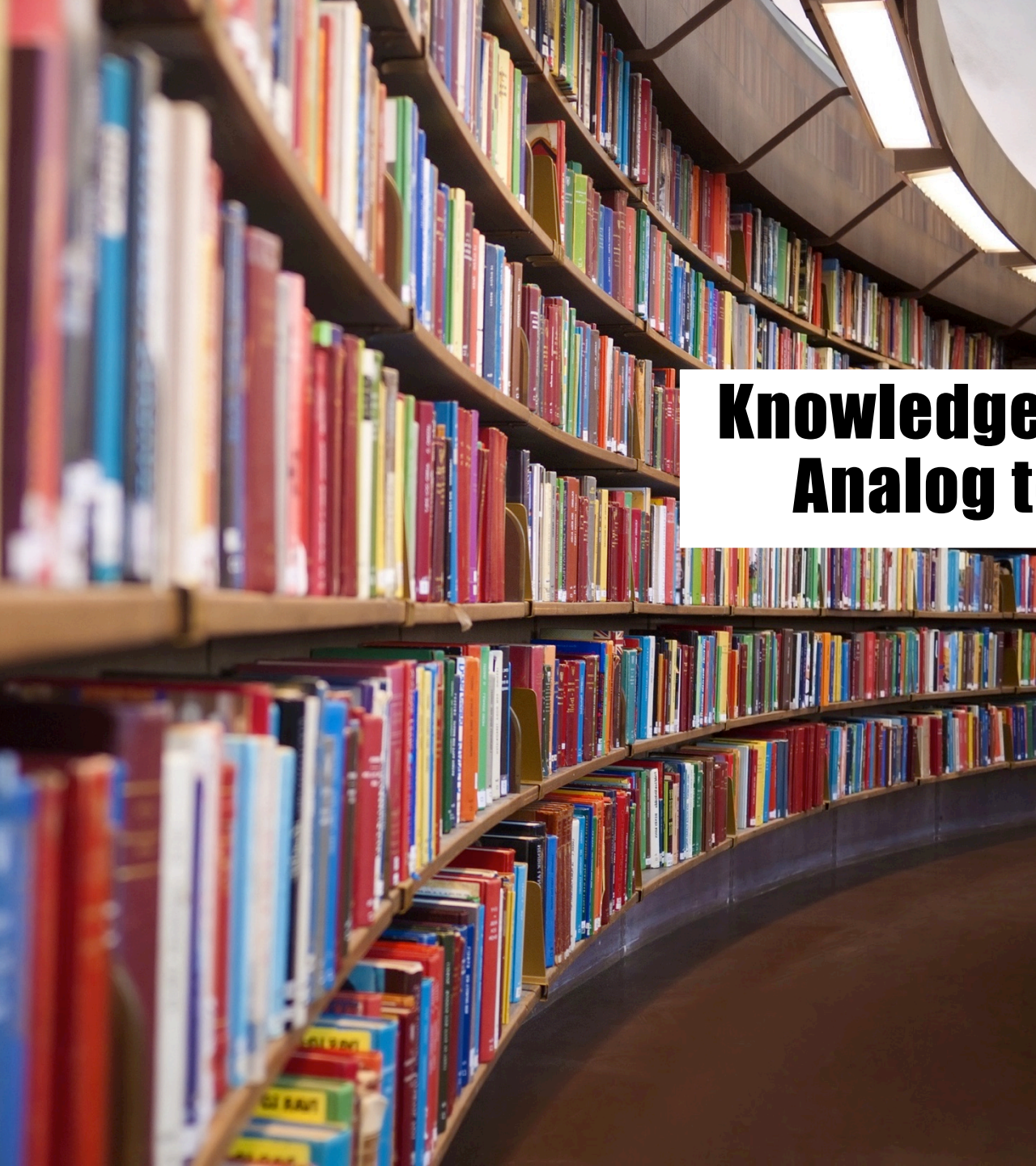
“An article about computational result is advertising, not scholarship. The actual scholarship is the full software environment, code and data, that produced the result.”

Why it is good for EPFL?

Open Science **=** **Visibility = larger impact**
Scrutiny = better quality
Reuse = higher efficacy
Public access = fair opportunity

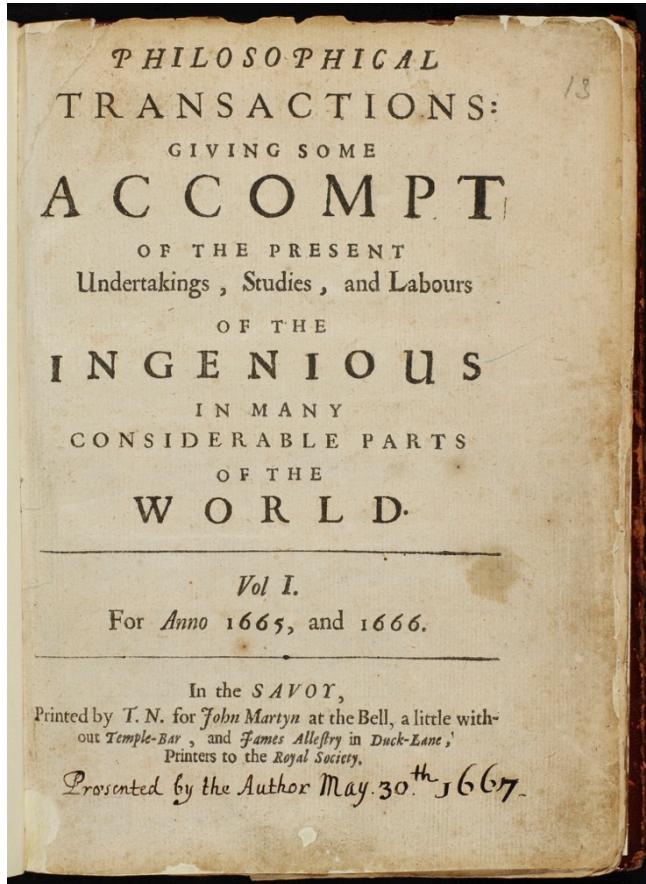
Why it happens now?





