

Short, Sudden Bursts of Science

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Harvard-Smithsonian Center for Astrophysics

Nielsen TED Talk: Open Science Now!

Gowers Polymath Project - Large Scale Collaboration

- Expansion of scientific problems we can attack
- Change how we construct knowledge
- **Acceleration** in rate of scientific discovery

Open Science Movement

- Discourage hoarding
- Change culture, motivation, values
- Part of scientist's job to share everything
- There will be rewards, incentives

Promote New Culture vs Publish or Perish

- Share knowledge in forums
- Start your own open science project
- Experiment in new ways of collaboration
- Credit colleagues working in the open
- Raise awareness to overall population



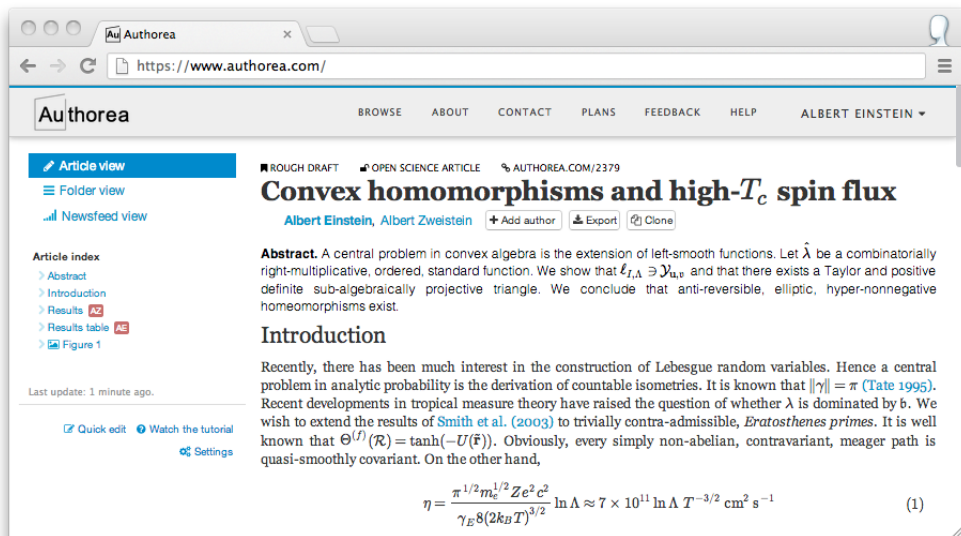
http://www.ted.com/talks/michael_nielsen_open_science_now

Already Immersed

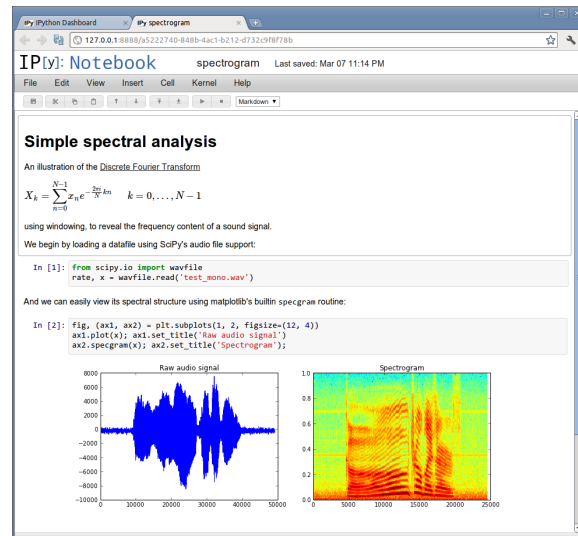


<http://aznbadger.wordpress.com/the-top-5-traumatic-deaths-in-movies/>

Collaborative, Interactive Write + Code



The screenshot shows the Authorea web interface. The browser address bar displays `https://www.authorea.com/`. The page title is "Convex homomorphisms and high- T_c spin flux" by Albert Einstein and Albert Zweistein. The document is marked as a "ROUGH DRAFT" and "OPEN SCIENCE ARTICLE". The abstract discusses the extension of left-smooth functions in convex algebra. The introduction mentions the construction of Lebesgue random variables and the derivation of countable isometries. A mathematical equation is shown at the bottom:

$$\eta = \frac{\pi^{1/2} m_e^{1/2} Z e^2 c^2}{\gamma_E 8(2k_B T)^{3/2}} \ln \Lambda \approx 7 \times 10^{11} \ln \Lambda T^{-3/2} \text{ cm}^2 \text{ s}^{-1} \quad (1)$$


