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FOR IMMEDIATE RELEASE

**Freedman, Kennicutt, and Mould Share \$500,000 Gruber Cosmology Prize for Their Work on Resolving the Value of the Hubble Constant, the Key Determinant for How Fast the Universe Is Expanding**

*August 3, 2009, New York, New York* - Thousands of scientists, including many of today's top astronomers and cosmologists, will be in Rio de Janeiro this week when renowned astronomers Wendy Freedman, Robert Kennicutt and Jeremy Mould receive the 2009 Gruber Cosmology Prize for their breakthrough work in helping establish the age of the Universe.

The Peter and Patricia Gruber Foundation will present the \$500,000 Prize and gold lapel medals to the three distinguished scientists during the Inaugural Ceremony of the XXVII General Assembly of the International Astronomical Union on August 4. The following day, the recipients will deliver a joint lecture on "Measuring the Hubble Constant with the Hubble Space Telescope."

Also being recognized at the assembly is Dr. M.B.N. Kouwenhoven, a young researcher at the University of Sheffield, UK, who is the 2009 recipient of a \$50,000 Gruber IAU Fellowship.

As the world marks 2009 as "The Year of Astronomy," the Gruber Foundation also celebrates the 10<sup>th</sup> anniversary of its international Prize program, which began with the Cosmology Prize. This year's Prize honors three scientists who are widely recognized for answering one of the biggest cosmological questions.

Wendy Freedman, director of the Observatories of the Carnegie Institution of Washington in Pasadena, California; Robert Kennicutt, director of the Institute of Astronomy at the University of Cambridge in England; and Jeremy Mould, professorial fellow at the University of Melbourne School of Physics, are being recognized for their leadership in the definitive measurement of the value of the Hubble constant, one of the most important numbers in astronomy. The Hubble constant indicates the rate at which the universe has been expanding since the "Big Bang," thus connecting the universe's age with its size.

"The Hubble constant ties time and space together," says Professor Ron Ekers, past President of the IAU. "As soon as Hubble saw that the universe was expanding, astronomers recognized that this number was the key to understanding the universe's history. It is most appropriate that in the International Year of Astronomy the Gruber Foundation has awarded the Cosmology prize to the team that has made the definitive measurement of the Hubble constant. Galileo's observations answered the question of where we are in the universe – these Hubble Space Telescope observations answer mankind's quest to know how big and how old it is."

The precise value of the Hubble constant was hotly debated for decades—ever since 1929, when the American astronomer Edwin P. Hubble first realized that the galaxies are moving away from each other at a speed proportional to their distance. The galaxies farthest away are receding the fastest, he determined. But how fast? Initially, Hubble calculated a speed of 500 kilometers per second per megaparsec (km/s/Mpc). (A megaparsec is 3.26 million light years, and a light year is about 5.9 trillion miles.) By the 1980s, scientists had narrowed the Hubble constant to within 50 and 100 km/s/Mpc, but they did not agree on whether the value was at the high or low end of this range. A low number would indicate a slow expansion—and, thus, a universe about 20 billion years old. A high number would suggest a fast expansion—and a relatively young universe of about 10 billion years.

Freedman, Kennicutt, and Mould essentially resolved this long-standing dispute. They led the Hubble Space Telescope Key Project on the Extragalactic Distance Scale, one of the three major projects of the Hubble Space Telescope when it was launched in 1990. Working with a team of more than two dozen astronomers at 13 different institutions around the world, Freedman, Kennicutt, and Mould determined that the best value of the Hubble constant is 72 km/s/Mpc, with an uncertainty of only 10 percent. This finding, which was published in final form in 2001, means the universe is 14 billion years old—which agrees with the age estimates for the oldest stars.

To reach its conclusion about the value of the Hubble constant, the Hubble Space Telescope Key Project team observed Cepheids, extremely bright, pulsating stars whose periodic brightening and dimming provide a reliable "standard candle" that astronomers can use to estimate extragalactic distances. During the ten-year life of the project, the team discovered almost 800 Cepheids in 18 galaxies, and used a wide variety of methods for meticulously measuring and analyzing their distances.

The resolution of the decades-long debate about the value of the Hubble constant is enabling scientists to answer fundamental questions about the universe. For example, in addition to reconciling the age of the universe (the time since the Big Bang) with the

ages of the oldest stars, astronomers are now able to more accurately estimate the density of the universe—a factor that will determine the fate of the universe, whether it expands forever, as most cosmologists currently believe, or eventually collapses back on itself.

