



for

Medical Research and HealthCare

Tim Smith CERN /IT

at CERN OpenLab “IT in HealthCare” Workshop



Data is the Answer...



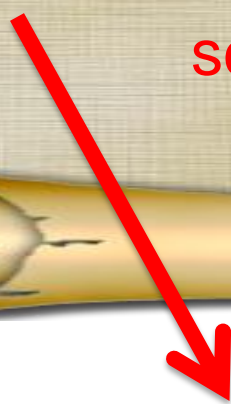
Digital Dark Ages

Scientific method

Propose hypotheses to explain phenomena

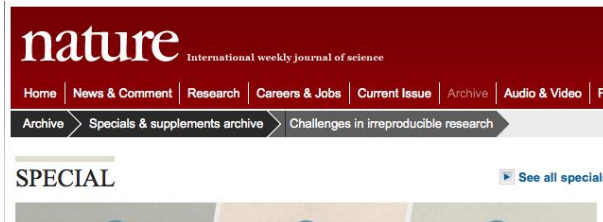
Test hypotheses predictions through **repeatable** experiment

Share observations and conclusions for independent **scrutiny**, **reproduction** and **verification**



Publication: Preparation (standardization), issuing

Unavailable / Unverified



Error prone

Biologists must realize the pitfalls of work on massive amounts of data.

CHALLENGES IN IRREPRODUCIBLE RESEARCH

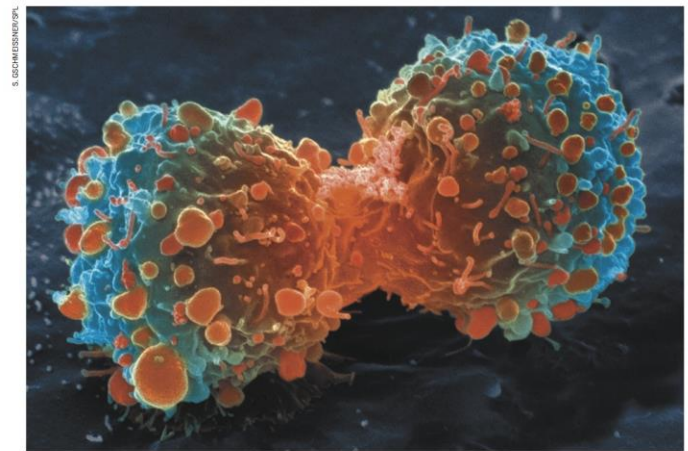
COMMENT

AVIAN INFLUENZA Shift expertise to track mutations where they emerge **p.534**

EARTH SYSTEMS Past climates give valuable clues to future warming **p.537**

HISTORY OF SCIENCE Descartes' lost letter tracked using Google **p.540**

OBITUARY Wylie Vale and an elusive stress hormone **p.542**



Many landmark findings in preclinical oncology research are not reproducible, in part because of inadequate cell lines and animal models.

Raise standards for preclinical cancer research

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

Efforts over the past decade to characterize the genetic alterations in human cancers have led to a better understanding of molecular drivers of this complex set of diseases. Although we in the

trials in oncology have the highest failure rate compared with other therapeutic areas. Given the high unmet need in oncology, it is understandable that barriers to clinical development may be lower than for other

investigators must reassess their approach to translating discovery research into greater clinical success and impact.

Many factors are responsible for the high failure rate, notwithstanding the inherent nature of this disease. Certifications of preclinical tools, adequate cancer-cell-line and 'is' make it difficult for even ▶

47/53 "landmark" publications could not be replicated

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RCUK Common Principles on Data Policy

Making research data available to users is a core part of the Research Councils' commitment to transparency and to a coherent approach across the research base. These RCUK common principles form the framework for individual Research Council policies on data policy.

Principles

- Publicly funded research data are a public good, produced in the public interest and subject to the fewest possible restrictions as possible in a timely and responsible manner that does not harm individuals or organisations.
- Institutional and project specific data management policies and plans should be developed and implemented in practice. Data with acknowledged long-term value should be preserved and re-used.