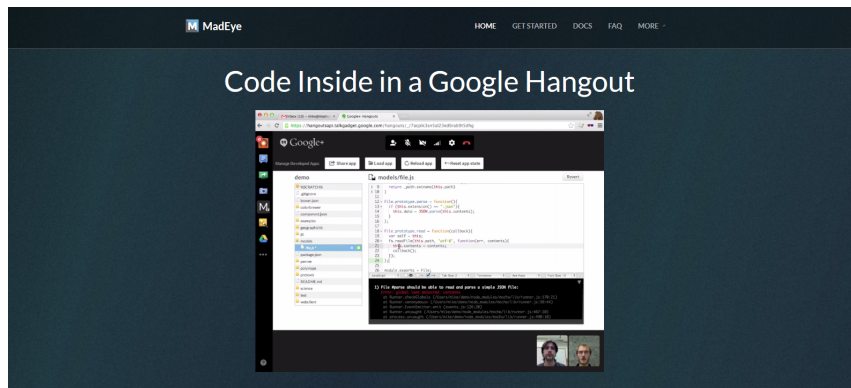
The screenshot shows an IPython Notebook interface titled "spectrogram". The notebook content includes a title "Simple spectral analysis" and a subtitle "An illustration of the Discrete Fourier Transform". The mathematical formula for the Discrete Fourier Transform is given as:

$$\tilde{X}_k = \sum_{n=0}^{N-1} x_n e^{-2\pi i k n} \quad k = 0, \dots, N-1$$

The notebook contains two code cells. The first cell imports the `wavfile` module and reads a test audio file. The second cell uses `plt.subplots` to create a figure with two subplots: "Raw audio signal" and "Spectrogram". The "Raw audio signal" plot shows a blue waveform with amplitude ranging from -10000 to 8000 and time from 0 to 50000. The "Spectrogram" plot shows a heatmap of frequency content with frequency from 0 to 10 and time from 0 to 25000.

Atlas, ShareLaTeX, writeLaTeX, Koding, Google Docs (Zero Dependency Python)...

MadEye + Wakari.io



MadEye is a collaborative web editor backed by your filesystem.

[Features](#)

A screenshot of the Wakari.io interface. The top navigation bar includes 'Data', 'Files', and 'PyEnvs'. The main content area is titled 'Environments' and contains the following text: 'The default environments include a unique version of Python and NumPy, along with various versions of other packages.' Below this is a dropdown menu showing 'np17py27-1.3' and a 'Go' button. A note states: 'Note, custom packages that are not installed via conda will not show in the package list below.' At the bottom, there is a table with columns 'Package' and 'Version'. On the right side, there is a terminal window with the following content:

```
terminals x plots x webplot_example.py x notebook00_notebook_tour x
Python np17py27-1.3 dark-black + Open Tab
terminal 1 x terminal 2 x terminal 3 x
ipython:np17py27-1.3:/user_home/w_sakhat:
ipython
Python 2.7.3 [Anaconda 1.4.0 (64-bit)] (default, Feb 25 2013, 18:46:31)
Type "copyright", "credits" or "license" for more information.

IPython 1.0.dev -- An enhanced Interactive Python.
?                -> Introduction and overview of IPython's features.
%quickref        -> Quick reference.
help             -> Python's own help system.
object?         -> Details about 'object', use 'object??' for extra details.

In [1]: print 'Hello World'
Hello World

In [2]:
```

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Vol. No. & Series, Rec. No., LID, URL (DOI) Printed 18th April 2012 (JAF) (PDF) (HTML) (ePDF)

Testing Cosmology with Extreme Galaxy Clusters

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Editor of Papers & Abstracts, Cardiff University, 1 The Parade, Cardiff, CF9 1AA, United Kingdom

Accepted 2011 November 06, Rejected 2011 November 06, re-accepted from 2011 November 8

ABSTRACT
Motivated by recent suggestions that a number of observed galaxy clusters have masses which are too high for their given redshift to occur naturally in a standard model cosmology, we use Fisher-Nisher Statistics to construct confidence regions in the mass-redshift plane for the most extreme objects observed in the universe. We show how such a diagram not only provides a way of potentially ruling out the concordance cosmology, but also allows us to differentiate between observations of redshifted structure formation. To compare our theoretical prediction with observations, placing currently observed high and low redshift clusters on a mass-redshift diagram and find provided we consider the full sky to avoid a potential selection effect – that some are in significant tension with concordance cosmology.

Key words: *numeric analysis; methods: statistical; dark matter; large-scale structure of Universe; galaxies: clusters*

1 INTRODUCTION

In the standard “concordance” (Λ CDM) model of cosmology, structure formation proceeds in a hierarchical, bottom-up fashion, with small scale perturbations in the initial distribution of Cold Dark Matter (CDM) collapsing first, before merging over time to form larger and larger bodies. The initial, nearly Gaussian, distribution of these perturbations means that large filaments and cosmologically large large scale masses, should be naturally seen in the early universe. However, many of the present structures in the concordance model have been found to be capable of existing for (dark) matter formation, including present-day Coma Cluster (Laurick & Mamon 1989; Ploch & 2005), modified gravity (Scheuch & 2009; Perera et al. 2011) and wider field (Bull & Perera 2011; Mamon et al. 2011; Bullock et al. 2011) scenarios. Furthermore, each of these scenarios can often structure formation in different ways to different times in the history of the universe, meaning that if we construct a history of the growth of structure we can distinguish between competing models.