“Generations of astronomers have worked to frame the question – how fast is the universe expanding? – and then to discover how to measure the answer,” says Philip James E. Peebles, Albert Einstein Professor of Science and professor emeritus of physics at Princeton University. “Freedman, Kennicutt, Mould and their colleagues have at last completed this great task. The result is an essential part of the web of tests that show how our universe has expanded from a hot dense state.”

### Additional Information

The official citation reads: *The Peter and Patricia Gruber Foundation proudly presents the 2009 Cosmology Prize to Wendy Freedman, Robert Kennicutt and Jeremy Mould for the definitive measurement of the rate of expansion of the universe, Hubble's Constant. This parameter effectively determines the age of the universe at the current time and underpins every other basic cosmological measurement.*

*An accurate measurement of the expansion rate was one of three major goals of the Hubble Space Telescope when it was launched in 1990. From meticulous measurements of a particular kind of variable star, the Cepheids, Freedman, Kennicutt and Mould met this goal, resolving one of the longest-standing debates in the history of modern cosmology.*

### Laureates of the Gruber Cosmology Prize

- **2008: J. Richard Bond** for his pioneering contributions to our understanding of the development of structures in the universe
- **2007: Saul Perlmutter** and **Brian Schmidt** and their teams: the **Supernova Cosmology Project** and the **High-z Supernova Search Team**, for independently discovering that the expansion of the universe is accelerating
- **2006: John Mather** and the **Cosmic Background Explorer (COBE) Team** for studies confirming that our universe was born in a hot Big Bang
- **2005: James E. Gunn** for leading the design of a silicon-based camera for the Hubble Space Telescope and developing the original concept for the Sloan Digital Sky Survey
- **2004: Alan Guth** and **Andrei Linde** for their roles in developing and refining the theory of cosmic inflation

- **2003: Rashid Alievich Sunyaev** for his pioneering work on the nature of the cosmic microwave background and its interaction with intervening matter
- **2002: Vera Rubin** for discovering that much of the universe is unseen black matter, through her studies of the rotation of spiral galaxies
- **2001: Martin Rees** for his extraordinary intuition in unraveling the complexities of the universe
- **2000: Allan R. Sandage and Phillip J. E. (Jim) Peebles:** Sandage for pursuing the true values of the Hubble constant, the deceleration parameter and the age of the universe; Peebles for advancing our understanding of how energy and matter formed the rich patterns of galaxies observed today

The Prize recipients are chosen by the Cosmology Selection Advisory Board. Its members are:

Jacqueline Bergeron, Institut d'Astrophysique-CNRS; Peter Galison, Harvard University; Ronald Ekers, Australia Telescope National Facility - CSIRO; Andrei Linde, Stanford University; Julio F. Navarro, University of Victoria; James Peebles, Princeton University; Roger Penrose, University of Oxford. Owen Gingerich of the Harvard-Smithsonian Center for Astrophysics, and Virginia Trimble of the University of California, Irvine, also serve as special cosmology advisors to the Foundation.

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The Gruber International Prize Program honors contemporary individuals in the fields of Cosmology, Genetics, Neuroscience, Justice and Women's Rights, whose groundbreaking work provides new models that inspire and enable fundamental shifts in knowledge and culture. The Selection Advisory Boards choose individuals whose contributions in their respective fields advance our knowledge, potentially have a profound impact on our lives, and, in the case of the Justice and Women's Rights Prizes, demonstrate courage and commitment in the face of significant obstacles.

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The Peter and Patricia Gruber Foundation honors and encourages educational excellence, social justice and scientific achievements that better the human condition. For more information about Foundation guidelines and priorities, please visit [www.gruberprizes.org](http://www.gruberprizes.org).

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### Affiliation with the International Astronomical Union

Since 2000, the IAU has contributed scientific integrity to the Cosmology Prize of the Gruber Foundation and joins the Foundation's efforts to encourage early career scientists through the Gruber IAU fellowship for young astronomers. Every third year the Gruber Cosmology Prize is awarded at the General Assembly meeting. More information is available from: [www.iau.org](http://www.iau.org).

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For more information on the Gruber Prizes email [media@gruberprizes.org](mailto:media@gruberprizes.org) or contact Bernetia Akin of the Gruber Foundation at +1 (340) 775-8035 or by mail 140 W 57th St Suite 10C New York, NY 10019.

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