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NIH Data Sharing Policies

This table lists data sharing policies in effect for investigators and data. Individual requests for data sharing that apply to these policies are subject to the following expectations for data sharing that apply to these policies:

Show 50 entries

IC	Data Sharing Policy Name	Description of Data Sharing Policy
NHGRI	ENCODE	Requires resource producers to release primary data along with an

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Policy on data management and sharing

The Wellcome Trust is committed to ensuring that the outputs of the research are used in ways that maximise public benefit. Making research data widely available and responsible manner ensures that these data can be verified, built upon and used to generate improvements in health.

Policy and position statements

Consultation responses

Make your data Available



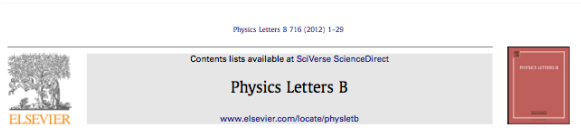
404. That's an error.

The requested URL `/research_data` was not found on this server. That's all we know.



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- 2011: arXiv: 28% referenced URLs don't exist
 - 45% exist but are not archived
- 2013: IJEDICT study of Theses: 58% URLs broken

Digital Libraries



Observation of a new particle in the search for the Standard Model Higgs boson with the ATLAS detector at the LHC[☆]

ATLAS Collaboration^{*}
This paper is dedicated to the memory of our ATLAS colleagues who did not live to see the full impact and contributions to the experiment.

ARTICLE INFO

Article history:
Received 30 July 2012
Received in revised form 8 August 2012
Accepted 17 August 2012
Available online 14 August 2012
Editor: W.D. Schlatter

ABSTRACT

A search for the Standard Model Higgs boson in proton–proton collisions at the LHC is presented. The datasets used correspond to integrated luminosity collected at $\sqrt{s} = 7$ TeV in 2011 and 5.8 fb⁻¹ at $\sqrt{s} = 8$ TeV in 2012. $H \rightarrow ZZ^{(0)} \rightarrow 4\ell$, $H \rightarrow \gamma\gamma$ and $H \rightarrow WW^{(0)} \rightarrow e\nu\mu\nu$ in the 8 TeV published results of searches for $H \rightarrow ZZ^{(0)}$, $WW^{(0)}$, $b\bar{b}$ and $\tau^+\tau^-$ improved analyses of the $H \rightarrow ZZ^{(0)} \rightarrow 4\ell$ and $H \rightarrow \gamma\gamma$ channels in the production of a neutral boson with a measured mass of 126.8 ± 0.4 GeV. This observation, which has a significance of 5.9 standard deviation (fluctuation probability of 1.7×10^{-7}), is compatible with the production of a Higgs boson.

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1. Introduction

The Standard Model (SM) of particle physics [1–4] has been tested by many experiments over the last four decades and has been shown to successfully describe high energy particle interactions. However, the mechanism that breaks electroweak symmetry in the SM has not been verified experimentally. This mechanism [5–10], which gives mass to massive elementary particles, implies the existence of a scalar particle, the SM Higgs boson. The search for the Higgs boson, the only elementary particle in the SM that has not yet been observed, is one of the highlights of the Large Hadron Collider (LHC) physics programme.

Indirect limits on the SM Higgs boson mass of $m_H < 158$ GeV at 95% confidence level (CL) have been set using global fits to precision electroweak results [12]. Direct searches at LEP [13], the Tevatron [14–16] and the LHC [17,18] have previously excluded, at 95% CL, a SM Higgs boson with mass below 600 GeV, apart from some mass regions between 116 GeV and 127 GeV.

Both the ATLAS and CMS collaborations reported excesses of events in their 2011 datasets of proton–proton (pp) collisions at centre-of-mass energy $\sqrt{s} = 7$ TeV at the LHC, which were compatible with SM Higgs boson production and decay in the mass region 124–126 GeV, with significances of 2.9 and 3.1 standard deviations (σ), respectively [17,18]. The CL and D0 significances for $m_H = 125$ GeV

120–135 GeV; using the existing LHC data are 1.7 and 2.3 σ , respectively.