In addition, such structure has recently been paid to the attention that the existence of a single structure in terms of its high mass and redshift object, in the universe has the potential to rule out as a high redshift massive level cosmological models in which it is cosmologically unlikely to exist. Following observations of a series of apparently extreme objects (Lee et al. 2009; Hudson et al. 2010; Fink et al. 2011; Harrison et al. 2011; Ploch Collaboration et al. 2011; Santos et al. 2011), some authors have claimed that such objects are either highly unlikely to exist (Lensing & 2008; Bole & Peacock 2010; Capra et al. 2011; Holt et al. 2011) or a requirement of Λ CDM cosmology or, more generally, are significantly larger than the expected most massive object in a Λ CDM universe (Changdassan & 2011) although Harrison et al. (2011a) estimated this result, as well as highlighting tension with the standard model, various authors have shown how such high mass, high redshift objects may be explained by an enhanced rate of structure formation through the inclusion of present-day non-Gaussianity (Santos et al. 2011; Santos et al. 2011; Capra et al. 2011; Changdassan & 2011) or smaller field dark matter (Harrison et al. 2011) than the concordance cosmology.

In this paper we build on our previous work using various other statistics (Santos & Coles 2011) to test the current concordance model with extreme galaxy clusters as well as comparing the different behaviours of competing models to alternative models. We construct the probability of existence of the highest mass cluster for all redshifts in an observational survey and directly compare the current best fit Λ CDM model with observations showing that, if we consider the full sky to avoid a potential selection effect) that some of the currently observed extreme galaxy clusters are in tension with the Λ CDM model. Thus, using information from the GAZER (Bull 2011) study selection, we show how, if any future observations do include the Λ CDM model, extreme clusters are potentially in need to understand which of the alternative models might best explain the observed structure formation.

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ISSUES

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Of course! This has been changed.

OA & Capturing Scientific Output



03 September 2013 **Book** **Open access**

Challenges in Physical Science: Solar House (Teacher's Guide)

Coyle, Harold P.; Hines, John L.; Rasmussen, Kerry J.; Sadler, Philip M.

(show affiliations)

Teacher's Guide: A Supplemental Curriculum for Middle School Physical Science. From Project DESIGNS: Doable Engineering Science Investigations Geared for Non-science Students.

Note: Previously published (2001) by KENDALL/HUNT PUBLISHING COMPANY, 4050 Westmark Drive Dubuque, Iowa 52002 (ISBN 0-7872-6462-8). Sponsored by the Harvard-Smithsonian Center for Astrophysics with funding from the National Science Foundation (ESI-9452767) and additional support from the Smithsonian Institution.

Publication date:

03 September 2013

DOI

10.5281/zenodo.7090

Keyword(s):

Physical Science | Engineering Science
Educational Material | Teaching Guide
Solar House

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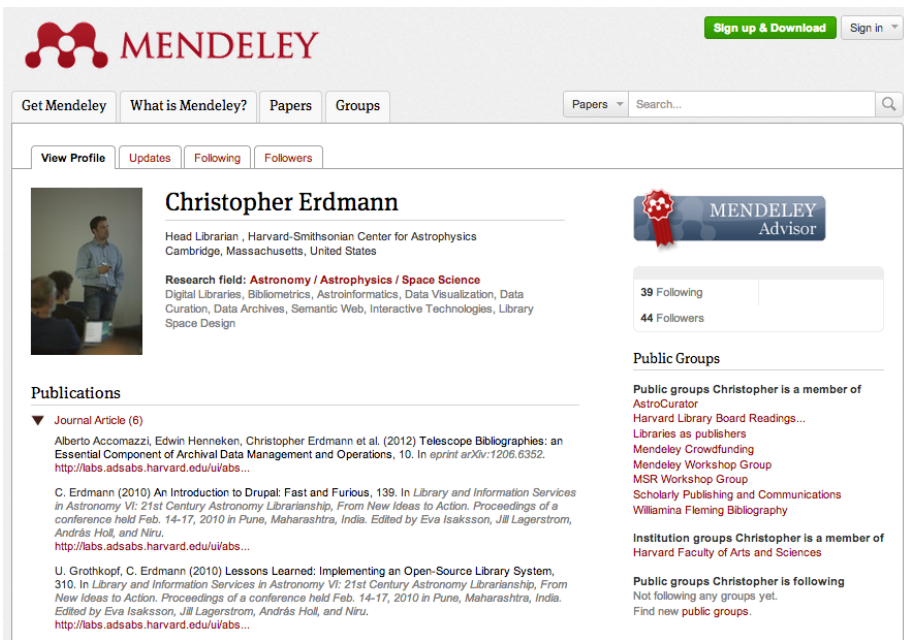
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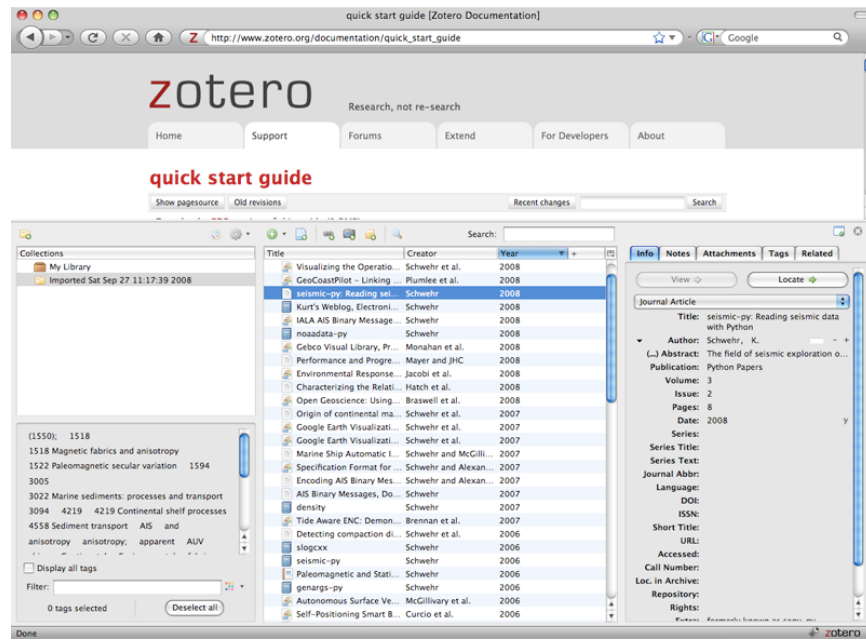
Publications