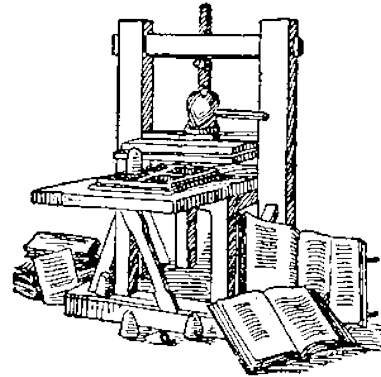
**Knowledge goes from
Analog to Digital**

The First Scientific Revolution



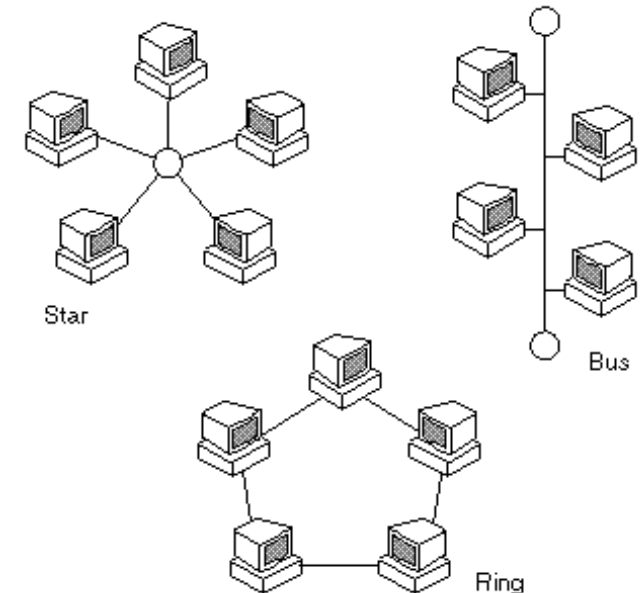
1665

Central role for print



2017

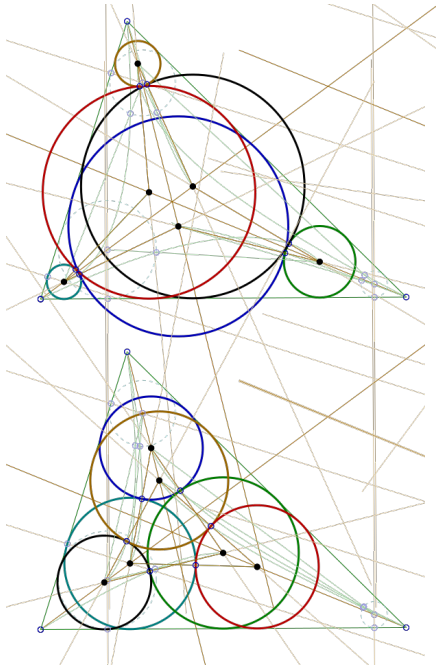
Digital technologies
and international collaborations



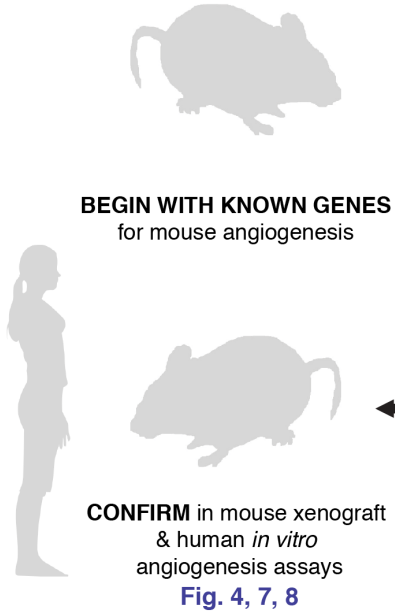
Philosophical Transactions – the world's first science journal

The scientific method is expanding

Deductive



Empirical



Computational



Data driven (aka “Big Data”)



High Potential

Scorecard

95%

📶 Basic Infrastructure

81%

🌐 International Competitiveness

65%

🚗 Mobility

60%

📺 Media

59%

🏛️ Public Sector & Politics

56%

🎓 Skilled Workers & Education

53%

51%

47%

🔒 Security

38%

🚀 Research & Innovation

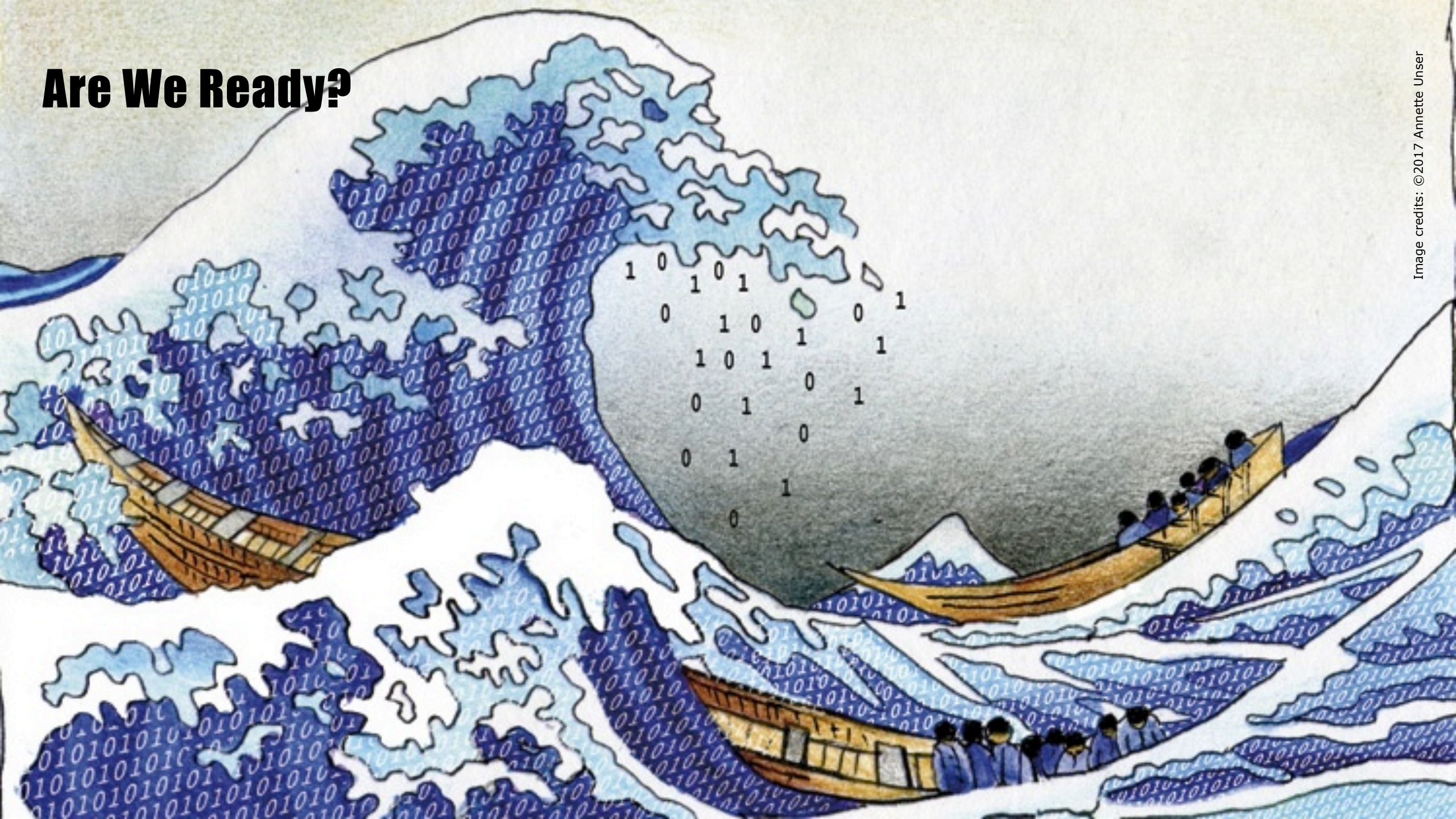
39%

💓 Health

18%

🏭 Industry 4.0

Are We Ready?



We've been there before



Too much to know?



Image credit: Wikimedia commons, CC0, A.J. Bassinger collection

Is it Time for a second Scientific Revolution?



