2011 nobel prize physics

2011 Nobel Prize in Physics: Accelerating Our Understanding of the Universe

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Introduction: The 2011 Nobel Prize in Physics was awarded for groundbreaking discoveries concerning the expansion of the universe. This prestigious award recognized the monumental work of Saul Perlmutter, Brian P. Schmidt, and Adam G. Riess, who independently led teams that used observations of distant supernovae to demonstrate that the expansion of the universe is not only occurring, but is accelerating. This discovery, shocking to the scientific community at the time, revolutionized our understanding of cosmology and introduced the concept of dark energy, a mysterious force that makes up the majority of the universe's energy density. This article delves deep into the 2011 Nobel Prize in Physics, exploring the research, its significance, and its lasting impact on our understanding of the cosmos.

The Accelerating Universe: A Paradigm Shift

The prevailing cosmological model in the late 20th century predicted that the expansion of the universe, initiated by the Big Bang, should be slowing down due to the gravitational attraction of matter. However, the research teams led by Perlmutter, Schmidt, and Riess, using observations of Type Ia supernovae as "standard candles," painted a dramatically different picture. Type Ia supernovae, resulting from the explosive death of white dwarf stars, offer a remarkably consistent brightness, making them ideal for measuring cosmic distances.

By meticulously observing these distant supernovae, both teams independently discovered that they were fainter than expected, implying that they were farther away than predicted by a decelerating universe model. This unexpected result led to the stunning conclusion: the expansion of the universe is not slowing down; it is accelerating. This finding was so unexpected and profound that it initially met with skepticism, but subsequent observations and independent confirmations solidified its validity. The 2011 Nobel Prize in Physics rightfully celebrated this paradigm shift in our understanding of the universe.

The Role of Supernovae in the 2011 Nobel Prize in Physics

The success of the research hinged on the careful selection and analysis of Type Ia supernovae. These supernovae, due to their consistent intrinsic luminosity, serve as powerful tools for measuring cosmic distances. By comparing the observed brightness of these distant supernovae with their expected brightness based on the redshift (a measure of the stretching of light due to the expansion of the universe), the teams were able to accurately determine the rate of expansion at different epochs in the universe’s history. The meticulous data collection, rigorous analysis, and innovative techniques employed by these teams were instrumental in achieving the accuracy needed to reveal the accelerating expansion. The 2011 Nobel Prize in Physics highlighted the power of observational astronomy and the importance of precision in scientific measurement.

Dark Energy: The Mysterious Force Driving Expansion

The accelerating expansion of the universe implied the existence of a mysterious force, dubbed "dark energy," acting against gravity. Dark energy constitutes approximately 68% of the universe's energy density and exerts a repulsive gravitational effect, counteracting the attractive force of matter and dark matter. The nature of dark energy remains one of the biggest unsolved mysteries in modern cosmology. The 2011 Nobel Prize in Physics underscored the need for further research to understand this elusive force, which fundamentally shapes the evolution and fate of the cosmos. This discovery opened a new frontier in physics, prompting a surge in theoretical and observational research to elucidate the nature of dark energy.

Significance and Relevance of the 2011 Nobel Prize in Physics

The 2011 Nobel Prize in Physics marks a significant milestone in our understanding of the universe. The discovery of the accelerating expansion has profoundly impacted cosmology, forcing a reevaluation of fundamental cosmological models. It has spurred intense research into dark energy, opening up new avenues for theoretical physics and observational astronomy. The work recognized by the 2011 Nobel Prize in Physics has not only expanded our understanding of the universe's evolution but has also broadened our awareness of the vast unknowns that still lie before us. The award highlights the importance of persistent scientific inquiry and the power of collaborative research in pushing the boundaries of human knowledge.

Conclusion:

The 2011 Nobel Prize in Physics stands as a testament to the power of observation and the relentless pursuit of scientific truth. The discovery of the accelerating expansion of the universe, driven by the mysterious dark energy, represents a paradigm shift in our cosmological understanding. The work of Perlmutter, Schmidt, and Riess has profoundly impacted our view of

the cosmos, opening new avenues of inquiry and fueling ongoing research aimed at unraveling the mysteries of dark energy and the ultimate fate of the universe. The legacy of the 2011 Nobel Prize in Physics continues to inspire and guide future generations of scientists as we strive to comprehend the universe’s intricate workings.

FAQs:

1. What is dark energy? Dark energy is a mysterious force that constitutes about 68% of the universe's energy density and is responsible for the accelerating expansion of the universe. Its nature remains unknown.