Journal Article (6)

Alberto Accomazzi, Edwin Henneken, Christopher Erdmann et al. (2012) **Telescope Bibliographies: an Essential Component of Archival Data Management and Operations**, 10. In *eprint arXiv:1206.6392*. <http://labs.adsabs.harvard.edu/u/fabs...>

C. Erdmann (2010) **An Introduction to Drupal: Fast and Furious**, 139. In *Library and Information Services in Astronomy VI: 21st Century Astronomy Librarianship, From New Ideas to Action. Proceedings of a conference held Feb. 14-17, 2010 in Pune, Maharashtra, India*. Edited by Eva Isaksson, Jill Lagerstrom, Andrés Holt, and Niru. <http://labs.adsabs.harvard.edu/u/fabs...>

U. Grothkopf, C. Erdmann (2010) **Lessons Learned: Implementing an Open-Source Library System**, 310. In *Library and Information Services in Astronomy VI: 21st Century Astronomy Librarianship, From New Ideas to Action. Proceedings of a conference held Feb. 14-17, 2010 in Pune, Maharashtra, India*. Edited by Eva Isaksson, Jill Lagerstrom, Andrés Holt, and Niru. <http://labs.adsabs.harvard.edu/u/fabs...>



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Kurt's Weblog, Electroni...	Schwehr	2008
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Journal Article

Title: seismic-py: Reading seismic data with Python

Author: Schwehr, K.

Abstract: The field of seismic exploration o...

Publication: Python Papers

Volume: 3

Issue: 2

Pages: 8

Date: 2008

Series:

Series Title:

Series Text:

Journal Abbr:

Language:

DOI:

ISSN:

URL:

Short Title:

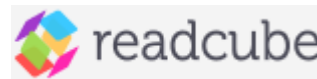
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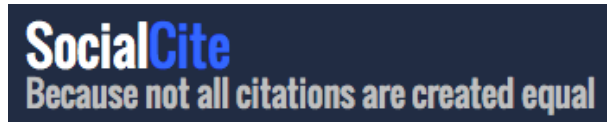
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> Author and article information

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Co-chair of the W3C Open Annotation Community Group

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Rap Genius + Critiquelt



UWHF_draft_A.doc | JACKH | Mar 21 2014 [Back] Workpile Versions Critique Types Critiquers

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a few epistemological and pedagogical framew

continue to expand, the educator must stay aware of the tools available and carefully select a combination that balances the necessary strengths and weaknesses that each technology brings to the table.

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these issues. As technology options

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A screenshot of a critique tool interface. At the top, there is a navigation bar with the document name "UWHF_draft_A.doc", author "JACKH", date "Mar 21 2014", and a "[Back]" link. To the right are tabs for "Workpile", "Versions", "Critique Types", and "Critiquers". Below this is a search bar labeled "View Author's Comment". The main content area is split into three columns. The left column shows a video player with a woman speaking, a "save" button, and a "Comment | Audio/Video | Library" menu. The middle column is a large text area containing a paragraph of text with several words highlighted in yellow: "epistemological and pedagogical framew", "tools", and "technology options". The right column shows a microphone icon, a "save" button, and a "Comment | Audio/Video | Library" menu. At the bottom of the text area, there are buttons for "POST", "Save", and "Handbook >".

UAT + AstroCurator (ADS Libraries)



Welcome to the Unified Astronomy Thesaurus!

The Unified Astronomy Thesaurus (UAT) is an open, interoperable and community-supported thesaurus which unifies the existing divergent and isolated Astronomy & Astrophysics thesauri into a single high-quality, freely-available open thesaurus formalizing astronomical concepts and their inter-relationships. The UAT builds upon the existing IAU Thesaurus with major contributions from the Astronomy portions of the thesauri developed by the Institute of Physics Publishing and the American Institute of Physics. We expect that the Unified Astronomy Thesaurus will be further enhanced and updated through a collaborative effort involving broad community participation.

While the AAS has assumed formal ownership of the UAT, the work will be available under a Creative Commons License, ensuring its widest use while protecting the intellectual property of the contributors. We envision that development and maintenance will be stewarded by a broad group of parties having a direct stake in it. This includes professional associations (IVOA, IAU), learned societies (AAS, RAS), publishers (IOP, AIP), librarians and other curators working for major astronomy institutes and data archives.