Image credits: © CERN

“ Universities behave like the internet never happened. ”

Cathy Davidson, Duke University

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- 2. The Power (and challenges) of Open**
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Preaching to the choir?



Open Data in Academia

THE PARASITE AWARDS

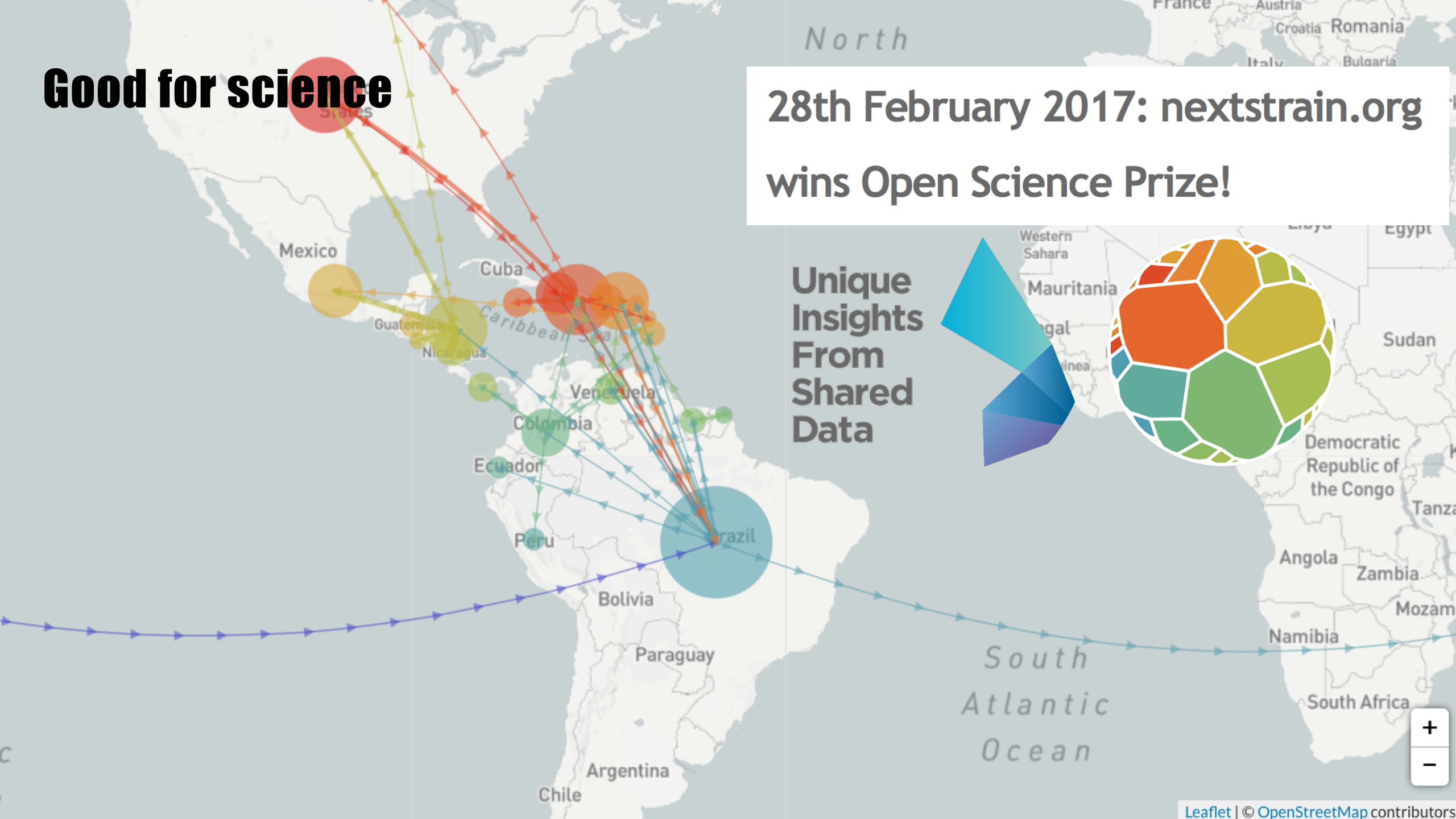
Celebrating rigorous secondary data analysis

ABOUT THE AWARD

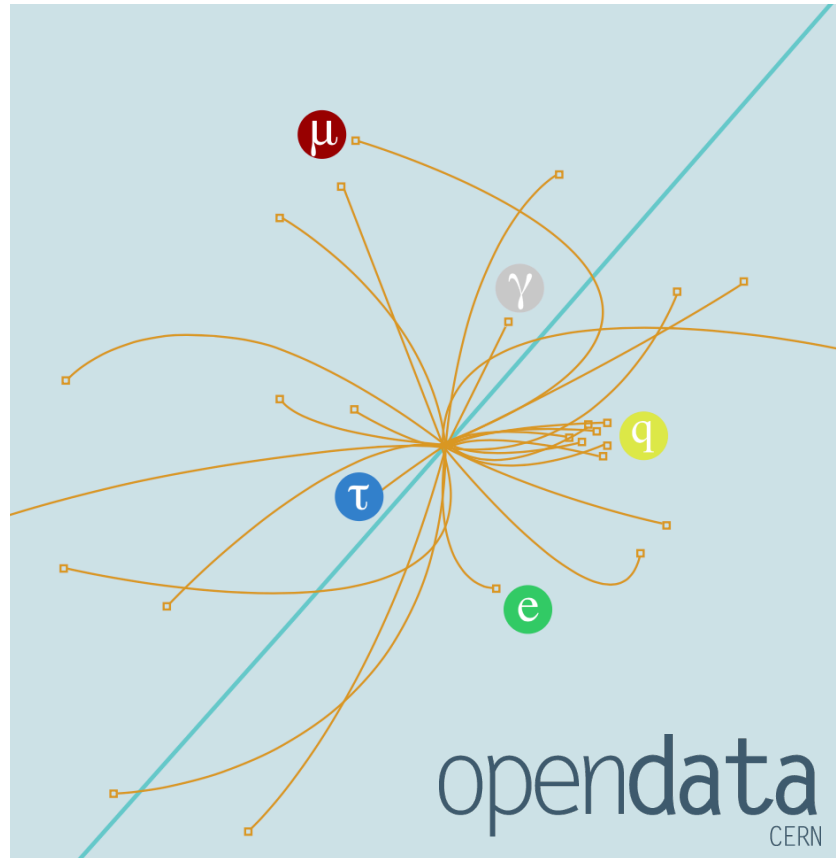
Good for science

28th February 2017: nextstrain.org
wins Open Science Prize!