The previous 7 TeV are combined $H \rightarrow \gamma\gamma$ and H production and decay in the mass region 124–126 GeV, with significances of 2.9 and 3.1 standard deviations (σ), respectively [17,18]. The CL and D0 significances for $m_H = 125$ GeV

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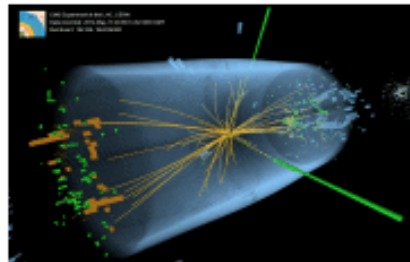
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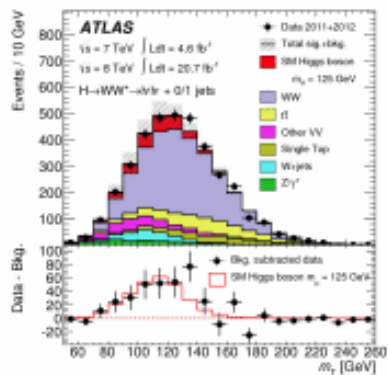
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CMS-PHO-EVENTS-2013-003



the CMS

taken in 2008.

SA-3.0)

solutions?



ATLAS-PHO-EVENTS-2013-003
ATLAS Experiment © 2013 CERN



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High-Energy Physics Literature Database

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 2014-02-26 Citation processing is now back to normal.

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* Email address: atlas.collaboration@cern.ch
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<http://dx.doi.org/10.1016/j.physletb.2012.08.020>



Open Source Repository Platform

- Mature **digital library** platform, originated in 2002 at CERN
 - **OAIS**-inspired **preservation** practices
- Co-developed by international collaboration



The screenshot shows the CERN Document Server search results page. At the top, it says "CERN Accelerating science" and "Signed in as: tjs (CERN)". Below that, the "CERN Document Server" header includes navigation tabs for "Search", "Submit", "Help", "Personalize", and "Administration". The search results are for "Creative Commons Images from CERN", showing 33 records found. The page includes a search bar, a "Search" button, and a "Display results" section with options for "Sort by" (latest first, desc, or rank by) and "Output format" (HTML portfolio). A grid of image thumbnails is displayed at the bottom.

The screenshot shows the Labordoc search results page. At the top, it says "Labordoc" and "International Labour Organization". Below that, the "Search" header includes navigation tabs for "Search", "Resources", and "Help". The search results are for "Focus on: Employment Policies, Maritime and Transport, Forced labour, Informal economy, Labour migration". The page includes a search bar, a "Search" button, and a "Narrow by collection" section with options for "ILO publications" (85,272) and "Other publications" (371,211). A grid of image thumbnails is displayed at the bottom.

Big Data ... *in small pieces*

Big facilities
x (a small number)

Dedicated
Big Data
Stores



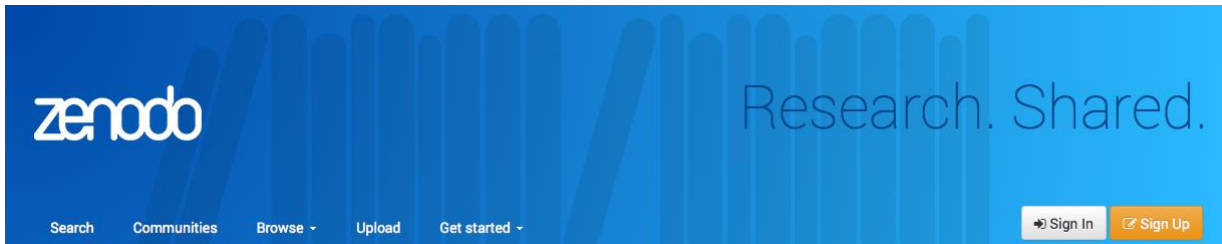
Data Size



Long tail of science
x (a large number)



Open Data as a service



DOI 10.5281/zenodo.10594

18 June 2014

Dataset Open access

Drosophila simulans template brains

Ostrovsky, Aaron D. ; Goetz, Lea ; Jefferis, Gregory S. X. E.

(show affiliations)

Male and female symmetric averaged templates (11 and 10 brains, respectively) and intersex template brain for *Drosophila simulans*. Voxel size: (0.461, 0.461, 1) micron.