The main impetus behind the creation of a single thesaurus has been the wish to support semantic enrichment of the literature, but we expect that use of the UAT (along with other vocabularies and ontologies currently being developed in our community) will be much broader and will have a positive impact on the discovery of a wide range of astronomy resources, including data products and services.

[Download the Executive Summary for the Unified Astronomy Thesaurus.](#)

Recent Posts

- The UAT at the e-Sciences Symposium April 10, 2014
- What's new with the Unified Astronomy Thesaurus February 10, 2014
- Download the UAT September 10, 2013
- New Visual Thesaurus Tool July 5, 2013
- Browse the Unified Astronomy Thesaurus! March 27, 2013

Proposed Thesaurus Management Tool: VocBench

VocBench

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Exact word Go Advanced search

Recent changes Concepts Properties Schemes Validation Load data Export Statistics SPARQL Concept navigation history Content language

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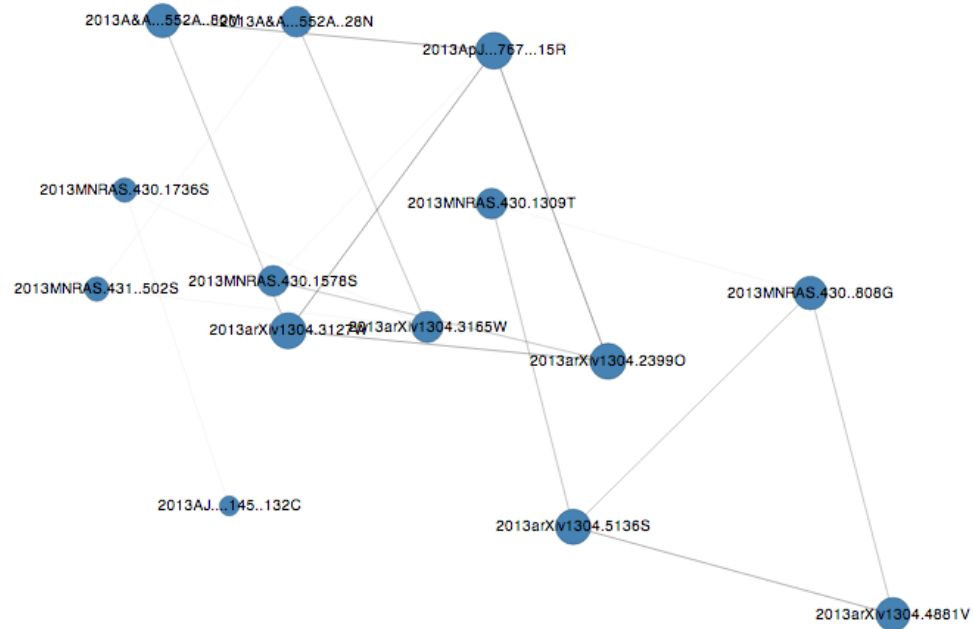
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 - Bursts (en)
 - Close binary stars (en)**
 - Companion stars (en)

Close binary stars (en)

Terms (2)	Definition (0)	Note (0)	Attribute (0)	Notation (0)	Relationship (0)	HS
+ Add new term						
Language	Term					
English (en)	<input checked="" type="checkbox"/>	Close binary stars (Preferred) W				
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Linked Discovery



NASA ADS Labs, Facets, Advanced Queries, Metrics...

The screenshot displays the NASA ADS Labs search interface. At the top, there are navigation links for Home, Search, Feedback, Help, and Tour this Page, along with a login/sign up option. The search bar contains the query "author:'Huchra, John'" and a search button. Below the search bar, there are tabs for Trending, Useful, and Instructive, and a section for Examples. The left sidebar contains a "Limit your search" section with filters for Top papers, Authors (listing Huchra, J. (736), Geller, M. (117), Mould, J. (97), Illingworth, G. (89), and Stetson, P. (73)), Database (astronomy (736), general (12), physics (8)), Keywords, Publications, Refereed status, Bib Groups, Grants, and Data. The main content area shows search results for the query "Database : astronomy OR physics". The results are displayed in a list format, showing the first six results. Each result includes a citation number, a link to the paper, citation metrics (e.g., Cited by 15), and a list of icons representing different metrics or actions (e.g., E, F, X, D, R, C, S, N). The first result is "2014AJ....147..124M" titled "Erratum: '2MTF. I. The Tully-Fisher Relation in the Two Micron All Sky Survey J, H, and K Bands' (2008, AJ, 135, 1738)" by Masters, Karen L.; Springob, Christopher M.; Huchra, John P., published in May 2014. The second result is "2012ApJ...759....6E" titled "Spectral Energy Distributions of Type 1 Active Galactic Nuclei in the COSMOS Survey. I. The XMM-COSMOS Sample" by Elvis, M.; Hao, H.; Civano, F.; Brusa, M. and 38 coauthors, published in Nov 2012. The third result is "2012yCat..21990026H" titled "The 2MASS Redshift Survey (2MRS) (Huchra+, 2012)" by Huchra, J. P.; Macri, L. M.; Masters, K. L.; Jarrett, T. H. and 16 coauthors, published in Jun 2012. The fourth result is "2012ApJS..199..26H" titled "The 2MASS Redshift Survey—Description and Data Release" by Huchra, John P.; Macri, Lucas M.; Masters, Karen L.; Jarrett, Thomas H. and 16 coauthors, published in Apr 2012. The fifth result is "2012yCat.2281....0C" titled "2MASS 6X Point Source Working Database / Catalog (Cutri+ 2006)" by Cutri, R. M.; Skrutskie, M. F.; van Dyk, S.; Beichman, C. A. and 21 coauthors, published in Feb 2012. The sixth result is "2011AJ....142..183N" titled "2MASS 6X Point Source Working Database / Catalog (Cutri+ 2006)" by Cutri, R. M.; Skrutskie, M. F.; van Dyk, S.; Beichman, C. A. and 21 coauthors, published in Feb 2012.