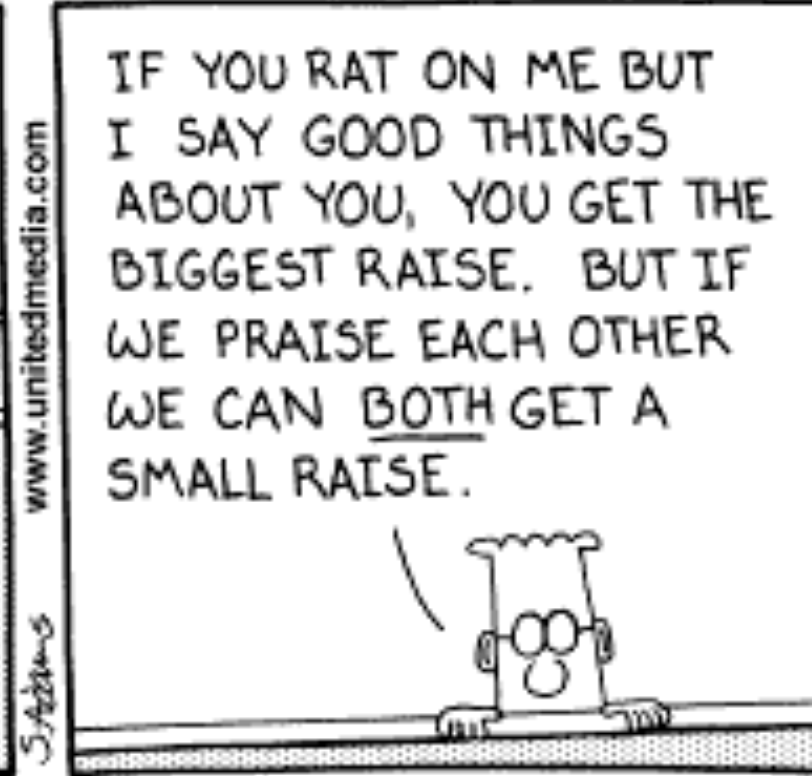
**Unique
Insights
From
Shared
Data**



Pioneers in Switzerland



A Prisoner's Dilemma



The Challenges

2016

Digital Science Report

The State of Open Data

Out of 2,000 scientists

- > 80% value data as much as article citations
- > 50% are unsure about how to cite a dataset
- > 60% are unsure about the licensing conditions

2017



OPEN DATA

THE RESEARCHER PERSPECTIVE

Out of 1,200 scientists

- 64% believe they own the data they generate
- 34% do not publish data at all
- 15% share data in a repository

Stairway to the data heaven

Science as an open enterprise

Summary report
June 2012

THE
ROYAL
SOCIETY

EC042_pAA1
pic_EC042_pAA033
EC042_pAA062
sigA_EC042_pAA035
EC042_pAA023
EC042_pAA022
capU_EC042_pAA021
EC042_pAA011
EC042_pAA011

Image credit: © Royal Society

Train



6. Increase the number of qualified data scientists
5. Developing standards for data storage and sharing
4. Development of tools to allow generating, curating and reusing datasets

