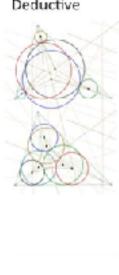


Deductive

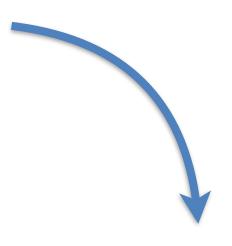


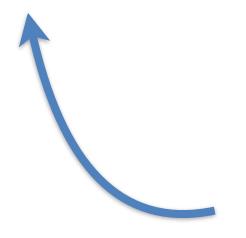
Empirical Computational



Data driven (aka "Big Data")









Raise standards for preclinical cancer research

C. Gienn Begley and Lee M. Ellis propose how methods, publications and moralities must change if patients are to benefit.

47 (out of 52) foundational cancer studies are not reproducible

A Pragmatic Action Plan

Data sets

Electronic Labbooks

Code

Preprints

Education

Data Sets

Platform to archive / version data sets

Support Data Management Plans

Swiss Data Science Center: a pilot project



Electronic Labbooks



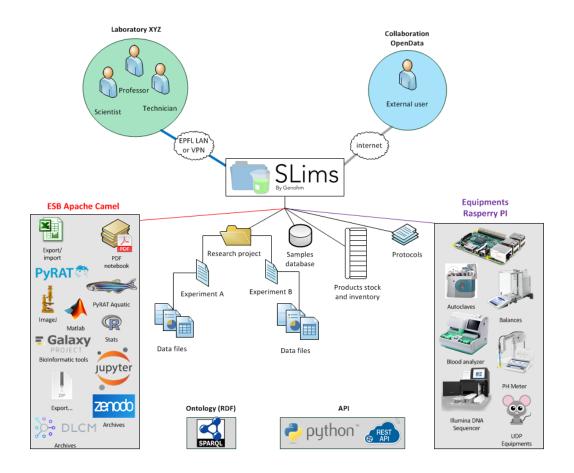
1876



2017

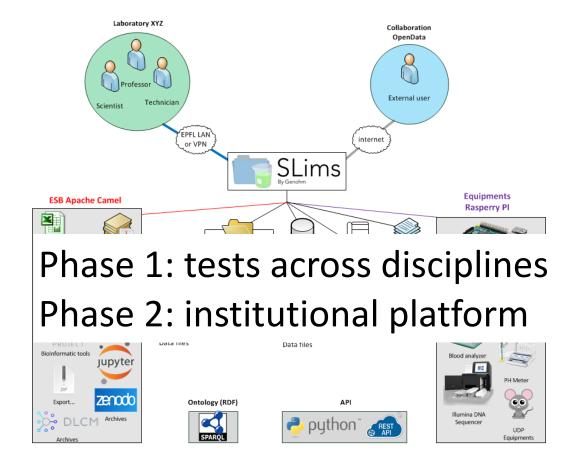


Pilot projects using SLIMS



in-house solutions also tested

Pilot projects using SLIMS



in-house solutions also tested

Code

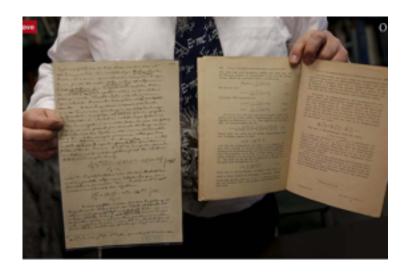
Code curation is well-known and tools exist (GIT, ...)

But code alone has limited value: code+data, parameters, dependencies, ...

Follow "rich code" initiatives: C4Science, Beat-eu

Preprints

The format of "The Paper" has not changed much in 100 years



Gravitational waves, take 1

PRL 116, 061102 (2016)

Selected for a Viewpoint in Physics
PHYSICAL REVIEW LETTERS

week ending 12 FEBRUARY 2016

gn

Observation of Gravitational Waves from a Binary Black Hole Merger

B. P. Abbott et al.

(LIGO Scientific Collaboration and Virgo Collaboration)

(Received 21 January 2016; published 11 February 2016)