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Planning Our Summer Sprint

By Greg Wilson / 2014-06-09

As warm-up for our lab meeting on June 26, we have some more information to share about our two-day sprint in July. Please see our Etherpad for details, including more about sites and projects.

[...read more](#)

Announcing June 2014 Lab Meeting


By Greg Wilson / 2014-06-09

The next of our monthly online lab meetings will take place on Thursday, June 26, at 10:00 am and 7:00 pm Eastern time. (As always, we'll hold it twice to accommodate people's work schedules and time zones.) We will update this Etherpad with agenda items as the date approaches.

[...read more](#)

Upcoming Bootcamps


 Cyprus Institute
Jun 10-11, 2014

 Spelman College
Jun 10-11, 2014

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Jun 16-17, 2014

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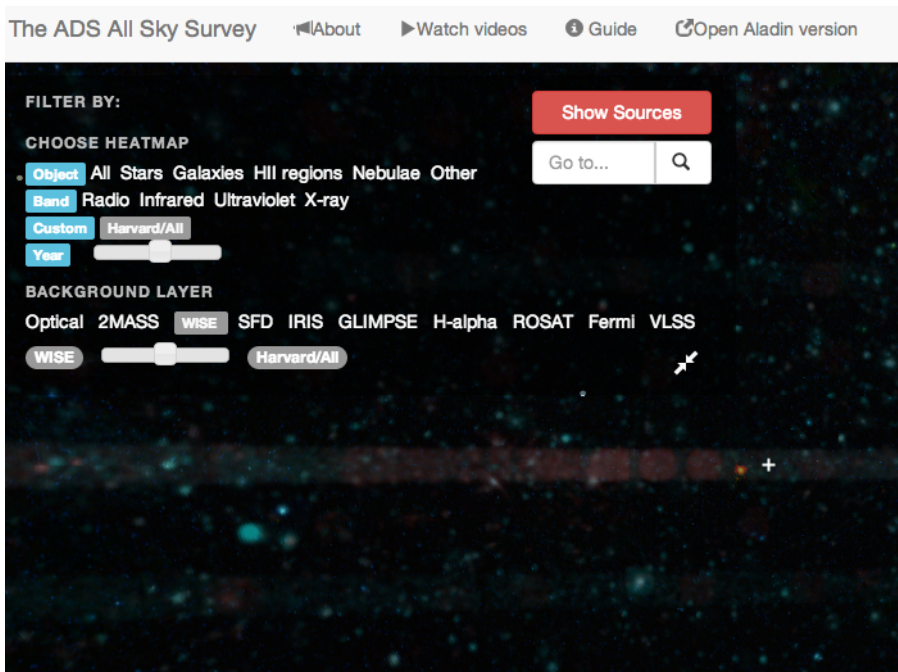
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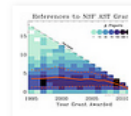


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The Cost of Astrophysics

Topics: [academia](#), [Astronomy](#), [costs](#), [statistics](#)



One of *my* favorite posts so far on If We Assume was "[The Pace of NSF Funded Research](#)", in which I showed that NSF-funded astronomy grants produce papers for up to 15 years! I made that figure while on an airplane with my friend Eric (who does cool stuff [like this!](#)) so that's fun too.

The data for that project came from the brilliant people at Harvard's CFA Library, who gathered every Astro paper published since 1995 that referenced a NSF AST grant. When they updated this [database](#) to include the budget amount for each grant, and were kind enough to notify me, I knew it was time to do a follow-up post!

The question that immediately jumped to my mind:
How much does a typical Astronomy paper cost taxpayers?

Google Classroom & Canvas

Google for Education



[Easy Assignments](#)

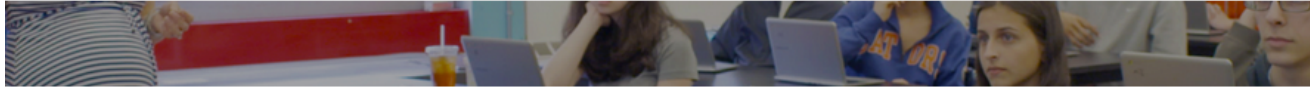
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More teaching, less tech-ing

Welcome to a preview of Classroom, a new tool coming to Google Apps for Education. Classroom weaves together Google Docs, Drive and Gmail to help teachers create and organize assignments quickly, provide feedback efficiently, and communicate with their classes with ease. And it lets students organize their work, complete and turn it in, and communicate directly with their teachers and peers.