3. Expanding evaluation criteria to give credit for useful data sharing

2. Mandating *intelligent* openness for data underlying published reports

1. A shift away from a research culture where data is a private good

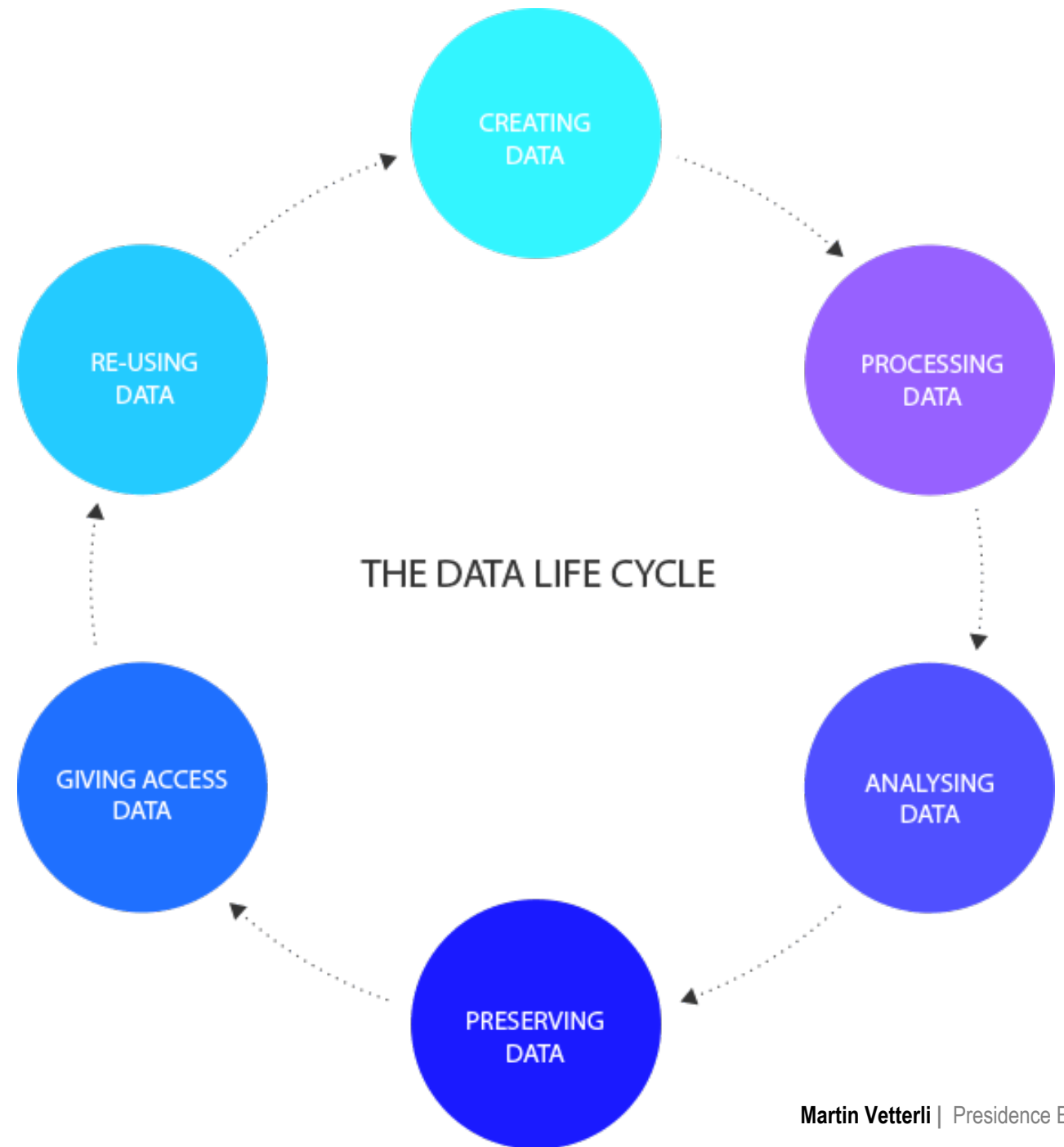


Reward

Rubbish in, Rubbish Out

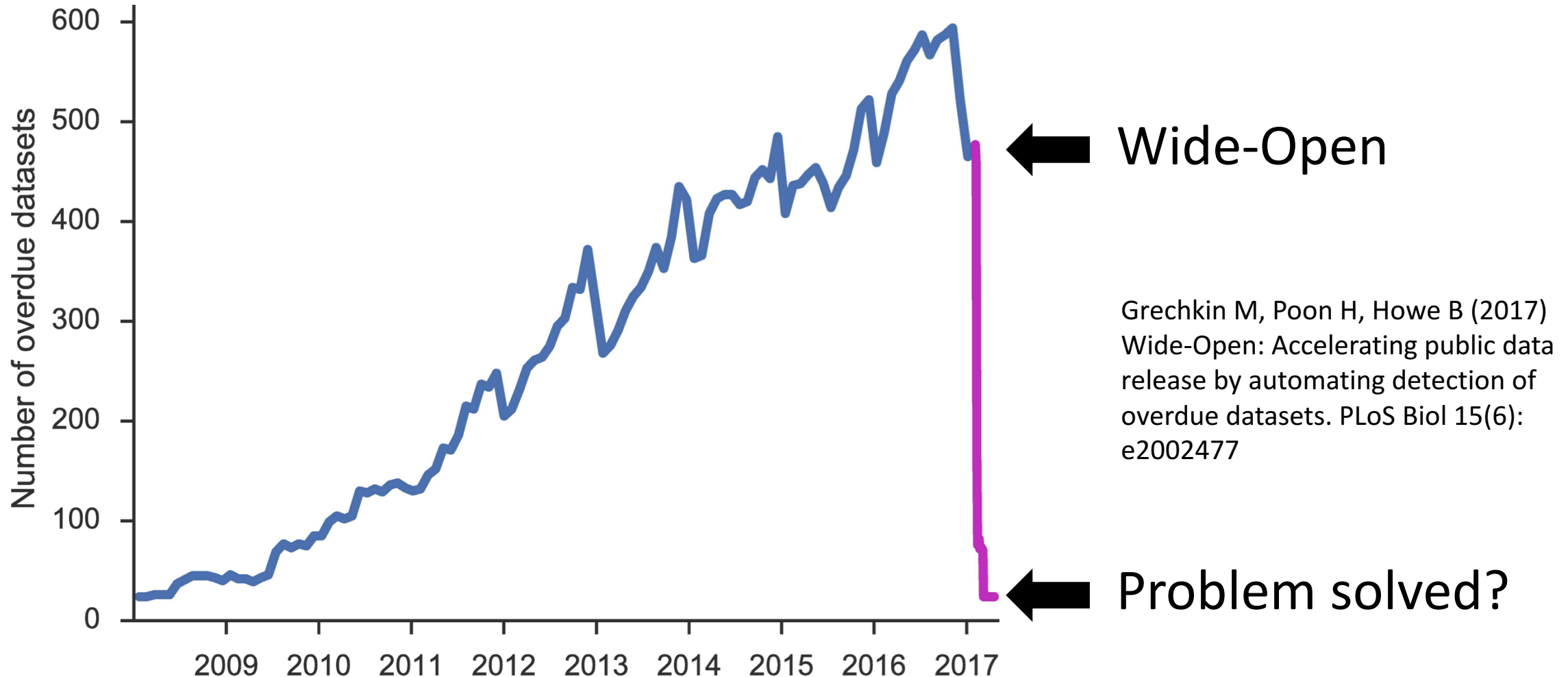
“The open data discourse needs to shift from data publication to data quality.”

