



Send a release

Member sign in

Become a member

For journalists

Global sites

Search

Advanced

☐ Products & Services

☐ News Rel

Products & Services

Knowledge Center

Browse News Releases

Contact PR Newswire

See more news releases in: [Education](#)

# NASA's Gravity Probe B Confirms Two Einstein Space-Time Theories

0

Like

0

Tweet

0

Share

WASHINGTON, May 4, 2011 /PRNewswire-USNewswire/ -- NASA's Gravity Probe B (GP-B) mission has confirmed two key predictions derived from Albert Einstein's general theory of relativity, which the spacecraft was designed to test.

(Logo: <http://photos.prnewswire.com/prnh/20081007/38461LOGO>)



The experiment, launched in 2004, used four ultra-precise gyroscopes to measure the hypothesized geodetic effect, the warping of space and time around a gravitational body, and frame-dragging, the amount a spinning object pulls space and time with it as it rotates.

GP-B determined both effects with unprecedented precision by pointing at a single star, IM Pegasi, while in a polar orbit around Earth. If gravity did not affect space and time, GP-B's gyroscopes would point in the same direction forever while in orbit. But in confirmation of Einstein's theories, the gyroscopes experienced measurable, minute changes in the direction of their spin, while Earth's gravity pulled at them.

The findings are online in the journal Physical Review Letters.

"Imagine the Earth as if it were immersed in honey. As the planet rotates, the honey around it would swirl, and it's the same with space and time," said Francis Everitt, GP-B principal investigator at Stanford University. "GP-B confirmed two of the most profound predictions of Einstein's universe, having far-reaching implications across astrophysics research. Likewise, the decades of technological innovation behind the mission will have a lasting legacy on Earth and in space."

GP-B is one of the longest running projects in NASA history, with agency involvement starting in the fall of 1963 with initial funding to develop a relativity gyroscope experiment. Subsequent decades of development led to groundbreaking technologies to control environmental disturbances on spacecraft, such as aerodynamic drag, magnetic fields and thermal variations. The mission's star tracker and gyroscopes were the most precise ever designed and produced.

GP-B completed its data collection operations and was decommissioned in December 2010.

"The mission results will have a long-term impact on the work of theoretical physicists," said Bill Danchi, senior astrophysicist and program scientist at NASA Headquarters in Washington. "Every future challenge to Einstein's theories of general relativity will have to seek more precise measurements than the remarkable work GP-B accomplished."

Innovations enabled by GP-B have been used in GPS technologies that allow airplanes to land unaided. Additional GP-B technologies were applied to NASA's Cosmic Background Explorer mission, which accurately determined the universe's background radiation. That measurement is the underpinning of the big-bang theory, and led to the Nobel Prize for NASA physicist John Mather.

The drag-free satellite concept pioneered by GP-B made a number of Earth-observing satellites possible, including NASA's Gravity Recovery and Climate Experiment and the European Space Agency's Gravity field and steady-state Ocean Circulation Explorer. These satellites provide the most precise measurements of the shape of the Earth, critical for precise navigation on land and sea, and understanding the relationship between ocean circulation and climate patterns.

GP-B also advanced the frontiers of knowledge and provided a practical training ground for 100 doctoral students and 15 master's degree candidates at universities across the United States. More than 350 undergraduates and more than four dozen high school students also worked on the project with leading scientists and aerospace engineers from industry and government. One undergraduate student who worked on GP-B became the first American woman in space, Sally Ride. Another was Eric Cornell who won the Nobel Prize in Physics in 2001.

"GP-B adds to the knowledge base on relativity in important ways and its positive impact will be felt in the careers of students whose educations were enriched by the project," said Ed Weiler, associate administrator for the Science Mission Directorate at NASA Headquarters.

NASA's Marshall Space Flight Center in Huntsville, Ala., managed the Gravity Probe-B program for the agency. Stanford University, NASA's prime contractor for the mission, conceived the experiment and was responsible for the design and integration

Winners of Trend Micro's 2011 Your Story?™ Internet Safety Vi Contest Challenge Youth to Ma Positive Choices

Print Email

Share it ▼

Blog it ▼

Blog Search ▼

## More in These Categories

### Education

The NAMM Foundation: Reco Number of Programs Earn Distinction As 'A Best Commu Music Education'

New Jersey Students and Lee to be Honored at 31st Govern Awards in Arts Education

El CHCI anuncia la incorpor nuevos miembros al Consejo para el periodo 2011-12

### Federal Executive Bran Agency

### Most Read

### Most Emailed

## Journalists and Blo



Visit PR Newswire for Jou for releases, photos, Profit experts, and customized fi just for Media.