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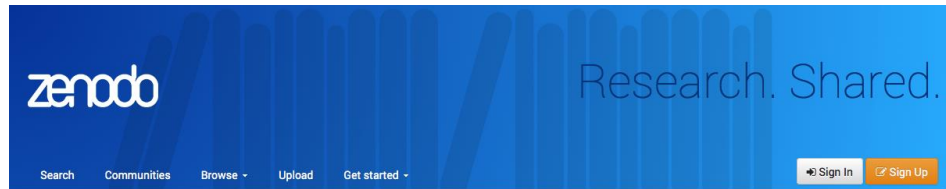
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Low Barriers



15 June 2014

Dataset Open access

Shares of Open Access journals charging publication fees per country

Herb, Ulrich
(show affiliations)

The files contains information on the ten countries that publish the most Open Access journals and the share of Open Access journals charging their authors with article processing charges (APCs) per country. The data was gathered at June 14, 2014 using the Directory of Open Access Journals web interface.

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Publication date:
15 June 2014

DOI
DOI: 10.5281/zenodo.10480

Keyword(s):
Open Access | Publication Fee
Article Processing Charges

Related publications and datasets:
New versions:
10.5281/zenodo.10758

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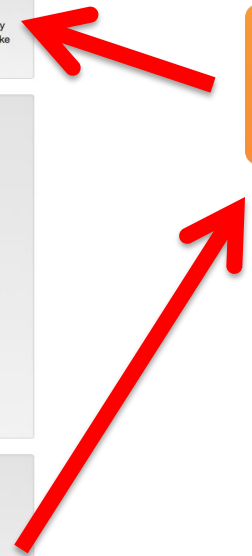
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Herb, Ulrich (2014). Shares of Open Access journals charging publication fees per country. ZENODO. 10.5281/zenodo.10480

Further citation formats: DOI Citation Formatter.

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Enhanced rates of particulate organic matter remineralization by microzooplankton are diminished by added ballast minerals

Le Moigne, F. A. C.; Lillard, M.; Laurenceau, E.; De La Rocha, C. L.

Abstract. To examine the potentially competing influences of microzooplankton and calcite mineral ballast on organic matter remineralization, we incubated cultures of darkness in rolling tanks with and without added calcite minerals (coccoliths) and ...

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Harvesting API: OAI-PMH interface

16 July 2013 [Conference paper](#) [Open access](#) [View](#)

Predicting User Movements in Heterogeneous Indoor Environments by Reservoir Computing

Bacciu, Davide; Gallicchio, Claudio; Micheli, Alessio; Chessa, Stefano; et al

Anticipating user localization by making accurate predictions of indoor movement patterns is a fundamental challenge for generating higher degrees of personalization and reactivity in smart home environments. We propose an approach to real-time ...

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25 April 2012 [Conference paper](#) [Closed access](#) [View](#)

Constructive Reservoir Computation with Output Feedbacks for Structured Domains

Gallicchio, Claudio; Micheli, Alessio; Visco, Giulio

We introduce a novel constructive algorithm which progressively builds the architecture of GraphESN, which generalizes Reservoir Computing to learning on graph domains. Exploiting output feedback signals in a forward fashion in such construction, allows ...

Uploaded by Victoria Macarthur on 11 October 2013.

10 October 2013 [Preprint](#) [Open access](#) [View](#)

Evaluation of Airport Security Training Programs: Perspectives and Issues

Shim, Woohyun; Masacci, Fabio; De Gramatica, Martina; Tedeschi, Alessandra; et al

While many governments and airport operators have emphasized the importance of security training and committed a large amount of budget to security training programs, the implementation of security training programs was not proactive but reactive. ...

Uploaded by Belen Gallego on 11 October 2013.

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Nielsen, Lars Holm

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1

13 November 2013 Dataset Open access

Country scientific output by Scopus/SCImago major areas (1996-2006)

Moya-Anegón, Félix ; Herrero-Solana, Víctor

CSV file with scientific output of 102 countries (rows) by 27 major Scopus/SCImago subject areas, from 1996 to 2006. Data extracted from SCImago Journal & Country Rank (scimagojr.com).