Paul Walsh, Chief Product Officer
at Open Knowledge International



DLCM project by swissuniversities

The Wonders of Automation



1. Science and Digitalisation
2. The Power (and challenges) of Open
3. **EPFL: Missions and Actions**



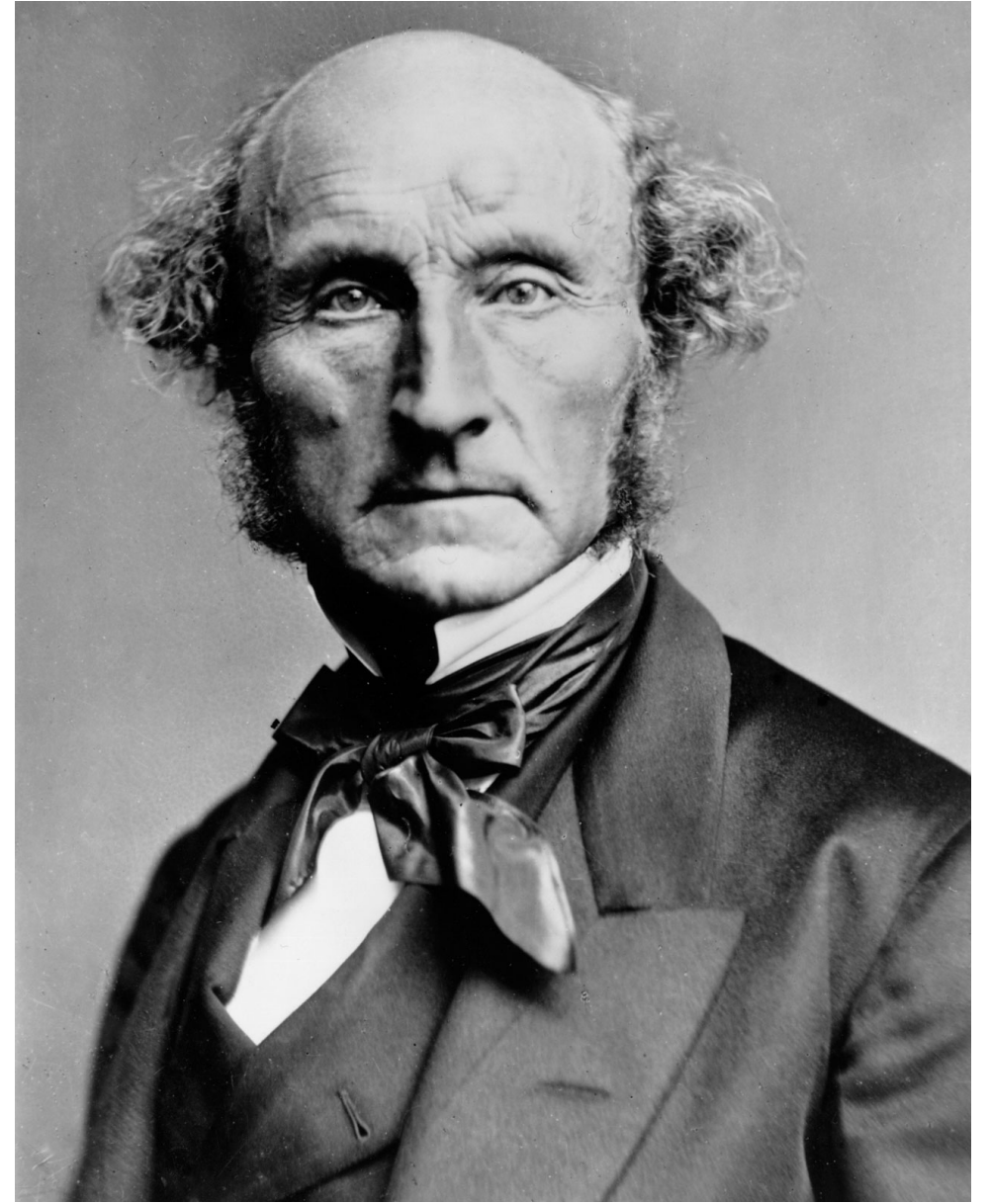
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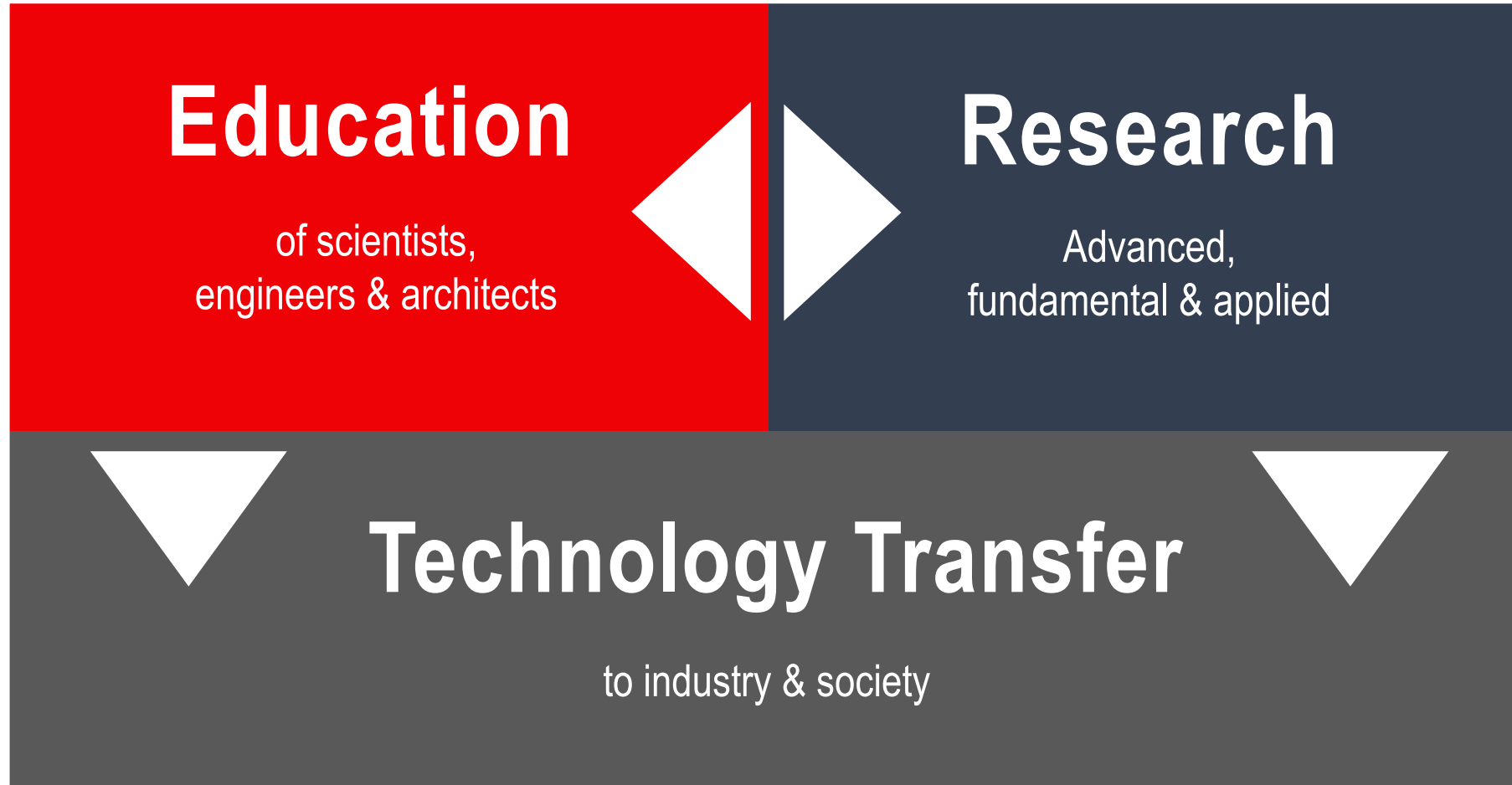
Open is in our DNA

“ A university exists for the purpose of laying **open** to each succeeding generation the accumulated treasures of the thoughts of mankind. ”

John Stuart Mill addressing students as newly elected Rector of St Andrews University in 1867.



Our missions



EPFL : A Digital Odyssey



2017 Master in Data Science

2017 Swiss Data Science Center

2016 Extension School

2012 MOOCs (1.4 Mio. Users seit 2012)

2012 Digital Humanities Laboratorium

2003 Internet pour les filles

2002 School of Computer & Communication Sciences (IC)

1991 Section Communication Systems

1987 Computer Science Department

1981 Section Computer Science



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EPFL World Wide Campus

A world map with a dark blue background and a light blue grid. The map is covered with numerous glowing orange dots, representing the locations of EPFL MOOC users. The dots are most densely concentrated in North America and Europe, with a more sparse distribution in South America, Africa, and Asia.

70 EPFL MOOCs online, 29 in preparation

> 1.6 Mio registered users since 2012

> 82,000 have completed a course

EPFL Computational Thinking

Traditional

Mathematics

*abstraction, logic,
proofs*

Physics

*laws, measurements,
models*



Up to date

**Computational
Thinking**

*calculations, data,
algorithms*



Need an example?

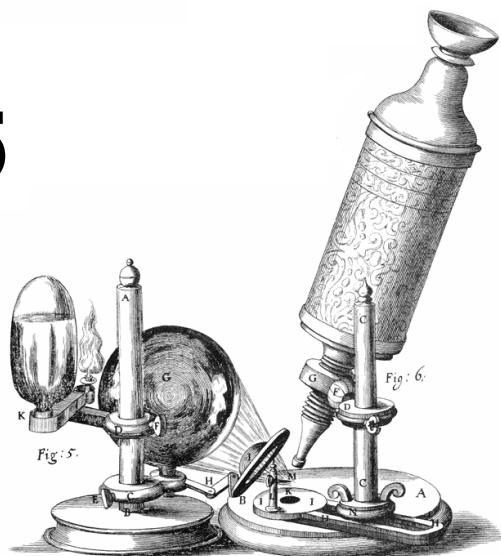
Gruyere wheel weighs 25 - 40 kg
Orders from Europe: 1, 2, 5, 10 kg
Orders from US: 1, 2, 5 lbs
Cut wheels to minimize waste