1. What are Type Ia supernovae? Type Ia supernovae are stellar explosions with remarkably consistent brightness, making them excellent "standard candles" for measuring cosmic distances.

1. How did the discovery of the accelerating universe impact cosmology? It forced a major revision of cosmological models, leading to the introduction of dark energy as a dominant component of the universe.

1. Who were the recipients of the 2011 Nobel Prize in Physics? Saul Perlmutter, Brian P. Schmidt, and Adam G. Riess.

1. What observational techniques were used in this research? Observations of distant Type Ia supernovae, measuring their brightness and redshift.

1. What is redshift? Redshift is the stretching of light waves due to the expansion of the universe, causing the light to appear redder.

1. What is the significance of "standard candles" in cosmology? Standard candles are objects with known intrinsic luminosity, allowing astronomers to determine their distance based on their observed brightness.

1. What are some ongoing research areas related to dark energy? Observational efforts to better constrain dark energy properties, and theoretical work to develop models explaining its nature.

1. What is the future of research on dark energy and the accelerating universe? Future research will likely involve more precise measurements of the expansion rate and the properties of dark energy, as well as the development of new theoretical frameworks to explain its existence.

Related Articles:

1. "The Accelerating Universe: A History of Discovery": A comprehensive historical overview of the research leading to the discovery of the accelerating expansion.

1. "Type Ia Supernovae as Cosmological Probes": A detailed technical article focusing on the use of Type Ia supernovae in cosmology.

1. "Dark Energy: The Biggest Mystery in the Universe": A popular science article discussing the nature of dark energy and its implications.

1. "The Nobel Prize in Physics 2011 – Advanced Information": The official Nobel Prize website's detailed explanation of the award.

1. "Saul Perlmutter's Contributions to Cosmology": A biography and overview of Perlmutter's research career.

1. "Brian Schmidt's Work on the Accelerating Universe": A profile of Schmidt's contributions to the field.

1. "Adam Riess's Research on Supernovae and Cosmology": A look at Riess's research and his role in the discovery.

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2011 nobel prize physics: The Extravagant Universe Robert P. Kirshner, 2016-09-13 The Extravagant Universe tells the story of a remarkable adventure of scientific discovery. One of the world's leading astronomers, Robert Kirshner, takes readers inside a lively research team on the quest that led them to an extraordinary cosmological discovery: the expansion of the universe is accelerating under the influence of a dark energy that makes space itself expand. In addition to sharing the story of this exciting discovery, Kirshner also brings the science up-to-date in a new epilogue. He explains how the idea of an accelerating universe--once a daring interpretation of sketchy data--is now the standard assumption in cosmology today. This measurement of dark energy--a quality of space itself that causes cosmic acceleration--points to a gaping hole in our understanding of fundamental physics. In 1917, Einstein proposed the cosmological constant to explain a static universe. When observations proved that the universe was expanding, he cast this early form of dark energy aside. But recent observations described first-hand in this book show that the cosmological constant--or something just like it--dominates the universe's mass and energy budget and determines its fate and shape. Warned by Einstein's blunder, and contradicted by the initial results of a competing research team, Kirshner and his colleagues were reluctant to accept their own result. But, convinced by evidence built on their hard-earned understanding of exploding stars, they announced their conclusion that the universe is accelerating in February 1998. Other lines of inquiry and parallel supernova research now support a new synthesis of a cosmos dominated by dark energy but also containing several forms of dark matter. We live in an extravagant universe with a surprising number of essential ingredients: the real universe we measure is not the simplest one we could imagine.

2011 nobel prize physics: *The Nobel Prize* Burton Feldman, 2000 Discusses the Nobel

Institution in detail, telling about the award and its beginnings, what it means to win a Nobel Prize, the fields in which it is presented, who judges and how the prize is awarded, and more.

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2011 nobel prize physics: Nobel Prizes that Changed Medicine Gilbert Thompson, 2012 This book brings together in one volume fifteen Nobel Prize-winning discoveries that have had the greatest impact upon medical science and the practice of medicine during the 20th century and up to the present time. Its overall aim is to enlighten, entertain and stimulate. This is especially so for those who are involved in or contemplating a career in medical research. Anyone interested in the particulars of a specific award or Laureate can obtain detailed information on the topic by accessing the Nobel Foundation''s website. In contrast, this book aims to provide a less formal and more personal view of the science and scientists involved, by having prominent academics write a chapter each about a Nobel Prize-winning discovery in their own areas of interest and expertise.

