The background of the slide is a blue grid with a network of red nodes and grey lines. Overlaid on this are several mathematical plots: a heatmap in the top left, a cardioid curve in the top center, a directed graph with 7 nodes in the top right, and a sine wave in the middle right. The Sage logo is centered in large, bold, black letters. Below it, the website URL is in a white box. At the bottom, a black banner contains the text "Creating a viable free open source alternative to Magma™, Maple™, Mathematica™, and Matlab™".

**sage**

[www.sagemath.org](http://www.sagemath.org)

*Creating a viable free open source alternative to Magma™, Maple™, Mathematica™, and Matlab™*

## History: Where did Sage Come From

1997–1999 (**Berkeley**) **HECKE** – C++ (modular forms)

1999–2005 (**Berkeley, Harvard**) I wrote over 25,000 lines of **Magma** code.

Ad hoc languages and closed source devel models of Magma, Mathematica, Matlab, and Maple are **old-fashioned and painful**. I must see **inside and change anything** in my software in order to be the best in the world at my research.

**For me, Magma is a bad long-term investment.**

Feb 2005 I released **SAGE-0.1** (over 3 years ago!)

Feb 2006 **UCSD SAGE Days 1** workshop – SAGE 1.0.

October 2006 **U Washington SAGE Days 2** workshop.

March 2007 **UCLA SAGE Days 3** workshop.

May 2007 Sage NSF grant– funds Clemenet Pernet.

June 2007 **U Washington SAGE Days 4** workshop.

October 2007 **Clay Math Institute SAGE Days 5** workshop.

November 2007 **Heilbronn Institute SAGE Days 6**

Feb,Mar 2008 **IPAM Sage Days 7; Austin Sage Days 8**

June 2008 **Sage Devel Days** at UW.

Nov 2007: Sage wins first place in Tropheés du Libre and gets slashdotted...



## Science: Open Source 'Sage' Takes Aim at High End Math Software

Posted by [CmdrTaco](#) on Saturday December 08, @09:15AM  
from the [that'll-take-awhile](#) dept.

[coondoggie](#) writes

"A [new open source mathematics program](#) is looking to push aside commercial software commonly used in mathematics education, in large government laboratories and in math-intensive research. The program's backers say the software, called Sage, can do anything from mapping a 12-dimensional object to calculating rainfall patterns under global warming."



octave, sage, it, software, maxima (*tagging beta*)

[Read More...](#) | [science.slashdot.org](http://science.slashdot.org)

[259](#) of [333](#) comments

Tons of articles all over resulted, about 10,000 downloads in a weekend, etc...



### Sage: Mission Statement

Provide a uniform open source high-quality **viable alternative** to **Magma, Mathematica, Maple** and **MATLAB**.

When possible, do not reinvent the wheel but **reuse existing building blocks**, and make sure the resulting code is **rigorously tested, easy to modify** and **very well documented**.

Also create a **helpful environment** and community (mailing lists, irc-channel, workshops, coding sprints). There are 430 subscribers to sage-support.

# What is Sage?

Sage is a very large mathematics software package developed by a worldwide community of over 50 developers. Sage is:

- 1 a **distribution** of the best free, open-source mathematics software available (Sage 2.11 ships about 70 packages) that is easy to compile or install from binaries.
- 2 a **new library**, filling in gaps in functionality so Sage covers a wide range of algebraic, scientific, and statistical computing.
- 3 **interfaces** to almost all existing mathematics software packages (including Magma, PARI, Gap, Matlab, Mathematica, Maple, etc.)

# Who Funds and Supports Sage Development?



CLAY  
MATHEMATICS  
INSTITUTE



**Microsoft®**

**Google™**

# Who? 31 people contributed code just to Sage-2.11

- 1 Tim Abbott
- 2 Michael Abshoff
- 3 Martin Albrecht
- 4 Nick Alexander
- 5 **Tom Boothby**
- 6 Robert Bradshaw
- 7 Craig Citro
- 8 John Cremona
- 9 Dan Drake
- 10 Didier Deshommes
- 11 Burcin Erocal
- 12 Lars Fischer
- 13 Gary Furnish
- 14 Alex Ghitza
- 15 Jason Grout
- 16 Marshall Hampton
- 17 Carlo Hamalainen
- 18 **Mike Hansen**
- 19 Ryan Hinton
- 20 David Joyner
- 21 Michael Kallweit
- 22 **Emily Kirkman**
- 23 Robert Miller
- 24 Joel Mohler
- 25 **Yi Qiang**
- 26 R. Rishikesh
- 27 David Roe
- 28 William Stein
- 29 Jaap Spies
- 30 Justin Walker
- 31 Carl Witty

# Python Binds all things in Sage Together

**Python** is a powerful modern interpreted programming language.

- “Python is fast enough for our site and allows us to **produce maintainable features in record times**, with a minimum of developers,” said Cuong Do, Software Architect, **YouTube.com**.
- “Google has made no secret of the fact they use Python a lot for a number of internal projects. Even knowing that, once **I was an employee, I was amazed at how much Python code there actually is in the Google source code system.**”, said Guido van Rossum, **Google**, creator of Python.
- “Python plays a key role in our production pipeline. Without it a project the size of **Star Wars: Episode II** would have been very difficult to pull off. From crowd rendering to batch processing to compositing, **Python binds all things together,**” said Tommy Burnette, Senior Technical Director, **Industrial Light & Magic**.