Bin packing problem
NP-complete

First Fit Decreasing (FFD)
 $11/8 \text{ OPT} + 6/9$

Instrumentation vs Documentation

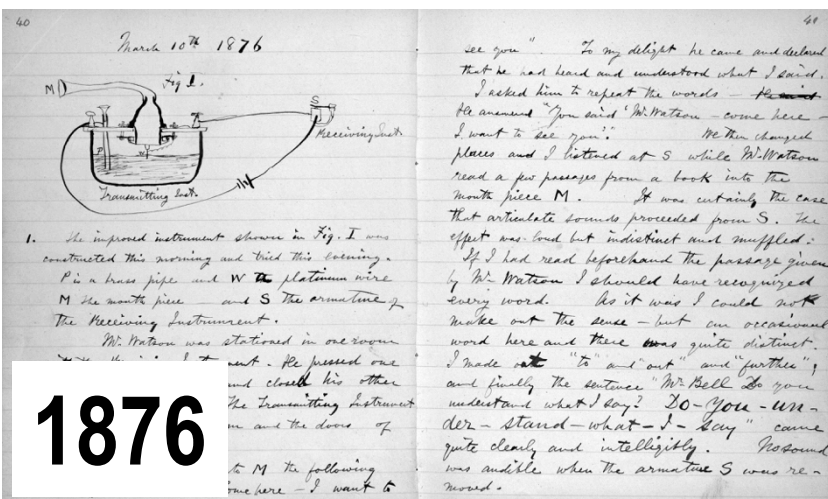
1665



2017



1876



2017



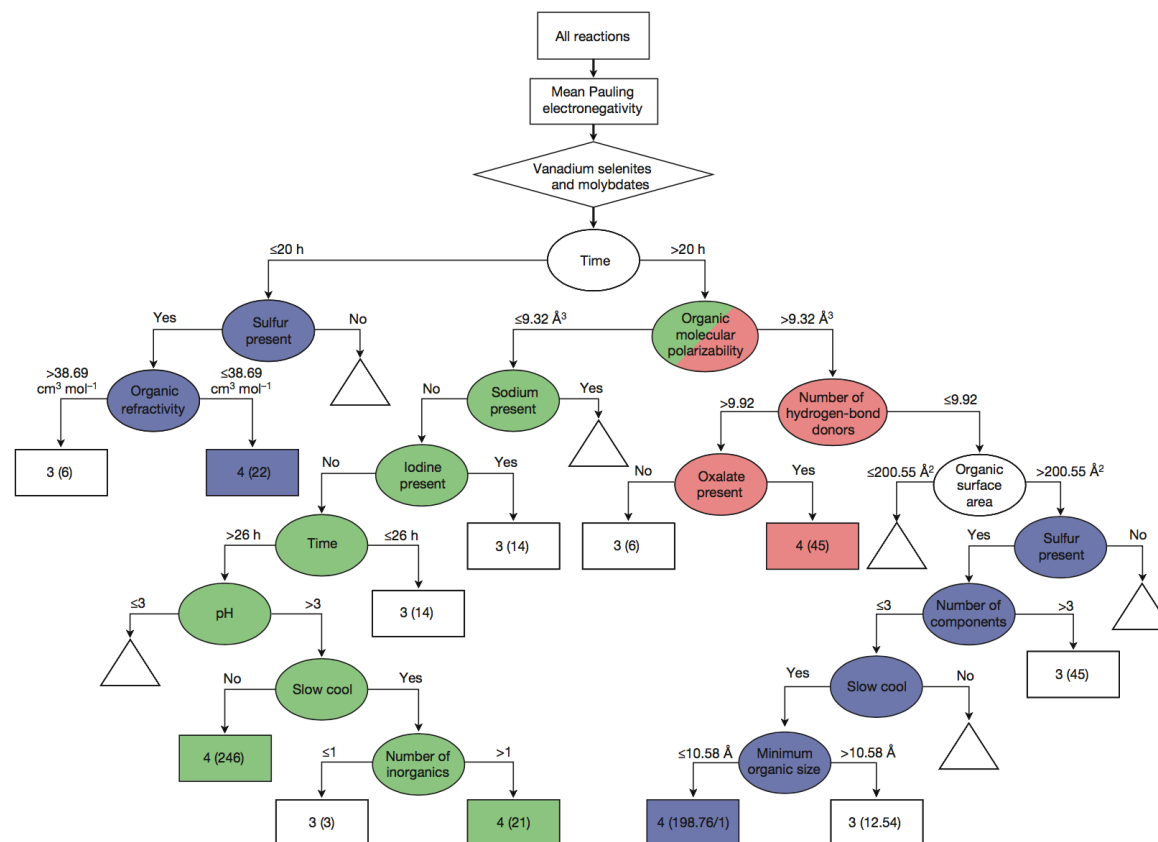
Harvesting « Dark Science »

Machine-learning-assisted materials discovery using **failed** experiments

Paul Raccuglia¹, Katherine C. Elbert¹, Philip D. F. Adler¹, Casey Sorelle A. Friedler¹, Joshua Schrier¹ & Alexander J. Norquist¹

New discovery process

With code and data available



Dark Reactions Project: <https://darkreactions.haverford.edu>

Knowledge as a network

[ABOUT](#)[TEAM](#)[EDUCATION](#)[CALL FOR PROPOSALS](#)[JOB OPENINGS](#)[NEWS](#)[BLOG](#)[CONTACT](#)

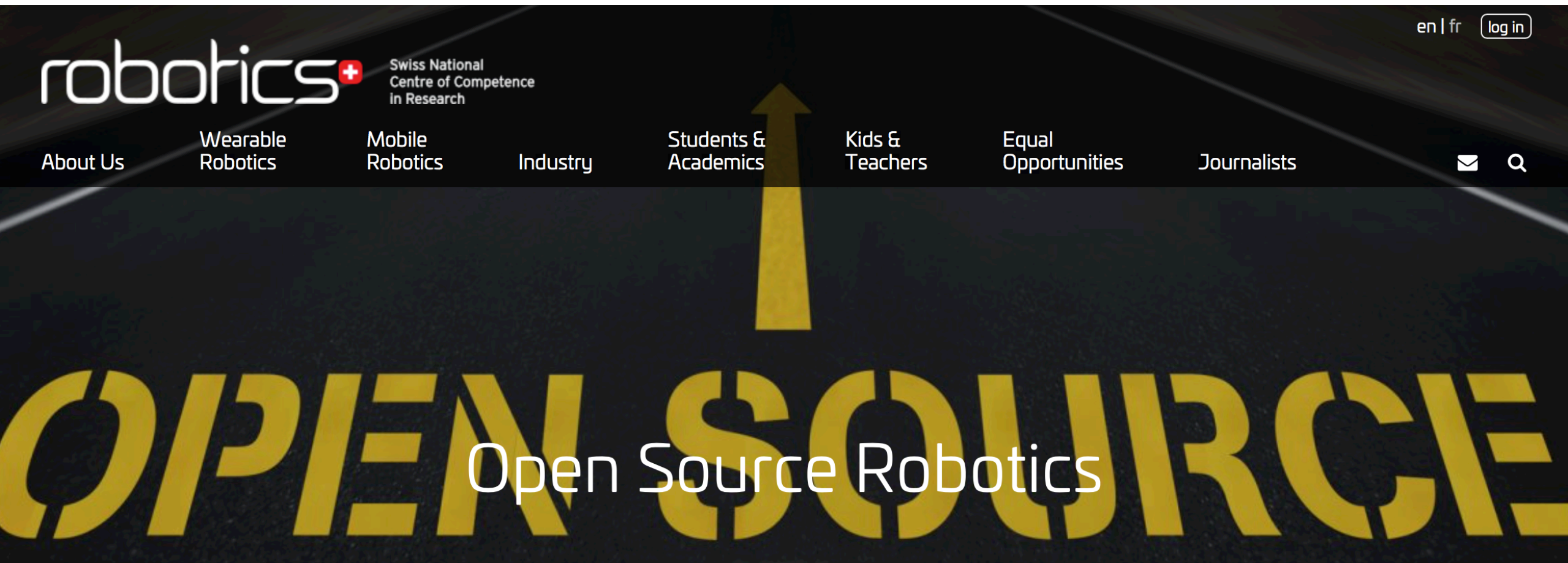
SWISS DATA SCIENCE CENTER

"A complex journey made simple"