View and download **archi**

of the science instrument, mission operations and data analysis. Lockheed Martin Corp. of Huntsville designed, integrated and tested the space vehicle and some of its major payload components.

For more information about Gravity Probe B, visit:

[http://www.nasa.gov/mission\\_pages/gpb/](http://www.nasa.gov/mission_pages/gpb/)

and

<http://einstein.stanford.edu/>

SOURCE NASA

[Back to top](#)

RELATED LINKS

<http://www.nasa.gov>

0

 Like

0

 Tweet

0

 Share

[Next in Education News](#)

Custom Packages

Browse our custom packages or build your own to meet your unique communications needs.

[Start today.](#)

Become a Member

[Fill out a PR Newswire membership form](#) or contact us at (888) 776-0942.

Contact PR Newswire

[Request more information](#) about PR Newswire products and services or call us at (888) 776-0942

**video** content distributed l  
MultiVu on The Digital Cer



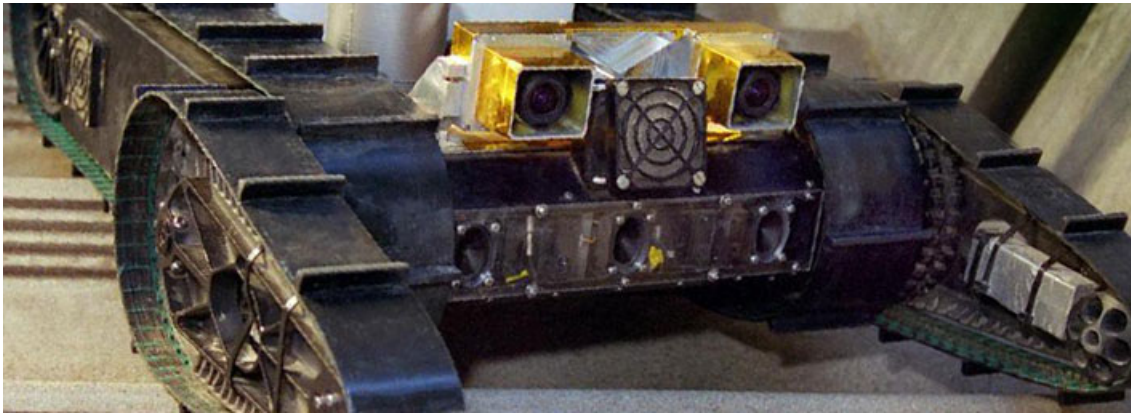
Join the  
Investment Revolut

Global growth is fueling ex  
growth. It's time to discove  
profit from leading compar

Visit Investor Uprising to t  
advantage of Market Blog:  
IU Education and our late  
Confidential Report - "All 1  
Glitters: The Ultimate Golc  
Report".

[› Log In To MyNASA](#) | [› Sign Up](#)

**For Public** | [For Educators](#) | [For Students](#) | [For Media](#) | [For Policymakers](#) | [For Employees](#) | [MyNASA](#)



**NASA Technology Looks Inside Japan's Nuclear Reactor**

Design techniques honed at NASA's Jet Propulsion Laboratory in Pasadena, Calif., for Mars rovers were used to create the rover currently examining the inside of Japan's nuclear reactors, in areas not yet deemed safe for human crews.

[› Learn More](#) | [› More on the Japan Quake and Tsunami](#)

|    |    |    |    |    |    |    |     |
|----|----|----|----|----|----|----|-----|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | III |
|----|----|----|----|----|----|----|-----|

**NASA Images**

Image of the Day      [nasaimages.org](#)



**Training Flight**

European Space Agency astronaut Roberto Vittori, a member of the STS-134 crew, is pictured in the rear station of a NASA T-38 trainer jet at Ellington...

**NASA Multimedia**



**Videos**  
**Alan Shepard - Ambassador of Exploration**

[› More Videos](#)



**NASA Television**  
**Watch Live Now**

[› View TV Schedule](#)



**Interactive Features**  
**Alan Shepard: Freedom 7**

[› More Interactive Features](#)



**Podcasts & Vodcasts**  
**This Week @ NASA, April 29, 2011**

**@NASA Twitter Up**

Check out photos from two new stamps co Alan Shepard and the spacecraft at [link](#) about 5 hours ago

NASA's Phil McAlister with the BBC today feature on commercial will air globally on the about 5 hours ago

Here are new NASA celebrating Alan Shepard flight & the MESSENGER

**Get NASA Updates**

Enter E-mail Address

Powered by Gov Delivery