

CERN Open Source Collaborative tools: Digital Library Software

Tim Smith CERN/IT

INVENIO

blog
forever



Libraries...



A Visionary Perspective



YEARS / ANS CERN

Sharing Knowledge..

..to accelerate Science

..to foster Collaboration

..to enrich the World



Preprint Culture



Dissemination



CERN Users around the World



10,000 scientists and engineers, 98 countries



Dawn of Internet Age

Vague but exciting...

CERN DD/OC

Tim Berners-Lee, CERN/DD

Information Management: A Proposal

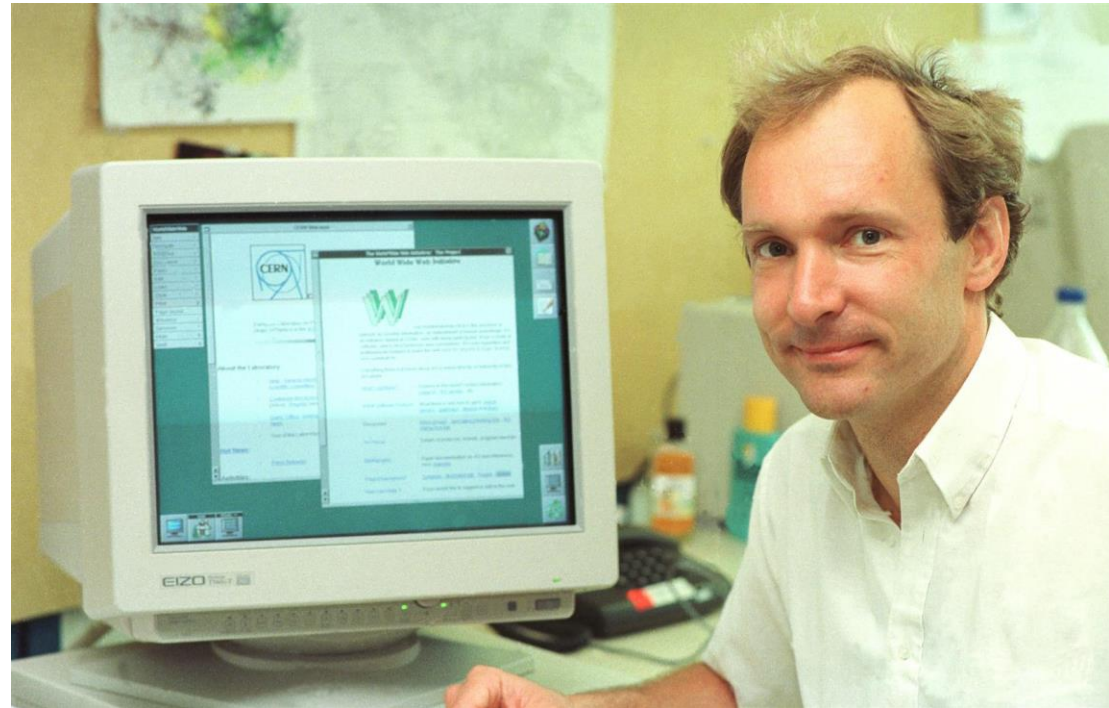
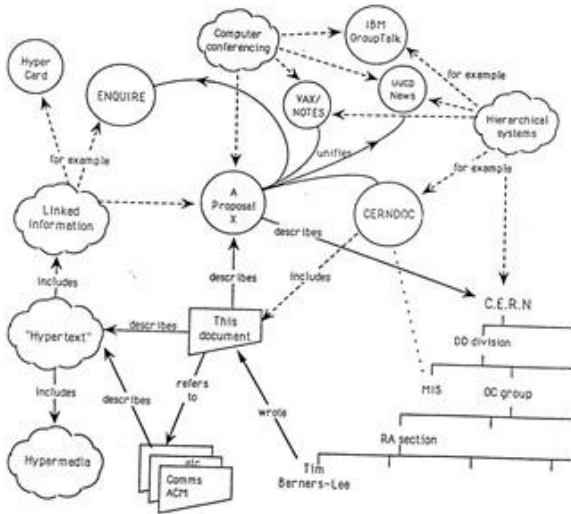
March 1989

Information Management: A Proposal

Abstract

This proposal concerns the management of general information about accelerators and experiments at CERN. It discusses the problems of loss of information about complex evolving systems and derives a solution based on a distributed hypertext system.

Keywords: Hypertext, Computer conferencing, Document retrieval, Information management, Project control

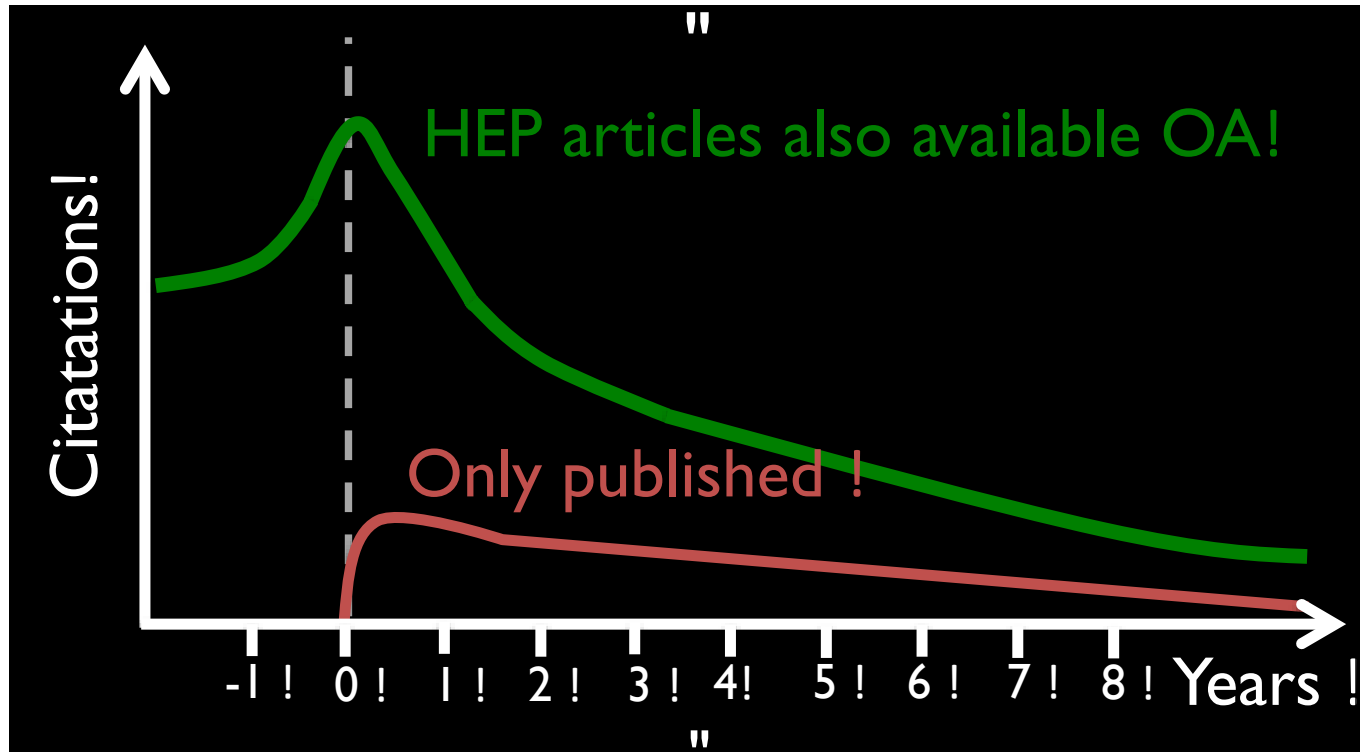


SPIRES: first web site in the USA



And the first DataBase on the web

Accelerating Science



Scientific dialogue on repositories

Gentil-Beccot, Mele, Brooks arXiv:0906.5418

EEN [Jun 2014] - 9



Towards Digital Libraries

- 1993:
 - CERN Preprint Server serves HEP & CERN preprints
- 1996:
 - CERN Library Server provides access to Library Catalog
- 2000:
 - CERN Document Server includes multimedia, restricted notes
- 2002:
 - CDSWare SW is released open source
- 2006:
 - CDSWare becomes Invenio; start of I18N collaborations
- 2010:
 - Invenio 1.0 released and adopted world-wide