[VIEW MORE](#)

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Beyond Data



Authorship and Ownership

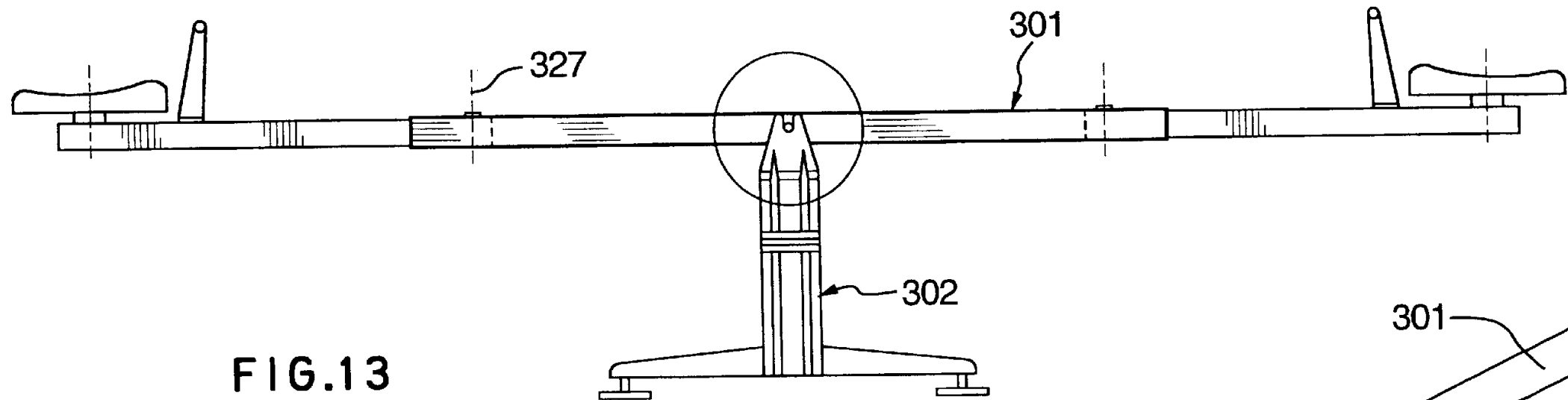


FIG. 13

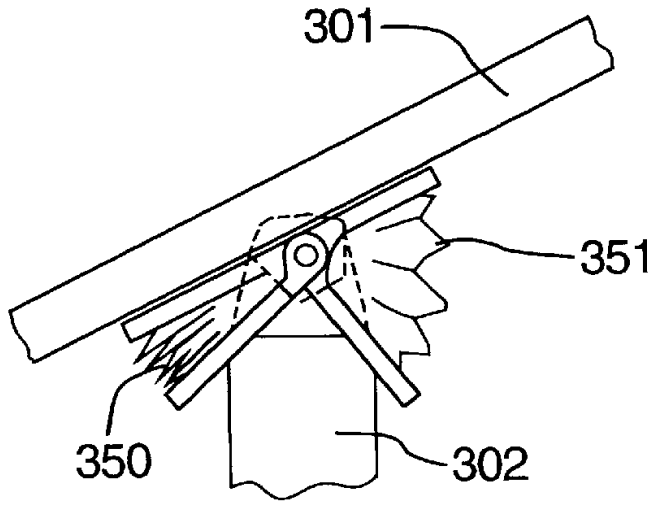
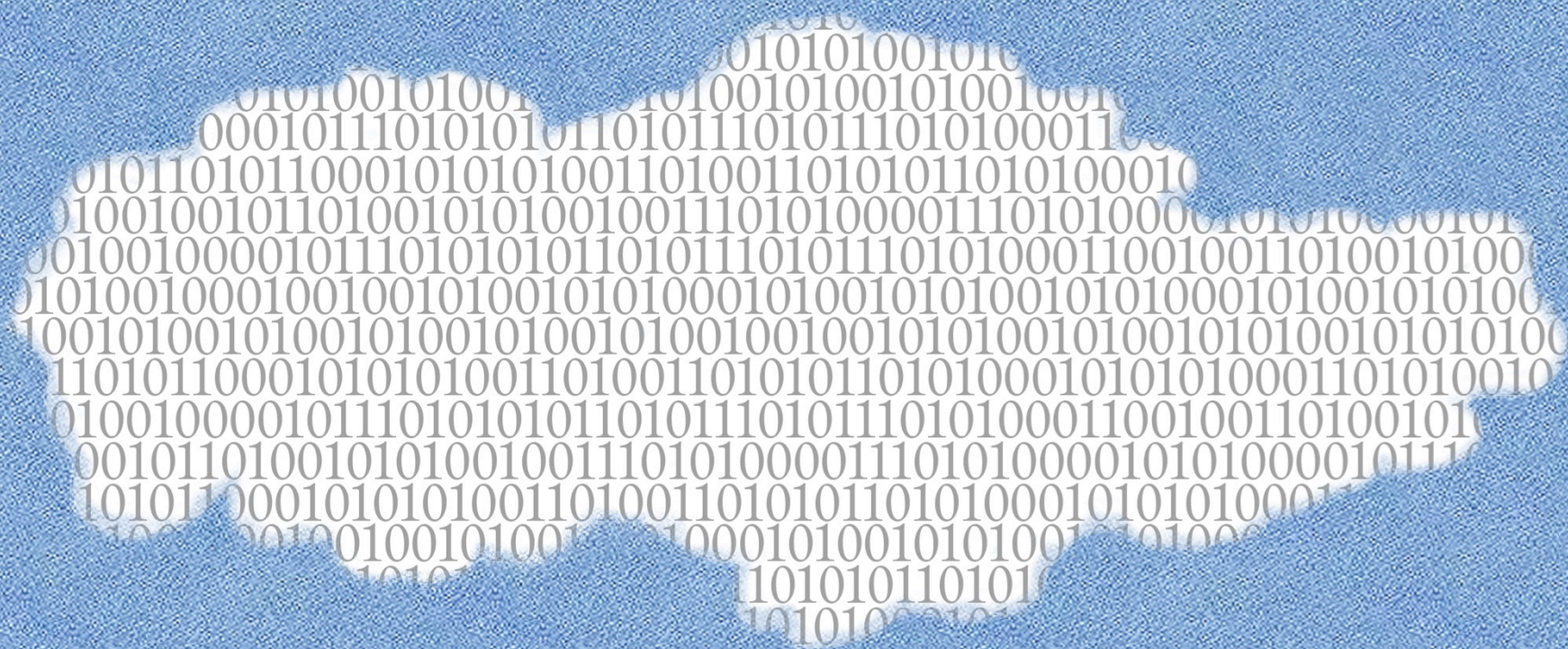


FIG. 15

U.S. Patent

Sep. 14, 1999

Sheet 8 of 8



Ceci n'est pas un nuage

Thank you!

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