Uploaded by vitiko on 13 November 2013.

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2

04 November 2013 Dataset Open access

C3-EURO4M-MEDARE Mediterranean historical climate data

Efthymiadis, Dimitrios ; Brunet, Manola ; Gilabert, Alba ; Jones, Phil

Historical surface climate data files and meta-data for stations in Mediterranean North Africa and Middle East areas (1852-2008)

Uploaded by dief on 05 November 2013.

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Decouple and recouple. — Edit

33 commits 3 branches 3 releases

branch: master decouple

This branch is 0 commits ahead and 0 commits behind master Pull Request Compare

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Inielsen-cern authored 22 minutes ago latest commit 87da47f16c

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- Plot Move PlotUtils to Decouple.src.plot_utils to make it available to ot... a month ago
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README.md

Decouple and Recouple

DOI: 10.5281/zenodo.8345

v1.1.3

07a2526 zip tar.gz

```
{  
  "name": "Plehn, Tilman",  
  "affiliation": "Institut für Theoretische PI  
  },  
  "description": "This repository contains the soft  
  "access_right": "open",  
  "license": "mit-license",  
  "related_identifiers": [{  
    "identifier": "arXiv:1401.0080",  
    "relation": "isCitedBy"  
  }]  
}
```

.zenodo.json

ON

DOI 10.5281/zenodo.8345

Code ↔ Data ↔ Paper

zenodo Research. Shared.

07 March 2014

decouple software as arXiv:1401.0080

Cranmer, Kyle; Kreiss, Sven

(show affiliations)

This repository contains the software implementation of Higgs Coupling Measurements (Cranmer, Kreiss, Plehn). It contains tools to apply the discussed methods to new models and to recreate the plots in the paper.

A demo for the recoupling stage where the effective likelihood is at decoupledDemo.

Name	Date
decouple-v1.2.5.zip	08 Mar 2014

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Information Citations (0) Files

Description:

This repository contains **Measurements** (Cranmer, Kreiss, Plehn) to new models and content to recreate the plots in the paper.

A demo for the recoupling stage where the effective likelihood is at decoupledDemo.

This dataset completes [A Novel Approach to Higgs Coupling Measurements](#)

Record created 2014-03-12, last modified 2014-02-23

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A Novel Approach to Higgs Coupling Measurements

Kyle Cranmer, Sven Kreiss (New York U., CCPP), David Lopez-Val (Louvain U., CP3), Tilman Plehn (U. Heidelberg, ITP)

Dec 30, 2013 - 39 pages

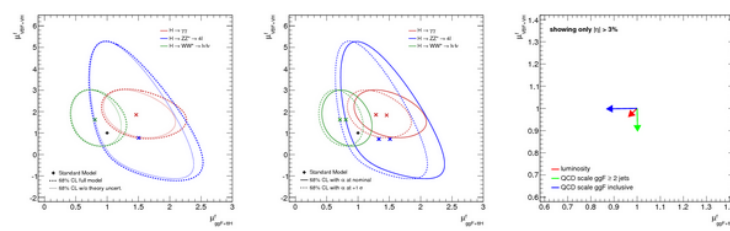
e-Print: [arXiv:1401.0080](https://arxiv.org/abs/1401.0080) [hep-ph] | [PDF](#)

Abstract (arXiv)

We develop a technique to present Higgs coupling measurements, which decouple the poorly defined theoretical uncertainties associated to inclusive and exclusive cross section predictions. The technique simplifies the combination of multiple measurements and can be used in a more general setting. We illustrate the approach with toy LHC Higgs coupling measurements and a collection of new physics models.