“One Stop Shop”

CERN Document Server

Access articles, reports and multimedia content in HEP

Search

Submit

Help

Personalize

Articles & Preprints (1,140,808)

Published Articles (345,823) Preprints (709,409)

Theses (19,592) Reports (5,891) CERN Notes (44,087)

Committee Documents (25,144)

Books & Proceedings (121,921)

Books (89,399) Proceedings (20,383)

Standards (11,969) Design Reports (188)

Presentations & Talks (21,676)

Conference Announcements (15,831)

Academic Training Lectures (747)

Summer Student Lectures (1,067)

General Talks (4,031)

Periodicals & Progress

Reports (2,338)

Periodicals (2,244) Progress Reports (107)

Multimedia & Outreach (60,334)

Photos (15,751) Videos (2,246) Press (36,728)

Audio Archives (445) Exhibition Objects (186)

Posters (765) Brochures (186) HEP Institutes (2,965)

Experiments at CERN (1,118)



Welcome to INSPIRE, the High Energy Physics information system. Please do feedback@inspirehep.net.

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HEP Search

High-Energy Physics Literature Database

Use "find" for SPIRES-style search ([other tips](#))

Brief format

Search

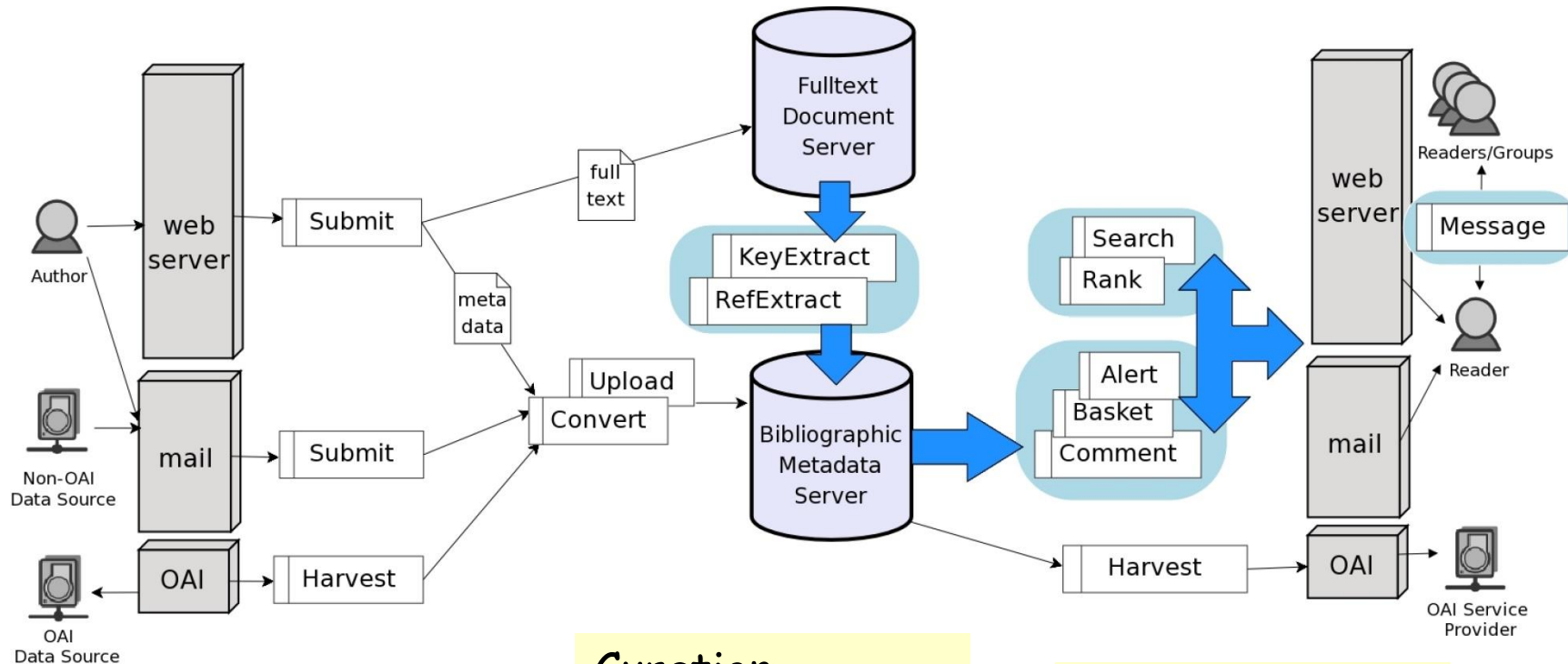
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find j "Phys.Rev.Lett..105" :: more

> 1 million records



Digital Library Services



Collection
Aggregation
Conversion
Stamping
Watermarking

Curation
Cataloguing
Organisation
Enrichment
Preservation

Access
Indexing
Ranking
Clustering
Classifying

Plot Extraction

The ridge in proton-proton collisi...

Information

References (41)

Citations (3)

Plots

The ridge in proton-proton collisions at the LHC.

Adrian Dumitru, Kevin Dusling, Francois Gelis, Jamal Jalilian-Marian, Tuomas Lappi, Raju Venugopalan.

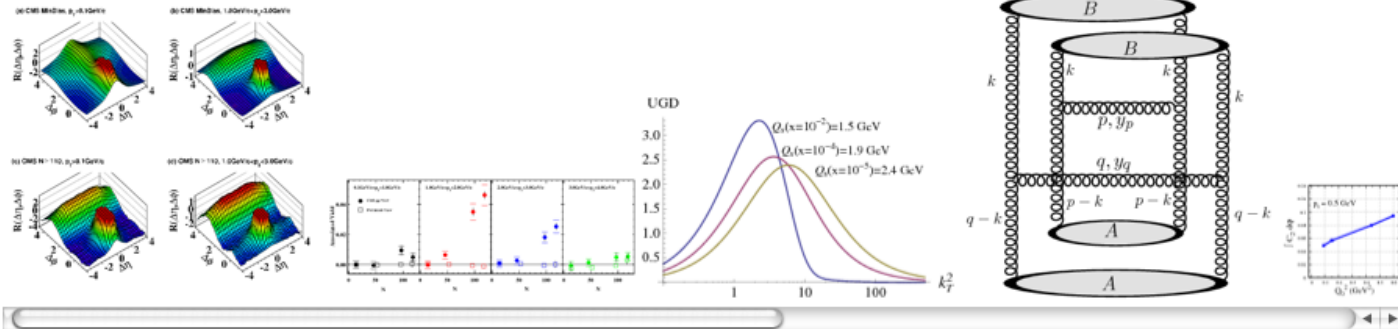
Sep 2010

e-Print: [arXiv:1009.5295 \[hep-ph\]](https://arxiv.org/abs/1009.5295)

Abstract: We show that the key features of the CMS result on the ridge correlation seen for high multiplicity events in $\sqrt{s}=7\text{TeV}$ proton-proton collisions at the LHC can be understood in the Color Glass Condensate framework of high energy QCD. The same formalism underlies the explanation of the ridge events seen in A+A collisions at RHIC, albeit it is likely that flow effects may enhance the magnitude of the signal in the latter.