2011 nobel prize physics: For the Love of Physics Walter Lewin, Warren Goldstein, 2011 Original publication and copyright date: 2011.

2011 nobel prize physics: The Theory of Electrons and Its Applications to the Phenomena of Light and Radiant Heat Hendrik Antoon Lorentz, 1916

2011 nobel prize physics: The Accidental Universe Alan Lightman, 2014-01-14 The bestselling author of Einsteins Dreams explores the emotional and philosophical questions raised by

recent discoveries in science with passion and curiosity. He looks at the dialogue between science and religion; the conflict between our human desire for permanence and the impermanence of nature; the possibility that our universe is simply an accident; the manner in which modern technology has separated us from direct experience of the world; and our resistance to the view that our bodies and minds can be explained by scientific logic and laws. Behind all of these considerations is the suggestion--at once haunting and exhilarating--that what we see and understand of the world is only a tiny piece of the extraordinary, perhaps unfathomable whole.

2011 nobel prize physics: The Martians of Science István Hargittai, 2008 Hargittai tells the story of five remarkable Hungarians: Wigner won a Nobel Prize in theoretical physics; Szilard was the first to see that a chain reaction based on neutrons was possible, initiated the Manhattan Project, but left physics to try to restrict nuclear arms; von Neumann could solve difficult problems in his head and developed the modern computer for more complex problems; von Kármán became the first director of NASA's Jet Propulsion Laboratory, providing the scientific basis for the U.S. Air Force; and Teller was the father of the hydrogen bomb, whose name is now synonymous with the controversial Star Wars initiative of the 1980s.

2011 nobel prize physics: Cosmology’s Century P. J. E. Peebles, 2022-04-26 From Nobel Prize–winning physicist P. J. E. Peebles, the story of cosmology from Einstein to today Modern cosmology began a century ago with Albert Einstein's general theory of relativity and his notion of a homogenous, philosophically satisfying cosmos. Cosmology's Century is the story of how generations of scientists built on these thoughts and many new measurements to arrive at a well-tested physical theory of the structure and evolution of our expanding universe. In this landmark book, one of the world's most esteemed theoretical cosmologists offers an unparalleled personal perspective on how the field developed. P. J. E. Peebles was at the forefront of many of the greatest discoveries of the past century, making fundamental contributions to our understanding of the presence of helium and microwave radiation from the hot big bang, the measures of the distribution and motion of ordinary matter, and the new kind of dark matter that allows us to make sense of these results. Taking readers from the field's beginnings, Peebles describes how scientists working in independent directions found themselves converging on a theory of cosmic evolution interesting enough to warrant the rigorous testing it passes so well. He explores the major advances—some inspired by remarkable insights or perhaps just lucky guesses—as well as the wrong turns taken and the roads not explored. He shares recollections from major players in this story and provides a rare, inside look at how science is really done. A monumental work, Cosmology's Century also emphasizes where the present theory is incomplete, suggesting exciting directions for continuing research.

2011 nobel prize physics: The Feynman Lectures on Physics, Vol. III Richard P. Feynman, Robert B. Leighton, Matthew Sands, 2011-10-04 New edition features improved typography, figures and tables, expanded indexes, and 885 new corrections.

2011 nobel prize physics: *The Detection of Gravitational Waves* David G. Blair, 2005-10-13 This book introduces the concepts of gravitational waves within the context of general relativity. The sources of gravitational radiation for which there is direct observational evidence and those of a more speculative nature are described. He then gives a general introduction to the methods of detection. In the subsequent chapters he has drawn together the leading scientists in the field to give a comprehensive practical and theoretical account of the physics and technology of gravitational wave detection.

2011 nobel prize physics: Losing the Nobel Prize: A Story of Cosmology, Ambition, and the Perils of Science's Highest Honor Brian Keating, 2018-04-24 Riveting.—Science A Forbes, Physics Today, Science News, and Science Friday Best Science Book Of 2018 Cosmologist and inventor of the BICEP (Background Imaging of Cosmic Extragalactic Polarization) experiment, Brian Keating tells the inside story of the mesmerizing quest to unlock cosmology’s biggest mysteries and the human drama that ensued. We follow along on a personal journey of revelation and discovery in the publish-or-perish world of modern science, and learn that the Nobel Prize might hamper—rather than advance—scientific progress. Fortunately, Keating offers practical solutions for reform,

providing a vision of a scientific future in which cosmologists may finally be able to see all the way back to the very beginning.