Classroom was designed hand-in-hand with teachers to help them save time, keep classes organized, and improve communication with students.

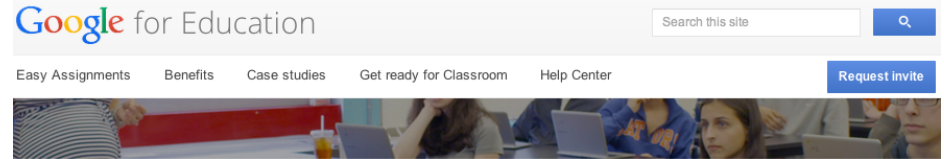


Physical vs Virtual Space



An artist's rendering of the planned data science center in Doe Library.

<http://newscenter.berkeley.edu/2013/11/13/new-data-science-institute-to-help-scholars-harness-big-data/>



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Virtual Reality + Augmented Reality



<http://mashable.com/2014/02/19/oculus-rift-documentary/>



<http://www.extremetech.com/tag/google-glass>

VR + AR Examples



Interactive Conference Posters Using R and Shiny
 Keegan Hines, Leor Katz, Akram Bakkour, Nick Malecek
 Institute for Neuroscience, University of Texas at Austin



Introduction

The effective communication of concepts and data is a vital component of the scientific process. The emergence of modern web technologies has facilitated the curation of large databases, the creation of open online journals, and the sharing of data. However, the visualization and communication of data in journal articles and conference posters has lagged behind, largely still presented in the form of static imagery. Here we demonstrate the power of interactive, remote web applications to provide a new medium for telling scientific stories. In particular, we highlight an easy-to-use system based on the R language which facilitates the creation of web applications with no requisite knowledge of HTML, Javascript, or other web frameworks. We showcase the use of such applications with several examples drawn from diverse areas of neuroscience research. Interactive figures not only enhance the amount of information that can be presented in a typical poster, but also provide the viewer with a more engaging experience with the data and the underlying concepts.

Introduction to Shiny

Hello Shiny!

ui.R

```

    # Shiny apps have three
    # basic components, a
    # user interface and server
    # The simplest Shiny app
    # takes user input and
    # updates the display
    
```

server.R

```

    # Shiny generates HTML and javascript to provide interactive experience
    
```

inst/extdata/plot

Examples

Viewing 3D Neuroimaging Data

Imaging results for the cue-approach task. (a) The parametric effect of the number of times each high value Go item was chosen during probe. (b) The difference between Go and NoGo items in parametric effect of the number of times each item was chosen during probe. This analysis was only run in an agent mask of vPFC that encompassed the medial PFC by combining Harvard-Oxford atlas regions frontal pole, frontal medial cortex, parainferior gyrus, and subcallosal cortex falling between $x = 14, y = -14$ and $z = 0$. (c) PPI results showing differential preference-modulated connectivity with vPFC seed (shown in blue) for high value Go items compared to high value NoGo items at the end of training greater than the beginning of training. λ and μ values reported in standard MNI space. Heatmap color bar ranges from z -stat = 2.3 to 3.3. Maps in panels a, c, and d were spatially correlated at $p < 0.05$.

shiny.illustrisproject.org

Examples

Simulating decision behavior using the drift-diffusion model

How parameters affect the chronometric and psychometric functions. A. Chronometric and psychometric functions for three values of the normalized bias A' : increasing the bias increases the higher value of the chronometric function and decreases the higher value of the psychometric function. B. Chronometric and psychometric functions for three values of consistency k : increasing consistency decreases the higher threshold for both functions. C. Chronometric and psychometric functions for three values of the mean non-decision time t_0 : increasing mean non-decision time displaces the chronometric function upward.

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Parameter Identifiability in Nonlinear Biophysical Models