Keyword(s): INSPIRE: [CERN LHC Coll](#) | [p, p: scattering](#) | [quantum chromodynamics](#) | [color glass condensate](#) | [Brookhaven RHIC Coll](#) | [flow](#) | [CMS](#)

Note: * Temporary entry *



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Visualizing Patterns of Connection

A Model of Leptons - HEP

http://inspirebeta.net/record/51188/citations

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- (6121) [CP Violation in the Renormalizable Theory of Weak Interaction](#) - Kobayashi, Makoto *et al.* Prog.Theor.Phys. 49 (1973) 652-657 . KUNS-242
- (3641) [Supersymmetry, Supergravity and Particle Physics](#) - Nilles, Hans Peter Phys.Rept. 110 (1984) 1-162 . UGVA-DPT-1983-12-412
- (3529) [The Search for Supersymmetry: Probing Physics Beyond the Standard Model](#) - Haber, Howard E. *et al.* Phys.Rept. 117 (1985) 75-263 . UM-HE-TH-83-17, SCIPP-85-47
- (3255) [Unity of All Elementary Particle Forces](#) - Georgi, H. *et al.* Phys.Rev.Lett. 32 (1974) 438-441
- (3196) [Review of particle physics. Particle Data Group](#) - Particle Data Group Collaboration (Barnett, R.Michael *et al.*) Phys.Rev. D54 (1996) 1-720

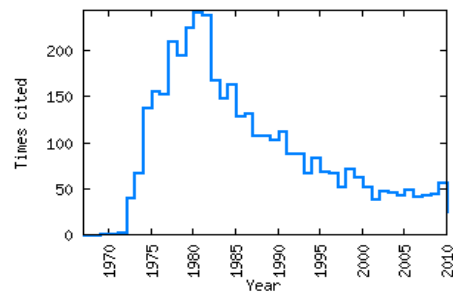
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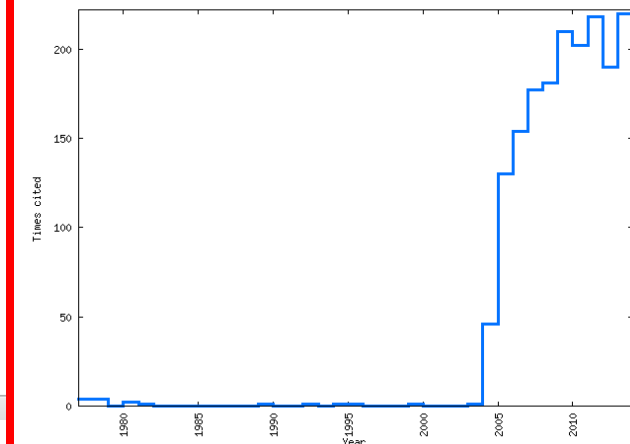
- (3762) [Partial Symmetries of Weak Interactions](#) - Glashow, S.L. Nucl.Phys. 22 (1961) 579-588
- (2110) [Weak Interactions with Lepton-Hadron Symmetry](#) - Glashow, S.L. *et al.* Phys.Rev. D2 (1970) 1285-1292
- (1464) [CP Violation in the Renormalizable Theory of Weak Interaction](#) - Kobayashi, Makoto *et al.* Prog.Theor.Phys. 49 (1973) 652-657 . KUNS-242
- (1070) [Broken symmetries, massless particles and gauge fields](#) - Higgs, Peter W. Phys.Lett. 12 (1964) 132-133
- (876) [Unity of All Elementary Particle Forces](#) - Georgi, H. *et al.* Phys.Rev.Lett. 32 (1974) 438-441

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Citation history:



Citation history:



Open and Closed Data !

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CERN Document Server

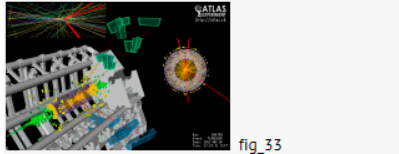
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Home > > Event displays of a Higgs to 4μ candidate event > Access to Fulltext

Information Discussion Files

Event displays of a Higgs to 4μ candidate event - ATLAS Collaboration - ATLAS-EVENT-DISPLAY-2012-005

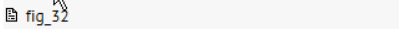
Main file(s):



fig_33

fig_33.png [1.94 MB] 31 Oct 2013, 14:13
fig_33.png (icon-1440) [960.97 KB] 31 Oct 2013, 14:23
version 1 fig_33.png (icon-180) [33.6 KB] 31 Oct 2013, 14:23
fig_33.png (icon-640) [260.33 KB] 31 Oct 2013, 14:23


Additional file(s):



fig_32

version 1 fig_32.png [1.57 MB] 31 Oct 2013, 14:13 *Persint display*

RESTRICTED

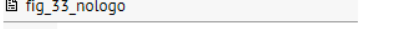


run204769_evt71902630

version 1 run204769_evt71902630.png [5.56 MB] 31 Oct 2013, 14:13 *Poster*

Press file(s):

RESTRICTED

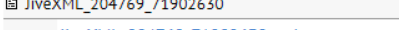


fig_35_nologo

version 1 fig_33_nologo.png [1.03 MB] 31 Oct 2013, 14:13

Source file(s):

RESTRICTED



JiveXML_204769_71902630

version 1 JiveXML_204769_71902630.xml.gz [3.17 MB] 31 Oct 2013, 14:13 *Atlantis XML*

