Scholarly literature and the press: scientific impact and social perception of physics computing

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God’s particle

'God particle': New particle found, could be the Higgs boson, CERN scientists say

CERN scientists have discovered a new subatomic particle that could be elusive Higgs boson, which is believed to be crucial in formation of universe.

Anuncian el descubrimiento de lo que podría ser la “partícula de Dios”

La Organización Europea para la Investigación Nuclear (CERN) anunció este miércoles el descubrimiento de una nueva partícula que podría ser el bosón de Higgs, aunque todavía es demasiado pronto para saber si se trata de la “partícula de Dios” que...

Scientists discover ‘god-like’ particle

After a quest spanning nearly half a century, physicists on Wednesday said they had found a new sub-atomic particle consistent with the Higgs Boson which is believed to confer mass....

Descoberta nova partícula coerente com a 'partícula de Deus'

Physicists Find Particle That Could Be the Higgs Boson -

Researchers said they had discovered what looked for all the world like the Higgs boson, a long-sought particle that could lead to a new ...

July 4, 2012 - By DENNIS OVERBYE - Science - Article - Print Headline: "Physicists Find Elusive Particle Seen as Key to Universe"
Foreword

This scientometric investigation does not have the character of a rigorous, quantitative statistical analysis due to the difficulty of retrieving data from mainstream media sources.

Nevertheless, the results provide some food for thought…

The few landmark cases we selected are intended to be representative of the field. Selections and omissions are not a judgement of merit!
Data sources

Thomson-Reuters: ISI Web of Knowledge
- CERN subscription: since 1970, conference database not included

CERN, Fermilab and SLAC press releases
- Limited time coverage
- Limited search facilities

Newspaper web sites
- Some have a search engine
- Search facilities are paying (e.g. FAZ) or with limited free access (e.g. NYT)
- Search engines are usually primitive

Warning: 2013 statistics covers only a portion of the year
The November revolution

- J. J. Aubert et al.,
  - Times Cited: 1059 (14 authors)

- J. E. Augustin et al.,
  - Times Cited: 963 (35 authors)
MINUIT

F. James and M. Roos,
MINUIT - System for function minimization and analysis of parameter errors and correlations
Comp. Phys. Comm., vol. 10, no. 6, pp. 343-367, 1975
Times Cited: 1330 (on 8 September 2013)

MINUIT – A SYSTEM FOR FUNCTION MINIMIZATION AND ANALYSIS OF THE PARAMETER ERRORS AND CORRELATIONS

F. JAMES
Data Handling Division, European Organization for Nuclear Research, CH-1211 Geneva 23, Switzerland

and

M. ROOS
Department of Nuclear Physics, University of Helsinki, SF-00170 Helsinki, Finland
The hare and the tortoise

Maria Grazia Pia, INFN Genova
Landmark experimental HEP papers

\textbf{J/ψ discovery} (citations: 1059, 963)

\textbf{τ discovery} (citations: 574)

\textbf{W and Z\(_0\) observation} (citations: 590, 550)

\textbf{t quark observation:} CDF, D0 (citations: 1005, 888)
F. Abe et al., Observation of top-quark production in \(p\bar{p}\)-collisions with the Collider Detector at Fermilab, \textit{Phys. Rev. Lett.} 74, no. 14, pp. 2626-2631, 1995

\textbf{Neutrino oscillations} (citations: 2906)

\textbf{CP violation observation:} E832, Belle, BaBar (citations: 346, 361, 335)
B. Aubert et al. BaBar, Observation of CP violation in the \(B_0\) meson system, \textit{Phys. Rev. Lett.} 87, no. 9, p. 091801, 2001

\textbf{Higgs boson observation} (citations: 681, 644)
Sic transit gloria mundi

- **tau**

- **W and Z0**

- **top quark**

- **BaBar meson**

- **Neutrino oscillations**

- **Neutrino oscillations – Wolfenstein**
What makes a paper of lasting value?
CP violation

- B. Aubert et al. **BaBar**, Observation of CP violation in the \( B^0 \) meson system, *Phys. Rev. Lett.* 87, no. 9, p. 091801, 2001 – 335 citations
Higgs boson

  - Times Cited: 730

  - Times Cited: 695

How long is glory going to last?

  - Times Cited: 1379
Evergreen
B. Aubert et al., The BABAR detector, NIM A 479, no. 1, pp. 1-116, 2002
- Times Cited: 952

- Times Cited: 904

J. L. Wiza, Microchannel plate detectors, NIM 162, no. 1-3, pp. 587-601, 1979
- Times Cited: 586
James Gillies, head of communication for CERN, admitted that the institute "very shamelessly" uses the collider to build a platform to promote particle physics and said they were always keen to make the most of Holywood's interest. However he added that the organisation is careful to show how the Higgs story was part of a broader push for scientific discovery.