On September 14, 2015 at 09:50:45 UTC the two detectors of the Laser Interferometer Gravitational-Wave Observatory simultaneously observed a transient gravitational-wave signal. The signal sweeps upwards in frequency from 35 to 250 bit with a peak gravitational-wave strain of 1.0×10^{-11} . It matches the waveform predicted by general relativity for the inspiral and merger of a pair of black holes and the ringdown of the resulting single black hole. The signal was observed with a matched-filter signal-to-noise ratio of 24 and a false alarm rate estimated to be less than 1 exent per 203 000 years, equivalent to a significance greater than 5. Is. The source lies at a luminosity distance of 410^{+160}_{-100} Mpc corresponding to a redshift $z=0.09^{+0.01}_{-0.04}$. In the source frame, the initial black hole masses are $367^{+0.01}_{-0.00}$, and $29^{+0.01}_{-0.04}M_{\odot}$, and the final black hole mass is $62^{+0.01}_{-0.00}M_{\odot}$, with $3.0^{+0.01}_{-0.00}M_{\odot}$ related in gravitation waves. All uncertainties define 90% credible intervals. These observations demonstrate the existence of binary stellar-mass black hole systems. This is the first direct detection of gravitational waves and the first observation of a binary black hole merger.

DOE: 10.1103/PhysRevLett.116.061102

Gravitational waves, take 2

Only the medium has changed

Academic publishing scores VERY LOW on innovation

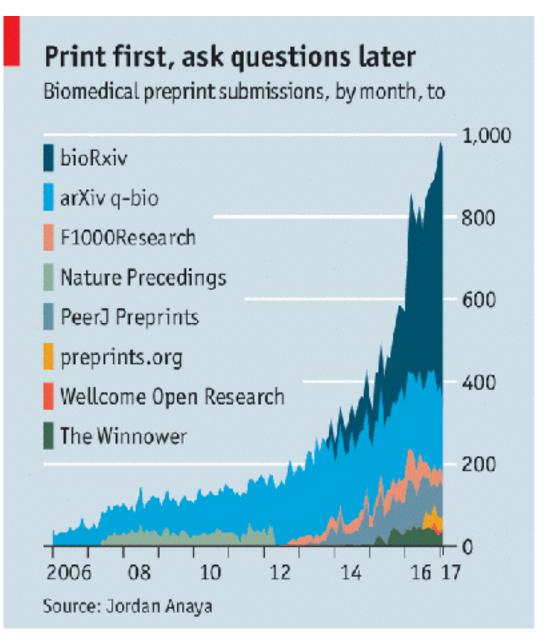
The Paper 2.0

Where is the code? Where is the data?

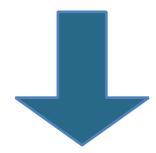
```
In [3]: # No need to suppress the days frequencies with seen bandpassings
        bb, as - butter(4, [10.+2./fs, 330.+2./fs], buype- band
        strain_Hi_whiterbp = filtfilt(No. ab. strain_Hi_whiten)
        strain_il_whiterbp = filtfilt(bb, ab, strain_il_whiter)
        NR_NL whitemap - filtfilt[bh, ab, NR_NL whitem)
        # first, shift 31 by 7 ms, and invert. See the GW150914 detection paper for wep!
        strain El_shift = -np.roll(strain El_whitenbp,int; 0.307-fab)
        plt.plot;time towest,ctrain El whiteshp, 'r'.label- 'H strain')
        plt. plut: time-tevent.etcain_ki_shift. 'g'.label-'ki stonia')
        pls.plot(Nicines).100,88_Ni_whiteshp, 'k',label='metoned Nk waveform')
        plt.xLim([-0.1,0.05])
        plt.ytim([-6,4]]
        plt. state! ("time (a) since "tate(towest))
        pit.ytabel("westeened scraim")
        plt.logend(loc-'lever left')
        plt.title( Admered 5360 WHITESED strain data mear GWESS914")
        pls.sewerigt":wisewid_strain_whitemed.pmg";
              Advenced IJGD WHITEHED strein data open DWES0884
                   III, strain
                  11 $12 in
                  matched MR waveform
                 -8.08 -8.35 -603 -003 COB 0.37 3.36
```

Gravitational waves, take 3

Fundamental issues in reviewing & reproducibility



Data Preprint Code



Invenio Digital Library Framework

Build your own fully customised digital library, institutional repository, multimedial archive, or research data repository on the web.

Education

Awareness

Develop good practices

Integrate into your research workflow

An introduction to Open Science for all PhD students at EPFL