DEV

- Workflows
- Transformations
- Restrictions

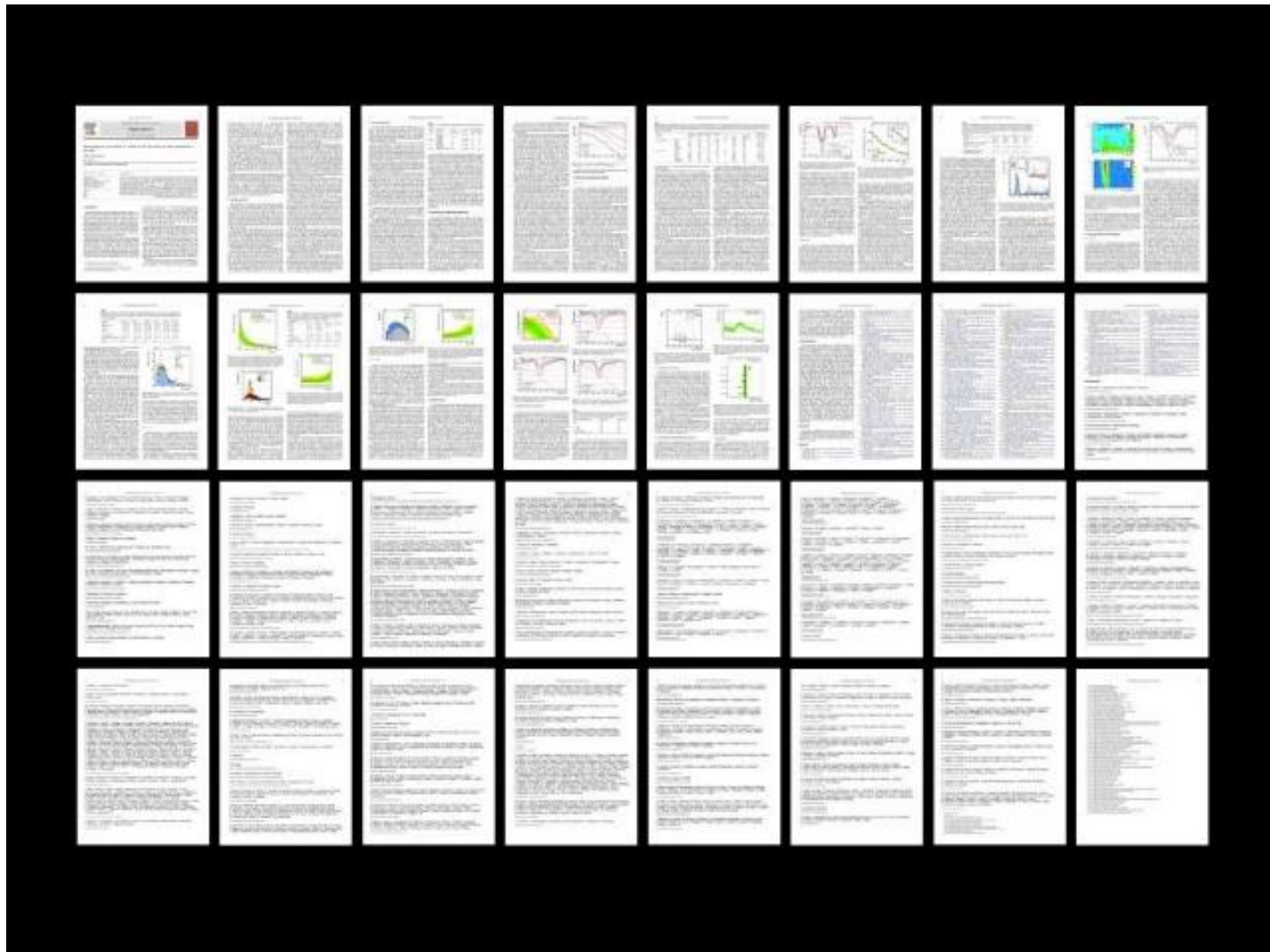


Digital Age Services

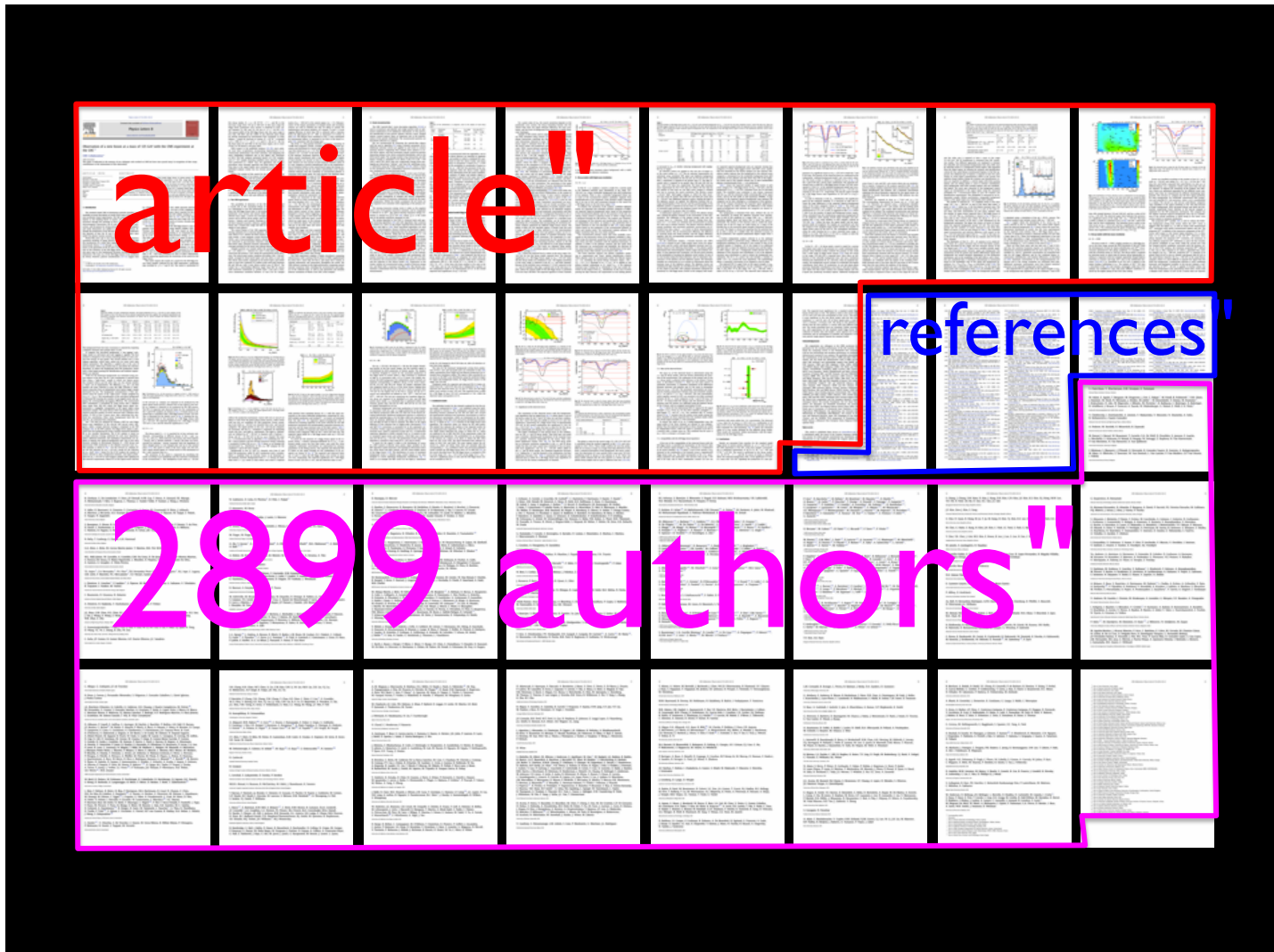
- Collaboration “Web2.0”
 - Comments, reviews, baskets
- Immediacy
 - Email alerts, RSS feeds
- Intensive tasks
 - Keyword & reference extraction
 - Citation analysis
 - Full text indexing & ranking
 - Conversion services: multiple download formats
- Flexible formats
 - Remove constraints of print versions
 - Internationalisation



