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FILIPPENKO, NOMOTO, AND WOOSLEY RECEIVE $500,000 GRUBER COSMOLOGY PRIZE FOR THEIR STUDIES OF SUPERNOVAE

Alexei V. Filippenko

Ken'ichi Nomoto

Stanford Woosley

May 19, 2026, New Haven, CT — The 2026 Gruber Cosmology Prize honors Alexei V. Filippenko, Ken'ichi Nomoto, and Stanford Woosley for their decades-long studies of supernovae—exploding stars that have proven invaluable in understanding the composition and evolution of the Universe.

Filippenko, Nomoto, and Woosley will evenly divide the $500,000 award, which they will receive on November 10 at the "Illuminating the Cosmos" conference at the Max Planck Institute for Astronomy and House of Astronomy in Heidelberg, Germany. The official citation honors them for "transforming supernovae from poorly understood stellar explosions into the basis for a quantitative, predictive, and empirically validated framework."

The three recipients have studied supernovae through complementary approaches, Filippenko as an observer and Nomoto and Woosley as theorists.

Observations of the sudden appearance of a new star, or nova, in the night sky date to ancient times. Not until the 1930s, however, did astronomers adopt the term supernova to differentiate between two types of bright stars. A nova brightens intensely before returning to its previous level of luminosity, while a supernova ends the star's life in a display of fireworks tens of thousands of times brighter than a nova.

The supernova work of Filippenko (University of California, Berkeley), Nomoto (The University of Tokyo), and Woosley (University of California, Santa Cruz) has fundamentally influenced cosmology in multiple ways:

• Dark energy. By the 1940s, astronomers knew that supernovae come in at least two varieties, Type I (those that do not contain hydrogen) and Type II (those that do). Filippenko's observations helped identify three Type I subcategories, including Type Ia (the other two being Ib and Ic, which physicists now know

possess different origins). By the early 1980s, some astrophysicists hypothesized that Type Ia arise when a variety of star called a white dwarf accretes enough mass from a close companion star that it triggers a thermonuclear explosion. In constructing theoretical models of Type Ia, Nomoto and Woosley independently studied the evolution of white dwarfs as they accrete mass and found that the white dwarf explosions are in good agreement with the observational features of Type Ia. However, Filippenko discovered that Type Ia supernovae come in several varieties whose peak luminosities, durations, and chemical compositions differ. These observational and theoretical works were crucial to the research programs of two rival collaborations of astrophysicists that, in the late 1990s, independently concluded the expansion of the Universe is accelerating under the influence of (a still-mysterious) "dark energy." (Filippenko was a member of both teams, although not at the same time, and therefore shared in each of their 2007 Gruber Prizes in Cosmology.)

• Supernova observations. Filippenko conceived the Lick Observatory Supernova Search, which from 1998 to 2008 found more relatively nearby supernovae than all other searches worldwide combined, and which therefore served as both an important resource in the suddenly burgeoning field of supernovae research as well as the progenitor for later all-sky supernova surveys. In addition, he continued to work on identifying subtleties in the observed properties of

Type Ia supernovae (such as yet additional variations of this subclass) that further improved their reliability as measures of cosmic distances, he explored the use of Type II supernovae for cosmology, and he studied many different additional kinds of supernovae. Most of this research was conducted with the telescopes at Lick (California) and Keck (Hawaii) Observatories.

• Supernova models. Nomoto and Woosley independently worked on models of both Type Ia and Type II supernovae. In their Type Ia models, they found that the rate at which a white dwarf accretes mass from a companion star will determine the nature of its thermonuclear demise. In their Type II models, they predicted the precise measures of the properties of those catastrophic events—luminosity, chemical composition, temperature—as well as what those events leave behind—neutron stars and black holes. They found that some of these events could even produce the most energetic phenomena in the Universe, gamma ray bursts, and that the accompanying supernovae would so luminous and energetic as to be worthy of a new designation: hypernovae.

• Nucleosynthesis. While physicists have known since the 1950s that successive generations of exploding stars seed the Universe with heavier and heavier elements (due to thermonuclear reactions), Woosley (along with collaborator Tom Weaver) and Nomoto calculated just how much of each element the various masses and kinds of supernovae made and showed that the total agreed with what we see in the Sun and other stars. In so doing, Woosley and Nomoto turned the study of supernovae into a predictive science.

Taken together, as the Gruber Prize citation says, Filippenko, Nomoto, and Woosley's "trail-blazing work links stellar evolution, explosive nucleosynthesis, the origin of heavy elements, and the chemical evolution of the Universe, and supports the use of supernovae for precision cosmology."