By Ben Riley-Smith
11:55AM BST 07 Jun 2013
LHCb experiment observes new matter-antimatter difference
24 Apr 2013

Geneva, 24 April 2013. The LHCb collaboration at CERN\(^1\) today submitted a paper to Physical Review Letters on the first observation of matter-antimatter asymmetry in the decays of the particle known as the \(B^0_s\). It is only the fourth subatomic particle known to exhibit such behaviour.

Scientists working on the LHCb detector at the Large Hadron Collider have now announced that they have spotted a slight difference in the way antimatter decays that may go some way to explaining this.
ATHENA’s antihydrogen

Thousands of cold anti-atoms produced at CERN

18 Sep 2002

Physicists' Antimatter Recipe Is More Sci-Than Fi

By DENNIS OVERBYE
Published: September 19, 2002

Correction Appended

Physicists working in Europe announced yesterday that they had passed through nature's looking glass and had created atoms made of antimatter, or antiatoms, opening up the possibility of experiments in a realm once reserved for science fiction writers. Such experiments, theorists say, could test some of the basic tenets of modern physics and light the way to a deeper understanding of nature.


Times Cited: 463
Forscherteam produziert Treibstoff für die Enterprise

Präzisionsmessungen an Anti-Wasserstoff sollen jetzt Theorien der Physik auf den Prüfstand stellen. Von Thomas Bührke

A Ginevra nasce l' antimateria da freezer

...ROMA - L' antimateria è tornata ad esistere, prodotta in quantità significativa dai fisici del Cern, il laboratorio di fisica delle particelle di Ginevra. Quello che sembrava un paradosso della...

Les physiciens ont fabriqué une multitude d' antimonides

Seule solution pour le savoir, regarder si les grandes lois de la physique restent « invariantes » dans une expérience qui met en jeu et associe simultanément les trois symétries de la physique : la symétrie C qui remplace la matière par de l'antimatière ; la symétrie P qui met en scène...
New State of Matter created at CERN

10 Feb 2000

Il vero volto dell' Universo
...Ginevra L' annunzio ufficiale verrà dato questa mattina a Ginevra: per la prima volta nella storia dell' Universo conosciuto, gli scienziati del Cern (Centro europeo di ricerche nucleari) sono...

di FRANCO PRATTICO

la Repubblica | 10 febbraio 2000 | pag. 35 | sez. CULTURA

L'après-big bang recréé en laboratoire

Le Figaro - Article, infographie - Fabrice NODE-LANGLOIS | Créé le 10 février 2000

Une équipe de physiciens d'une vingtaine de pays présente aujourd'hui au Cern (1) à Genève le fruit de six années d'un travail fondamental[...]Les équipes du Cern[...]les atomes de plomb dans une « boule de feu », pour reprendre l'image des physiciens du Cern[...]Moins d'un milliardième de milliardième de seconde, estime Claude ...
Elusive Atomic Particle Found by Physicists

By MALCOLM W. BROWNE
Published: March 03, 1995

Culminating nearly a decade of intense effort, two rival groups of physicists announced today that they had found the elusive top quark -- an ephemeral building block of matter that probably holds clues to some of the ultimate riddles of existence.

Top-Quark zweifelsfrei nachgewiesen

Standardmodell der Elementarteilchen bestätigt / Von Christoph Ettl
FRANKFURT, 2. März. Die Existenz des sogenannten Top-Quarks ist jetzt experimentell gesichert. Dies gaben am Donnerstag Forscher vom Fermi National ...
Giant magnet goes underground at CERN

28 Feb 2007

Geneva, 28 February 2007. At 6:00 am this morning the heaviest piece of the Compact Muon Solenoid (CMS) particle detector began a momentous journey into the experiment’s cavern, 100 metres underground at CERN. Using a huge gantry crane, custom-built by the Vorspann System Losinger Group, the pre-assembled central piece, containing the magnet and weighing as much as five Jumbo jets (1920 tonnes) is being gently lowered into place.
CERN and Caltech join forces to smash Internet speed record

15 Oct 2003

CERN¹ and California Institute of Technology (Caltech) will tomorrow receive an award for transferring over a Terabyte of data across 7,000 km of network at 5.44 gigabits per second (Gbps), smashing the old record of 2.38 Gbps achieved in February between CERN in Geneva and Sunnyvale in California by a Caltech, CERN, Los Alamos National Laboratory and Stanford Linear Accelerator Center team.

The New York Times

10 November 2003

But the Europeans are racing ahead in developing faster optical networks. A CERN-Caltech team set an Internet 2 Land Speed Record recently by transferring 1.1 trillion bytes of data in less than 30 minutes.