Authors



Authors



Author Disambiguation

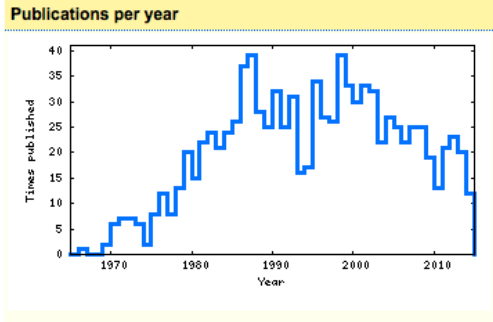
Ellis, Jonathan Richard

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- Publications list**
- Publications in INSPIRE:
1. A spinor approach to quaternion methods in relativity
 2. D-FIation
 3. The Physics Programme Of The MoEDAL Experiment At The LHC
 4. Astrophysical Shrapnel: Discriminating Among Extra-solar Sources of Live Radioactive Isotopes
 5. A No-Scale Inflationary Model to Fit Them All
 6. The Extent of the Stop Coannihilation Strip
 7. Generalized Skyrmions and The Mass of the Lightest Electroweak Baryon*
 8. Closing in on the Tip of the CMSSM Stau Coannihilation Strip
 9. Complete Higgs Sector Constraints on Dimension-6 Operators
 10. Resurrecting Quadratic Inflation in No-Scale Supergravity in Light of BICEP2
 11. Starobinsky-Like Inflation in Dilaton-Brane Cosmology
 12. The CTA Sensitivity to Lorentz-Violating Effects on the Gamma-Ray Horizon
 13. Exploring Two-Field Inflation in the Wess-Zumino Model

Papers

	All papers authored	Single papers authored
All papers	982	239
Book	2	0
ConferencePaper	240	161
Introductory	21	19
Lectures	46	36
Published	643	55
Review	105	72
Thesis	1	1
Proceedings	16	0



Subject categories

Frequent keywords

Citations (from papers in INSPIRE)

Citations summary

Generated on 2014-06-13

982 papers found, 806 of them citeable (published or arXiv)

Citation summary results	Citeable papers	Published only
Total number of papers analyzed:	806	643
Total number of citations:	60,506	57,364
Average citations per paper:	75.1	89.2
Breakdown of papers by citations:		
Renowned papers (500+)	12	12
Famous papers (250-499)	43	41
Very well-known papers (100-249)	116	111
Well-known papers (50-99)	135	128
Known papers (10-49)	278	238
Less known papers (1-9)	172	99
Unknown papers (0)	50	14
h_{EP} index [?]	126	124

See additional metrics

Exclude self-citations or RPP

Warning: The citation search should be used and interpreted with great care. Read the fine print

HepNames data

John Richard Ellis (King's Coll. London)
[\[Author Profile\]](#) [\[Google\]](#) [\[Students\]](#) [\[arXiv\]](#) [\[ADS\]](#)

PhD Institution: Cambridge U.
Undergrad: Cambridge U.
Email: john.ellis@cern.ch
URL: http://www.kcl.ac.uk/news/news_details.php?news_id=1324&year=2010
Field: HEP-TH, HEP-PH, ASTRO-PH
Author Profile: J.R.Ellis.1
Inspire ID: INSPIRE-00146525

Institutional History:

Institution	Rank	Start Date	End Date
King's Coll. London	SENIOR	2010	
CERN	SENIOR	1973	2010
Caltech	PD		
SLAC	PD		
Cambridge U.	PHD	1967	1971
Cambridge U.	UG	1964	1967

Name variants	Affiliations
Ellis, Jonathan Richard (2)	CERN (892)
Ellis, Jonathan R. (2)	King's Coll. Lond.
Ellis, John.R. (1)	SLAC (37)
Ellis, John R. (843)	Caltech (9)
Ellis, John (91)	Cambridge U., D
Ellis, J.R. (16)	LBL, Berkeley (5)
Ellis, J. R. (1)	Sussex U. (3)
Ellis, J. (25)	Cambridge U. (3)
Ellis, J (1)	Karlsruhe U., TU
	UC Santa Cruz



The Invenio Platform

- Mature **digital library** platform
 - Articles, books, notes, photos, videos, software, data
 - **OAIS**-inspired **preservation** practices
- Typical use cases:
 - **Institutional** document **repositories**, e.g. CERN, EPFL, GSI
 - Internal collections, pre-publication workflows with approval
 - **Subject-based** information **systems**, e.g. INSPIRE, ILC
 - Public collections, worldwide data with citation analysis
 - **Large libraries** and **library networks**, e.g. ILO, RERO, FZ
- Co-developed by international collaboration



Invenio @ M9



- “Museum of the 20th Century” in Mestre, Italy
- privately funded, Fondazione di Venezia, 2011–2014
- collaborating with CILEA
- using Invenio for repository
 - native support for formats ICCD, MAG, UNIMARC
 - native support of **archival formats** EAD, ISAD(G)
 - **data model abstraction** and **logical fields**
 - **rich API** to expose objects to apps