Additional Information

In addition to the cash award, each recipient will receive a gold laureate pin and a citation that reads:

The Gruber Foundation is pleased to present the 2026 Gruber Cosmology Prize to Alexei V. Filippenko, Ken'ichi Nomoto and Stanford E. Woosley for transforming supernovae from poorly understood stellar explosions into the basis for a quantitative, predictive and empirically validated framework: their trail-blazing work links stellar evolution, explosive nucleosynthesis, the origin of heavy elements, and the chemical evolution of the universe, and supports the use of supernovae for precision cosmology.

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The Cosmology Prize honors a leading cosmologist, astronomer, astrophysicist or scientific philosopher for theoretical, analytical, conceptual or observational discoveries leading to fundamental advances in our understanding of the universe.

Laureates of the Gruber Cosmology Prize:

- **2025 Ryan Cooke and Max Pettini** for bringing the light element abundances and Big Bang Nucleosynthesis (BBN) into the realm of precision cosmology.
- **2024 Marcia Rieke**, for pioneering work on astronomical instrumentation to reveal the breadth and details of the infrared universe
- **2023 Richard S. Ellis,** for contributions in galaxy evolution, onset of cosmic dawn and reionization in the high redshift universe, and detection of earliest galaxies via the Hubble Ultra Deep Field study
- **2022 Frank Eisenhauer,** designed instruments that collected evidence for a black hole at the center of our galaxy
- **2021 Marc Kamionkowski, Uroš Seljak, and Matias Zaldarriaga,** for contributions to methods essential for studying the early universe
- **2020**: **Lars Hernquist** and **Volker Springel,** for computer simulations that revolutionized the study of processes behind the structure of the cosmos
- **2019: Nicholas Kaiser** and **Joseph Silk,** revolutionized cosmology with contributions to two of its vital components: dark matter and relic radiation from the Big Bang
- **2018: The Planck Team, Jean-Loup Puget** and **Nazzareno Mandolesi,** for measuring the universe's contents and the geometry and test inflation with unparalleled precision
- **2017: Sandra M. Faber,** for a body of work that has helped establish many of the foundational principles underlying the modern understanding of the universe on the largest scales
- **2016: Rainer Weiss, Kip Thorne, Ronald Drever,** and the entire **LIGO team,** for a first detection of gravitational waves that emanated from the collision of two black holes
- **2015: John Carlstrom, Jeremiah Ostriker,** and **Lyman Page**, for their individual and collective contributions to the study of the universe on the largest scales
- **2014: Jaan Einasto, Kenneth Freeman, Brent Tully** and **Sidney van den Bergh,** for pioneering contributions to the understanding of the structure and composition of the nearby Universe
- **2013: Viatcheslav Mukhanov** and **Alexei Starobinsky,** for contributions to inflationary cosmology and the theory of inflationary perturbations of the metric, which changed our views on the origin of our universe and on the mechanism of formation of its structure

- **2012: Charles Bennett** and the **WMAP Team,** for their exquisite measurements of anisotropies in the relic radiation from the Big Bang---the Cosmic Microwave Background
- **2011: Marc Davis, George Efstathiou, Carlos Frenk**, **Simon White,** pioneering use of numerical simulations to model and interpret the large-scale distribution of matter in the Universe
- **2010: Charles Steidel,** for his groundbreaking studies of the distant Universe
- **2009: Wendy Freedman, Robert Kennicutt** and **Jeremy Mould,** for the definitive measurement of the rate of expansion of the universe, Hubble's Constant
- **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 International Astronomical Union partners with the Foundation on the Prize and nominates the members of the Selection Advisory Board that chooses the Prize recipients. Its members are:

Mihalis Dafermos, Princeton University; **Luis Ho,** Kavli Institute for Astronomy and Astrophysics at Peking University (Chair); **John Peacock,** The University of Edinburgh; **Christopher Smeenk,** Western University; **Suzanne Staggs,** Princeton University; **Véronique Van Elewyck,** Université Paris Cité; **Licia Verde**, Universitat de Barcelona. **Wendy Freedman** of The University of Chicago and **Robert Kennicutt** of The University of Arizona also serve as special Cosmology advisors to the Foundation.

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The Gruber International Prize Program honors individuals in the fields of Cosmology, Genetics and Neuroscience, 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 and potentially have a profound impact on our lives.

The Gruber Foundation was established in 1993 by the late Peter Gruber and his wife Patricia Gruber. The Foundation began its International Prize Program in 2000, with the inaugural Cosmology Prize.

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For more information on the Gruber Prizes, visit www.gruber.yale.edu, e-mail info@gruber.yale.edu or contact A. Sarah Hreha at +1 (203) 432-6231. By mail: The Gruber Foundation, Yale University, Office of International Affairs, PO Box 208320, New Haven, CT 06520.

Media materials and additional background information on the Gruber Prizes are in our online newsroom: https://gruber.yale.edu/news-media

More information about the "Illuminating the Cosmos" conference is available here: https://indico.nbi.ku.dk/event/2262/

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