Such transfer speeds were "not even thinkable a year ago," said Flavia Donno, the computer scientist in charge of physics experiments on the grid for CERN.

la Repubblica

16 October 2003

Un download da record nasce l'Internet superveloce

I ricercatori: "Nel futuro, collegamenti da 10 gigabit al secondo"

di ALESSIO BALBI

IMMAGINATE di poter scaricare da Internet l'ultimo cd del vostro artista preferito in un secondo. Fantascienza? Assolutamente no. È il futuro di Internet. Domani, due scienziati del Cern e del California Institute of Technology (CalTech) saranno premiati per aver realizzato, con i rispettivi team, il più impressionante record di velocità della storia della Rete: la trasmissione di un terabyte di dati a 7 mila chilometri di distanza con una velocità media di 5,44 gigabit per secondo.
Global Grid service for LHC computing succeeds in gigabyte-per-second challenge
12 Feb 2006

LHC Computing Grid Goes Online
29 Sep 2003

LHC Computing Centres Join Forces for Global Grid Challenge
25 Apr 2005

CERN awards the Italian Institute for Nuclear Physics for its role in Grid development
01 Dec 2004

CERN recognizes UK's outstanding contribution to Grid computing
02 Jun 2004

Let the number-crunching begin: the Worldwide LHC Computing Grid celebrates first data
03 Oct 2008

World's Largest Computing Grid Surpasses 100 Sites
15 Mar 2005

CERN launches Europe-wide tests of Grid technology
16 Sep 2002

The Grid gets real
13 Nov 2002

World's largest scientific Grid sustains a million jobs per month
25 Sep 2006

CERN Grid leadership recognized by business world
15 Sep 2006
Let the number-crunching begin: the Worldwide LHC Computing Grid celebrates first data

03 Oct 2008

Geneva, 3 October 2008. Today, three weeks after the first particle beams were injected into the Large Hadron Collider—the world’s largest particle accelerator—the Worldwide LHC Computing Grid celebrates the start of its crucial data challenge: the analysis and management of more than 15 million Gigabytes of data every year, to be produced from the hundreds of millions of subatomic collisions expected inside the LHC every second. This data-handling feat marks an essential stage in the process of enabling researchers to discover new physics.
HEP software

At most this is the result of searching for the words “CERN” and “software”…
Scientific software in press releases
S. Agostinelli et al.
**Geant4: a simulation toolkit**

Most cited publication in
- Nuclear Science and Technology
- Instruments and Instrumentation
- **Particle and Fields Physics**

Most cited CERN publication in WoS

J. Allison et al.
**Geant4 Developments and Applications**

Many papers cite the NIM paper, but they omit citing the TNS one, even though both are indicated in [http://cern.ch/geant4](http://cern.ch/geant4)

Many papers that use Geant4 do not cite either reference
Search

Enter your keywords: geant4 type:press_release language:en

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Your search yielded no results

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Enter your keywords: "monte carlo" type:press_release

Search

Advanced search

Your search yielded no results

- Check if your spelling is correct.
Simulation in press releases

Putting your computer to work to fight against malaria in Africa

13 Jul 2006

Geneva, 13 July 2006. While you are sending an email or surfing the web, your computer could be helping to tackle one of Africa’s major humanitarian challenges, malaria. Africa@home, a project conceived and coordinated by CERN, was launched publicly this week. It is recruiting volunteer computers in homes and offices to run a computer-intensive simulation program called MalariaControl.net, developed by researchers at the Swiss Tropical Institute (STI).

To install MalariaControl.net, volunteers just need to download the necessary software from the Africa@home website, which will do the scientific calculations in the background, while they are doing something else. The results are regularly returned to a server at the University of Geneva, so that the researchers can evaluate them.
Citations of HEP physics papers mostly come from journals specialized in HEP and a few related fields (astroparticle and nuclear physics)
Most recent citations MINUIT on 8 October 2013


3. F. Acero et al., Constraints on the galactic population of TeV pulsar wind nebulae using Fermi large area telescope observations, *Astrophysical Journal*, vol. 773, no. 1, p. 77, AUG 2013


Who uses MINUIT?

MINUIT citations, October 2013

Source of citations

MINUIT citations, October 2013

Source of citations
Geant 4

Born from LHC experimental requirements
Multidisciplinary sources of citations

Based on Thomson-Reuters’ Web of Science data
Conclusions

"You have to shout to be heard when it comes to getting science into the media and people to listen," said Professor Lythgoe.

Hannah Devlin Science Editor
Published at 12:01AM, June 7 2013

How loud to get HEP software into the media and HEP management to listen?
Among the citations of Higgs boson observation:
Most cited physics papers

  - Times Cited: 41831 (Physics, Condensed Matter)

  - Times Cited: 41315 (Physics, Atomic, Molecular & Chemical)
Web of Science champions

  - Times Cited: 209978

  - Times Cited: 148770