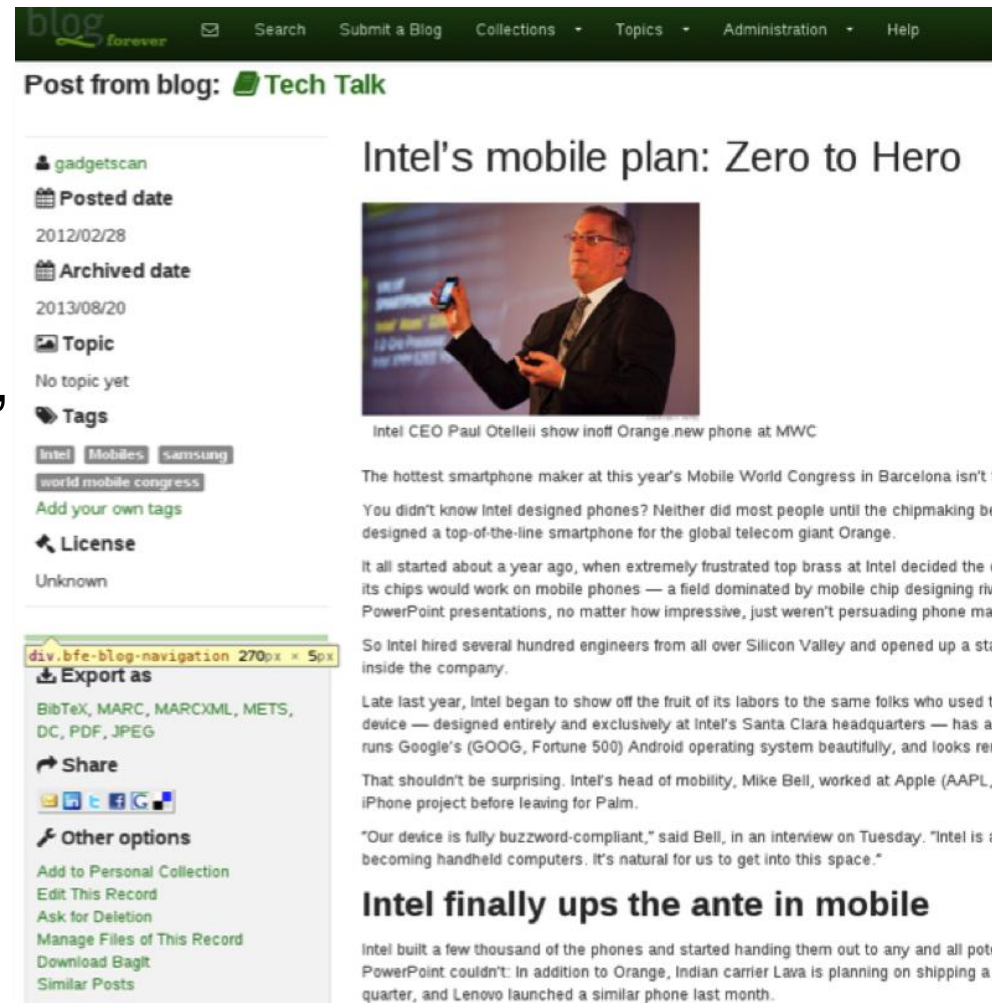
M9

Scientific dialogue 2.0



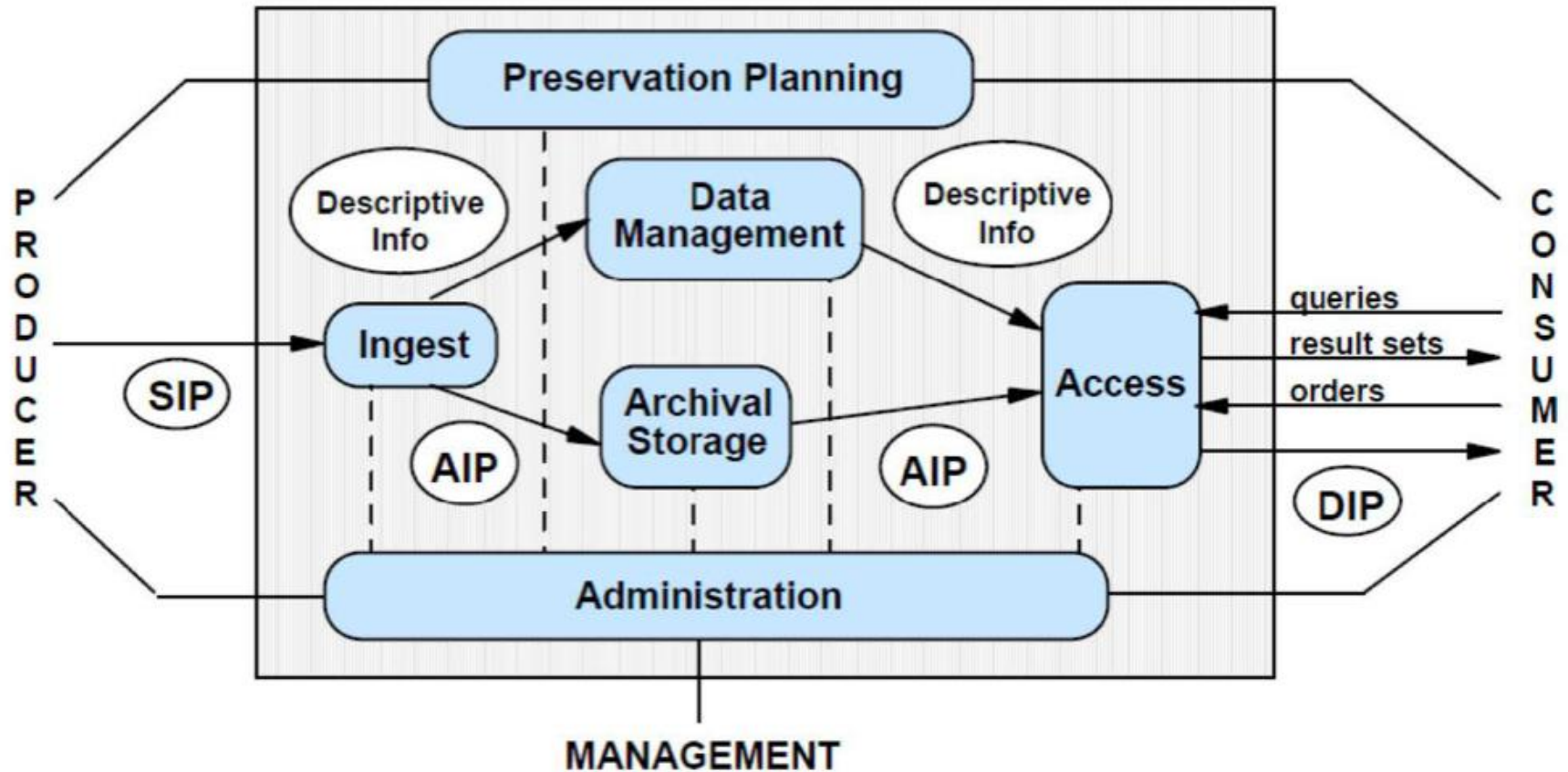
BlogForever - Preservation

- EC funded project, 2011–2013 (Invenio based)
 - Platform to **harvest, manage, preserve** and **disseminate** blog content
 - **Blog posts, comments, embedded material** (images, videos)
 - Ensure **authenticity, integrity, completeness, long-term usability**
 - **OAIS AIP**



The screenshot shows a web browser displaying a blog post on the BlogForever platform. The page header includes navigation links like 'Search', 'Submit a Blog', 'Collections', 'Topics', 'Administration', and 'Help'. The post is from the 'Tech Talk' blog, authored by 'gadgetscan' on 2012/02/28. It is archived as of 2013/08/20. The topic is 'No topic yet' and it has tags for 'intel', 'mobiles', 'samsung', and 'world mobile congress'. The license is 'Unknown'. The main content features a photo of Intel CEO Paul Otellini at a conference, with a caption: 'Intel CEO Paul Otelleii show inoff Orange.new phone at MWC'. The text discusses Intel's entry into the smartphone market, mentioning its partnership with Orange and the challenges of competing in a market dominated by mobile chip designers. It also mentions Intel's hiring of engineers from Silicon Valley and the launch of a new phone. The post concludes with a quote from Mike Bell, Intel's head of mobility, stating that Intel's device is 'fully buzzword-compliant' and that it's natural for them to get into the handheld computer space. The post is titled 'Intel finally ups the ante in mobile'.