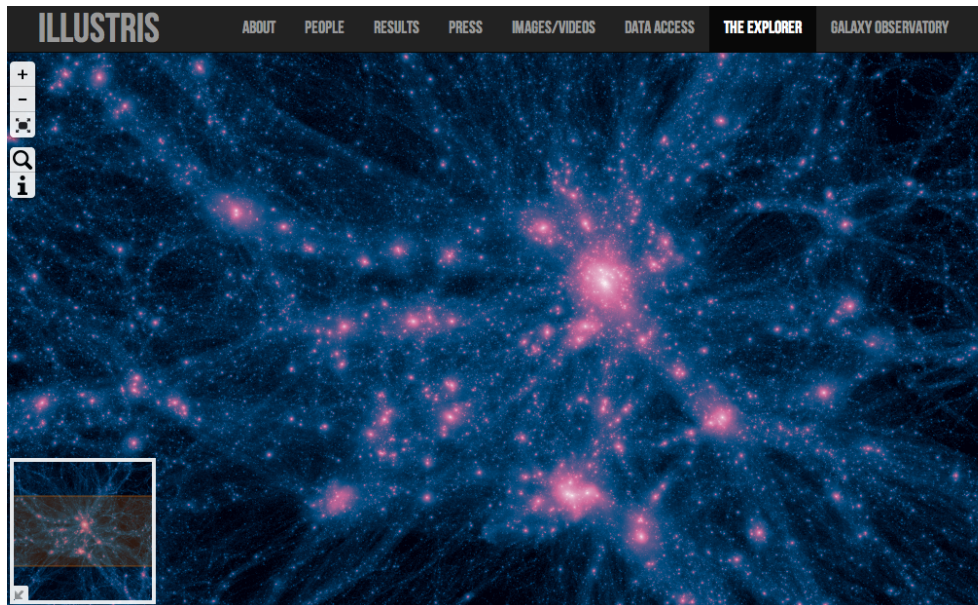
Parameter estimation for a two-site sequential binding model. (Left) Diagram of ligand binding model in which macroscopic binding constants K_1 and K_2 quantify the affinity of the first and second ligand binding sites, respectively. (Middle) Simulated binding curves for two different parameter sets. Parameter set A is consistent with weak cooperativity between the binding sites ($K_1 = K_2 = 200 \mu M$). Parameter set B is consistent with strong binding cooperativity ($K_1 = 100 \mu M, K_2 = 100 \mu M$). Though these parameter sets (and their mechanistic interpretations) are quite different, they produce nearly identical observations. (Right) Log-likelihood surface in $K_1 - K_2$ parameter space with respect to the non-linear data curve in B. The GR code at right links to an interactive version of this figure.

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Behavior: Prospective Effort and Loss Aversion

Behavioral choice data from a mixed gambles paradigm. Subjects select whether to risk performing a calibrated level of physical effort to receive a mixed-outcome gamble. Willingness to gamble modulated by effort prospect is shown in two figures. Left: Fit of a logistic regression model of probability of accepting a gamble at 5 levels of prospective effort. Right: Group mean loss aversion coefficients at 5 levels of prospective effort.

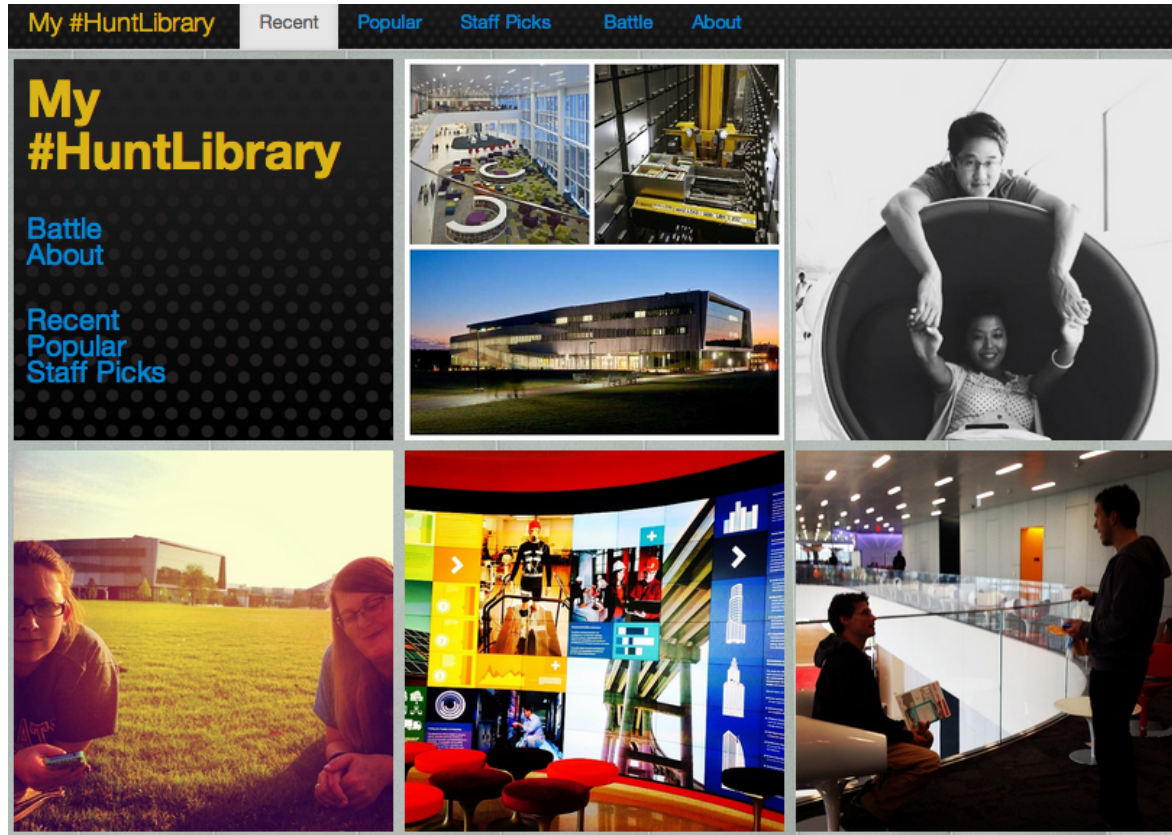
shiny.illustrisproject.org/behavior



<https://twitter.com/keeghin/status/476804758347333633/photo/1>

<http://www.illustris-project.org/>

#MyESO - Capture Events w/ Twitter



Thanks!

Questions?