## Python

- A mainstream language with millions of users.
- **TIOBE declares Python as programming language of 2007!** “Python has been declared as programming language of 2007. It was a close finish, but in the end Python appeared to have the largest increase in ratings in one year time (2.04%). There is no clear reason why Python made this huge jump in 2007. Last month *Python surpassed Perl* for the first time in history, which is an indication that Python has become the “de facto” glue language at system level. It is especially beloved by system administrators and build managers. Chances are high that Python’s star will rise further in 2008, thanks to the upcoming release of Python 3.”

**Cython:** compiled Python – lead developer (Robert Bradshaw at UW)

- Growing and getting used in other projects...
- Cython is for some people definitely one of the main “killer features” of Sage over Magma.

# A Powerful Web-based Graphical User Interface

public notebooks available at <http://www.sagenb.org>

The screenshot shows a web browser window titled "Copy of 2.5.1 dirichlet characters (SAGE)". The address bar shows "http://localhost:8000/home/admin/15/". The page header includes "SAGE Notebook" and user information "admin | Toggle | Home | Published | Log | Help | Sign out". The main heading is "2.5.1 dirichlet characters" with a timestamp "last edited on November 07, 2007 08:49 PM by admin". Below the heading are buttons for "Save", "Save & close", and "Discard changes". A menu bar contains "File...", "Action...", "Data...", "sage", "Print", "Use", "Edit", "Text", "Revisions", "Share", and "Publish". The content area is titled "SAGE Tutorial" and contains navigation links: "Previous: 2.5 Number Theory", "Up: 2.5 Number Theory", and "Next: 2.6 Linear Algebra". The main section is "2.5.1 Dirichlet Characters". A paragraph defines a Dirichlet character as an extension of a homomorphism  $(\mathbf{Z}/N\mathbf{Z})^* \rightarrow R^*$  to a map  $\mathbf{Z} \rightarrow R$  where  $\gcd(N, x) > 1$  maps to 0. Below this is a code editor with the following code:

```
G = DirichletGroup(21)
list(G)

[[1, 1], [-1, 1], [1, zeta6], [-1, zeta6], [1, zeta6 - 1],
[-1, zeta6 - 1], [1, -1], [-1, -1], [1, -zeta6], [-1, -zeta6],
[1, -zeta6 + 1], [-1, -zeta6 + 1]]

G.gens()

[[-1, 1], [1, zeta6]]

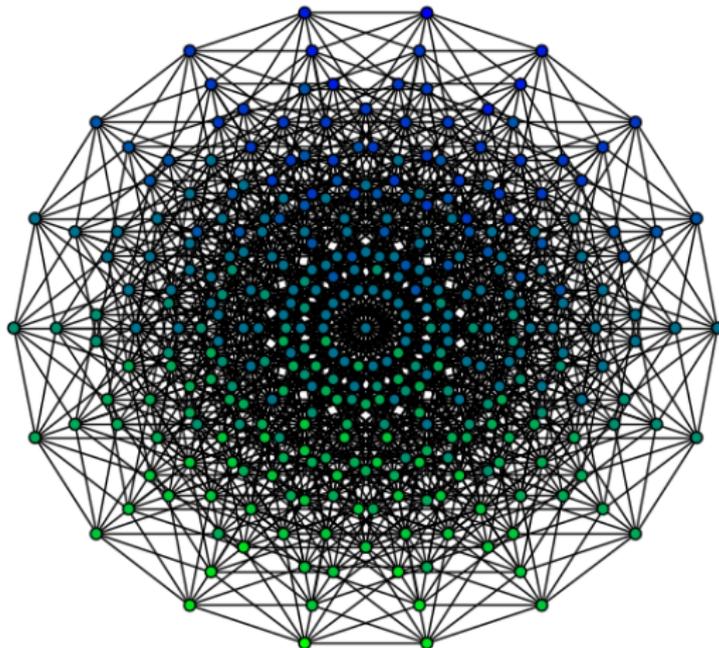
len(G)

12
```

At the bottom, a text box says "Having created the group, we next create an element and compute with it." and a "Done" button is visible.

- graphical user interface
- plotting
- LaTeX typesetting
- remote access
- worksheet sharing
- interface to 3rd party systems, e.g. Magma

# Demo



# Getting Started With Sage

Web page: <http://www.sagemath.org>

- 1 Install Sage on your computer or sign up for an account at <http://www.sagenb.org>
- 2 Thousands of pages of documentation
- 3 Mailing lists
- 4 Course on Sage this quarter at UW with video online for each lecture and a book in progress: <http://wiki.wstein.org/2008/480a>
- 5 Sage Devel Days 8.5 in June (13-20)

The logo for Sage, featuring the word "SAGE" in a stylized, bold, black font. The letters are interconnected, with the 'S' and 'A' sharing a vertical stroke, and the 'G' and 'E' sharing a horizontal stroke. The 'S' is on the left, followed by 'A', 'G', and 'E' on the right.