Open Archival Information System



SIP = Submission Information Package · AIP = Archival Information Package · DIP = Dissemination Information Package

Open Access ...always

- DOI
 - 10.1103/PhysRevLett.105.
- Citation networks
- Format



>Lorem ipsum dolor
amet, consectetur
adipiscing elit.
Aliquam vitae faucibus
nisi. Nullam vel tellus sit
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tudin. Cras sollicitudin
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lacinia.
Integer auctor mauris
nunc. Morbi dignissim
erat vel lorem fermentum



>Lorem ipsum dolo
amet, consectetur
adipiscing elit.
Aliquam vitae faucibus
nisi. Nullam vel tellus sit
amet dui posuere sollicitu-
din. Cras sollicitudin erat
eget velit vehicula lacinia.
Integer auctor mauris nunc.
Morbi dignissim erat vel
lorem fermentum et
interdum eros accumsan.

$$\mathcal{L} \propto H_D \frac{n_\gamma^{3/2}}{\sqrt{\epsilon_y}} \frac{P_b}{E_b} \propto H_D \frac{n_\gamma^{3/2}}{\sqrt{\sigma_z}} \frac{1}{\sqrt{\epsilon_y}} \eta \frac{P_{AC}}{E_b}$$



$$\mathcal{L} \square H_D \frac{n_\gamma^{3/2}}{\sqrt{\epsilon_y}} \frac{P_b}{E_b} \square H_D \frac{n_\gamma^{3/2}}{\sqrt{\sigma_z}} \frac{1}{\sqrt{\epsilon_y}} \square \frac{P_{AC}}{E_b}$$

- Transformation: PDF/A
- OAIS (ISO 14721:2012)
 - Preservation meta data: provenance, context, usage

Data Intensive Science



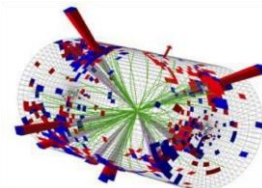
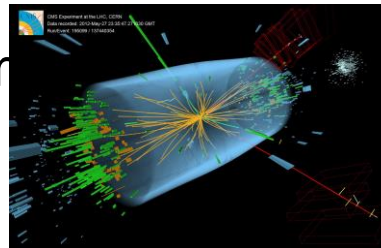
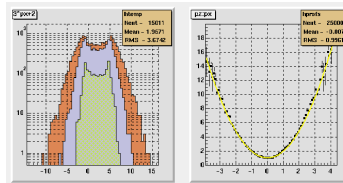
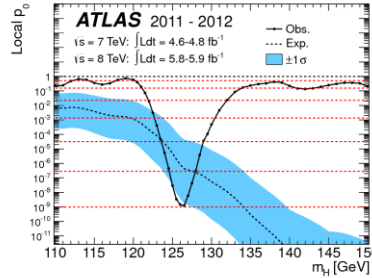
Data Analysis and Preservation

- Papers
- Tabular Data
- Correlation Matrices

- Internal Notes
- Wikis
- Presentations

- Quality monitoring data
- Filter / selection algorithms
- Formatters

- Calibration Data
- Conditions Data
- Log Books



Researchers
T2s, T1s

Analysis Coordinators
T1s

Production Managers
T0, T1s

SW: 10M LoC

Contextual metadata

Workflows

EEN [Jun 2014] - 27



Big Data ... *in small pieces*



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Home / Publications / Branch-specific plasticity enables self-organization of nonlinear computation in single neurons

27 July 2011

Journal article Open access

Branch-specific plasticity enables self-organization of nonlinear computation in single neurons

Legenstein, Robert ; Maass, Wolfgang

(show affiliations)

It has been conjectured that nonlinear processing in dendritic branches endows individual neurons with the capability to perform complex computational operations that are needed in order to solve for example the binding problem. However, it is not clear how single neurons could acquire such functionality in a self-organized manner, since most theoretical studies of synaptic plasticity and learning concentrate on neuron models without nonlinear dendritic properties. In the meantime, a complex picture of information processing with dendritic spikes and a variety of plasticity mechanisms in single neurons has emerged from experiments. In particular, new experimental data on dendritic branch strength potentiation in rat hippocampus have not yet been incorporated into such models. In this article, we investigate how experimentally observed plasticity mechanisms, such as depolarization-dependent STDP and branch-strength potentiation could be integrated to self-organize nonlinear neural computations with dendritic spikes. We provide a mathematical proof that in a simplified setup these plasticity mechanisms induce a competition between dendritic branches, a novel concept in the analysis of single neuron adaptivity. We show via computer simulations that such dendritic competition enables a single neuron to become member of several neuronal ensembles, and to acquire nonlinear computational capabilities, such as for example the capability to bind multiple input features. Hence our results suggest that nonlinear neural computation may self-organize in single neurons through the interaction of local synaptic and dendritic plasticity mechanisms.

Preview -

1 / 16 < > 🔍 📄

Development/Plasticity/Repair

Branch-Specific Plasticity Enables Self-Organization of Nonlinear Computation in Single Neurons

Robert Legenstein and Wolfgang Maass
Institute for Theoretical Computer Science, Graz University of Technology, 8000 Graz, Austria

It has been conjectured that nonlinear processing in dendritic branches endows individual neurons with the capability to perform complex computational operations that are needed to solve the example the binding problem. However, it is not clear how single neurons could acquire such functionality in a self-organized manner, because most theoretical studies of synaptic plasticity and learning concentrate on neuron models without nonlinear dendritic properties. In the meantime, a complex picture of information processing with

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LegensteinMaass_2011.pdf	07 Feb 2013	1.4 MB	Preview Download

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Publication date:
27 July 2011

DOI:
10.1523/JNEUROSCI.5684-10.2011

Report number(s):
OpenAIRE-BRAIN_I-NETS-2011-001

Published in:
The Journal of Neuroscience : the official journal of the Society for Neuroscience: 30 (2011) no. 31, pp. 10878-10802

Grants:
BRAIN-I-NETS - Novel Brain-Inspired Learning Paradigms for Large-Scale Neuronal Networks (243914)

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Vrábliková, Katerina View

In this new discussion paper series, the Prague SECONOMICS team intends to allow the broader academic community taking part in an on-going discussion about risks and threats as well as trade-offs between them and security. [...]

Uploaded by Belen Gallego on 23 May 2013.

21 March 2013 Journal article Embargoed access
Growth and galvanic replacement of silver nanocubes in organic media
Polavarapu, Lakshminarayana ; Liz-Marzan, Luis M. View

Although metal nanoparticulates with various shapes can be prepared in polar organic solvents, little has been advanced toward the shape-controlled synthesis in non-polar solvents. [...]

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OpenAIRE CERN 7 infrastructure



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DOI:
10.5281/zenodo.6785

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Grants:
BRAIN-I-NETS - Novel Brain-Inspired Learning Paradigms for Large-Scale Neuronal Networks (243914)

<http://www.openaire.eu>



Home / Publications / Branch-specific plasticity enables self-organization of nonlinear computation in single neurons

27 July 2011 Journal article Open access

Branch-specific plasticity enables self-organization of nonlinear computation in single neurons

Legenstein, Robert ; Maass, Wolfgang

(show affiliations)

It has been conjectured that nonlinear processing in dendritic branches endows individual neurons with the capability to perform complex computational operations that are needed in order to solve for example the binding problem. However, it is not clear how single neurons could acquire such functionality in a self-organized manner, since most theoretical studies of synaptic plasticity and learning concentrate on neuron models without nonlinear dendritic properties. In the meantime, a complex picture of information processing with dendritic spikes and a variety of plasticity mechanisms in single neurons has emerged from experiments. In particular, new experimental data on dendritic branch strength potentiation in rat hippocampus have not yet been incorporated into such models. In this article, we investigate how experimentally observed plasticity mechanisms, such as depolarization-dependent STDP and branch-strength potentiation could be integrated to self-organize nonlinear neural computations with dendritic spikes. We provide a mathematical proof that in a simplified setup these plasticity mechanisms induce a competition between dendritic branches, a novel concept in the analysis of single neuron adaptivity. We show via computer simulations that such dendritic competition enables a single neuron to become member of several neuronal ensembles, and to acquire nonlinear computational capabilities, such as for example the capability to bind multiple input features. Hence our results suggest that nonlinear neural computation may self-organize in single neurons through the interaction of local synaptic and dendritic plasticity mechanisms.