Note: 39 pages, 12 figures

Keyword(s): INSPIRE: [Automatic Keywords](#) | [coupling: Higgs](#) | [CERN LHC Coll](#) | [new physics](#) | [decoupling](#)



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Record created 2014-01-03, last modified 2014-02-23

Example Zenodo Records

The screenshot shows the Zenodo website interface. At the top, the Zenodo logo and the tagline 'Research. Shared.' are visible. Navigation links include Search, Communities, Browse, Upload, and Get started. A 'Sign In' button and a 'Sign Up' button are also present. The main content area displays a record for a dataset published on 28 April 2014. The dataset title is 'Data set of CA1 pyramidal cell models using an intact whole hippocampus preparation'. The authors listed are Carey Y.L. Huh, Katie A. Ferguson, Bénédicte Amilhon, Sylvain Williams, and Frances K. Skinner. The abstract describes the frequency-current (f-I) profiles of pyramidal cells, detailing the experimental setup and the resulting data files (PYR1.abf, PYR2.abf, PYR3.abf). A table at the bottom of the record lists these files with their names, dates, and sizes, along with download buttons. On the right side, there is a metadata section containing publication date, DOI (10.5281/zenodo.8747), keywords (hippocampus, pyramidal cells, frequency-current profile), collections (Communities, Datasets, Open Access), license (Creative Commons CCZero), and uploader information (F1000Research, 29 April 2014). Below this, there is a 'New to ZENODO?' section with a 'Sign Up' button and a link to 'Read more about features and benefits.' At the bottom right, there is a 'Share' section with social media icons and a 'Cite as' section with the citation text: 'Carey Y.L. Huh et al.. (2014). Data set of'.

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11 June 2014

Consens structure

Parker, Christopher S Michael ; Clark, Chris

(show affiliations)

Weighted brain network letters denote the color number represents the names and parcellation X_region_names.txt and filename_key.txt.

28 April 2014 Dataset Open access

Data set of CA1 pyramidal cell models using an intact whole hippocampus preparation

Carey Y.L. Huh ; Katie A. Ferguson ; Bénédicte Amilhon ; Sylvain Williams ; Frances K. Skinner

(show affiliations)

The frequency-current (f-I) profiles of pyramidal cells are presented. Each .abf file contains the f-I curve data for the respective cell (as labelled PYR1, PYR2, PYR3 and PYR4 for Pyramidal cell 1, Pyramidal cell 2, Pyramidal cell 3 and Pyramidal cell 4). That is, they contain the cell's response to the application of a series of depolarizing current steps of 1 s duration while the cells are held in current clamp, as well as the current clamp data itself. Each recording is 2 s total. Amplitudes of the input were increased incrementally with step sizes of 10 pA for PYR1, PYR3, and PYR4, and a step size of 25 pA for PYR 2. PYR1 first spikes on the 5th of 30 steps with 38.7 pA of depolarizing input. PYR2 first spikes on the 3rd of 13 steps with 1.2 pA of input. PYR3 first spikes on the 7th of 34 steps with 62.0 pA of input, and PYR4 first spikes on the 7th of 30 steps with 12.1 pA of input.

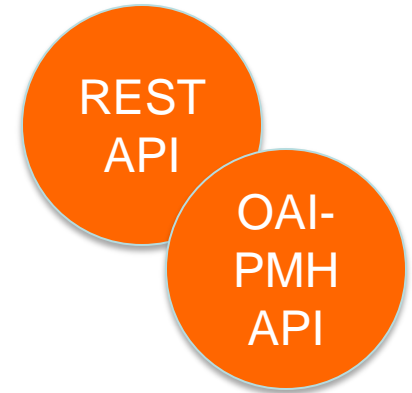
Name	Date	Size	
PYR1.abf	29 Apr 2014	2.4 MB	Download
PYR2.abf	29 Apr 2014	1.0 MB	Download
PYR3.abf	29 Apr 2014	2.7 MB	Download

Publication date: 28 April 2014
DOI: 10.5281/zenodo.8747
Keyword(s): hippocampus, pyramidal cells, frequency-current profile
Collections: Communities, Datasets, Open Access
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Carey Y.L. Huh et al.. (2014). Data set of

Integration Ideas



- Nordic Countries: clinical trial data
- Switzerland: life-science laboratory experiment notebook backend
- US: Virtual machines to run stored code on data

Conclusions

- *Information is a valuable asset that is multiplied when it is shared*
- Zenodo offered to help make Open Data a reality
- Preserving **forever** is an interesting challenge
 - Involving technological and sustainability innovation
 - The LHC started in 1984 ... Higgs Boson discovery 2012
 - Let's explore the challenge together!



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