Publication date: 27 July 2011
DOI: 10.5281/ZENODO.6785-10.2011
Report number: OpenAIRE: OPENAIRE-2011-001
Publication: The Journal of Neuroscience : the official journal of the Society for Neuroscience: 30 (2011) no. 31, pp. 10878-10802
Grants: BRAIN-I-NETS - Novel Brain-Inspired Learning Paradigms for Large-Scale Neuronal Networks (243914)
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01 March 2013 Journal article Embargoed access

Everything you always wanted to Know about Black Dye (but Were Afraid to Ask): A DFT/TDDFT Investigation

Fantacci, Simona ; Lobello, Maria G. ; De Angelis, Filippo

(show affiliations)

We report an exhaustive theoretical and computational investigation of the electronic, optical, redox and acid-base properties, along with the adsorption mode on TiO₂, of Black Dye (BD), the prototypical panchromatic dye for solar cell applications. We investigated in detail the variation of the relevant dye properties as a function of the solution pH, corresponding to the stepwise deprotonation of the carboxylic groups. Our results reproduced the expected blue-shift of the optical absorption spectrum and the experimental trend of oxidation potentials by increasing pH, which turned both out to be in excellent agreement with experimental values. Also, our calculated excited state oxidation potential is in good agreement with available experimental data. We then

Publication date:
01 March 2013

Embargoed
Files available as **Open Access** after 01 March 2014

DOI:
[10.2533/chimia.2013.121](https://doi.org/10.2533/chimia.2013.121)

Report number(s):
OpenAIRE-ESCORT-2013-007

Published in:
Chimia: 67 (2013) no. 3, pp. 121-128

Grants:
ESCORT - Efficient Solar Cells based on Organic and hybrid Technology (261920)

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

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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).

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2

04 November 2013 Dataset Open access

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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.

View



Reusability: Software Preservation

The screenshot shows the Zenodo user interface. At the top, the Zenodo logo and the tagline "Research. Shared." are visible. Below the navigation bar, the "Settings" section is open, showing a list of GitHub repositories. The repository "Inielson-cern/decouple" is highlighted, and its status is shown as "ON".

The screenshot shows the GitHub repository page for "Inielson-cern/decouple". The repository is public and has 33 commits, 3 branches, and 3 releases. The "Code" section is open, showing the repository's metadata. A callout box highlights the version "v1.1.3" and the release assets "zip" and "tar.gz". Another callout box highlights the repository's JSON metadata, which includes the name, affiliation, description, access rights, license, and related identifiers.

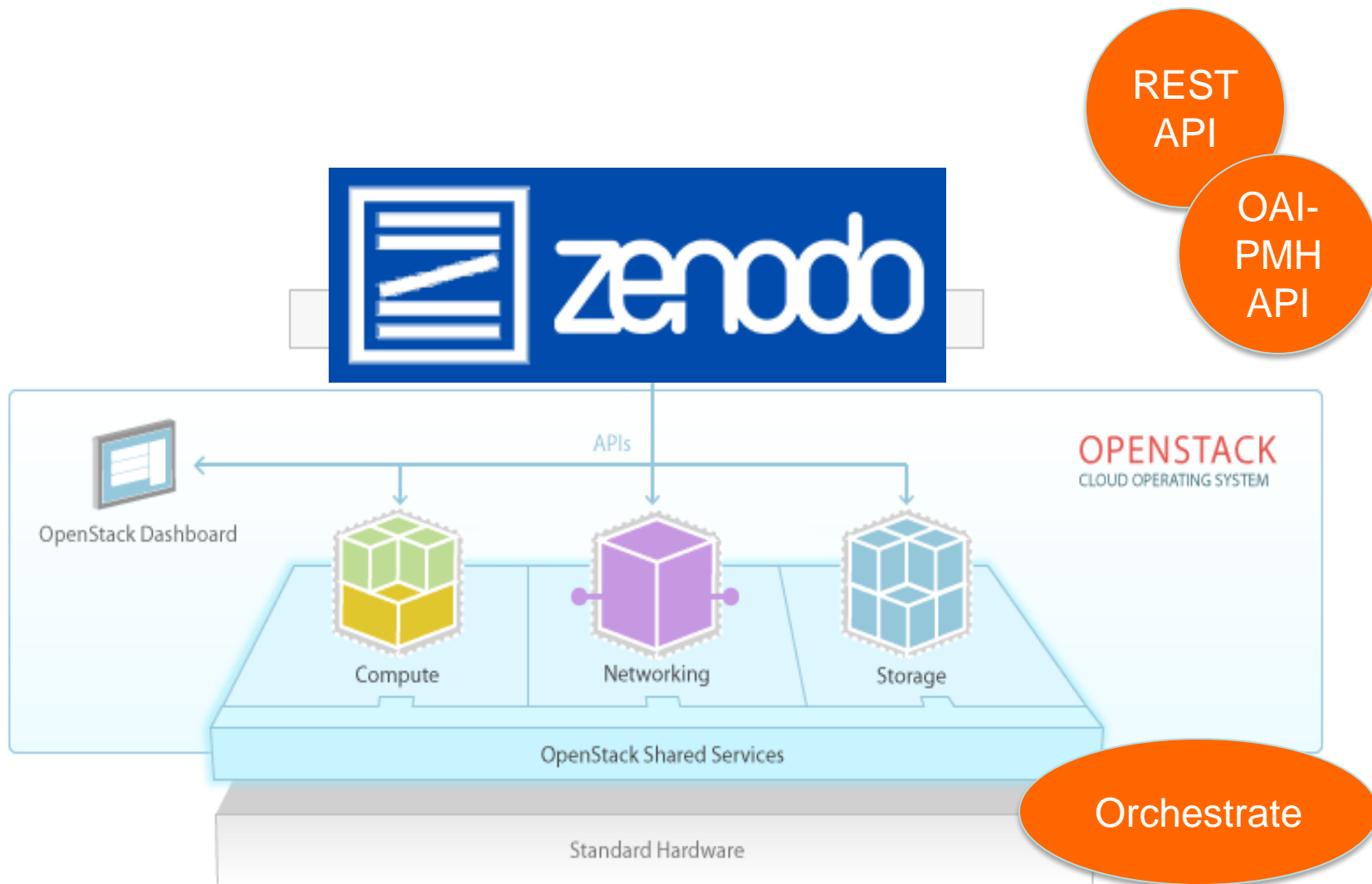
```
{  
  "name": "Plehn, Tilman",  
  "affiliation": "Institut für Theoretische Pl",  
  "description": "This repository contains the sof",  
  "access_right": "open",  
  "license": "mit-license",  
  "related_identifiers": [{  
    "identifier": "arXiv:1401.0080",  
    "relation": "isCitedBy"  
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

A callout box showing the "ON" status of the repository, with an arrow pointing to the "ON" button in the Zenodo settings interface.

A callout box showing the DOI "10.5281/zenodo.8345", with an arrow pointing to the DOI field in the GitHub repository metadata.



Open Data as a Service



Conclusions

- *Information is a valuable asset that is multiplied when it is shared*
- Mandates and policies
 - Openness, preservation
- Open Data
 - Discoverable, Accessible, Intelligible, Assessable, Useable
- Digital Libraries make this possible !





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