2011 nobel prize physics: Science and Conscience Jost Lemmerich, Ann Hentschel, 2011-08-10 Originally published in German under the title Aufrecht im Sturm der Zeit: Der Physiker James Franck, 1882-1964.

2011 nobel prize physics: The God Particle Leon M. Lederman, Dick Teresi, 2006 A fascinating tour of particle physics from Nobel Prize winner Leon Lederman. At the root of particle physics is an invincible sense of curiosity. Leon Lederman embraces this spirit of inquiry as he moves from the Greeks' earliest scientific observations to Einstein and beyond to chart this unique arm of scientific study. His survey concludes with the Higgs boson, nicknamed the God Particle, which scientists hypothesize will help unlock the last secrets of the subatomic universe, quarks and all--it's the dogged pursuit of this almost mystical entity that inspires Lederman's witty and accessible history.

2011 nobel prize physics: *Feynman's Rainbow* Leonard Mlodinow, 2011-11-29 Some of the brightest minds in science have passed through the halls of the California Institute of Technology. In the early 1980s, Leonard Mlodinow joined their ranks to begin a postdoctoral fellowship. Afraid he was not smart enough to be there, despite his groundbreaking Ph.D. thesis, he took his insecurities to Richard Feynman, Caltech’s intimidating resident genius and iconoclast. So began a pivotal year in a young man’s life. Though a series of fascinating exchanges, Mlodinow and Feynman delve into the nature of science, creativity, love mathematics, happiness, God, art, pleasures and ambition, producing a moving portrait of a friendship and an affecting account of Feynman’s final creative years.

2011 nobel prize physics: Candid Science V Balazs Hargittai, Istv n Hargittai, 2005 Candid Science V: Conversations with Famous Scientists contains 36interviews with well-known scientists, including 19 Nobel laureates, Wolf Prize winners, and other luminaries. These in-depth conversationsprovide a glimpse into the greatest achievements in science during thepast few decades, featuring stories of the discoveries, and showingthe human drama behind them

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2011 nobel prize physics: *My View of the World* Erwin Schrödinger, 2008-11-27 A Nobel prize winner, a great man and a great scientist, Erwin Schrödinger has made his mark in physics, but his eye scans a far wider horizon: here are two stimulating and discursive essays which summarize his philosophical views on the nature of the world. Schrödinger's world view, derived from the Indian writings of the Vedanta, is that there is only a single consciousness of which we are all different aspects. He admits that this view is mystical and metaphysical and incapable of logical deduction. But he also insists that this is true of the belief in an external world capable of influencing the mind and of being influenced by it. Schrödinger's world view leads naturally to a philosophy of reverence for life.

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tacit knowledge can be recovered so that we can begin to identify the unspoken rules that govern scientific practice.

2011 nobel prize physics: *Fermilab* Lillian Hoddeson, Adrienne W. Kolb, Catherine Westfall, 2009-08-01 Fermi National Accelerator Laboratory, located in the western suburbs of Chicago, has stood at the frontier of high-energy physics for forty years. Fermilab is the first history of this laboratory and of its powerful accelerators told from the point of view of the people who built and used them for scientific discovery. Focusing on the first two decades of research at Fermilab, during the tenure of the laboratory's charismatic first two directors, Robert R. Wilson and Leon M. Lederman, the book traces the rise of what they call "megascience," the collaborative struggle to conduct large-scale international experiments in a climate of limited federal funding. In the midst of this new climate, Fermilab illuminates the growth of the modern research laboratory during the Cold War and captures the drama of human exploration at the cutting edge of science.

2011 nobel prize physics: More and Different Philip W. Anderson, 2011 I. Personal reminiscences. Introduction. BCS and me. A mile of dirty lead wire: a fable for the scientifically literate. Scientific and personal reminiscences of Ryogo Kubo -- II. History. Introduction. Physics at Bell Labs, 1949-1984: young Turks and younger Turks. It's not over till the fat lady sings. Reflections on twentieth century physics: historical overview of the 20t century in Physics. 21st century Physics. Y. Nambu and broken symmetry. Nevill Mott, John Slater, and the magnetic state: winning the prize and losing the PR battle -- III. Philosophy and sociology. Introduction. Emergence vs. reductionism. Is the theory of everything the theory of anything? Is measurement itself an emergent property? Good news and bad news. The future lies ahead. Could modern America have invented wave mechanics?. Loose ends and Gordian knots of the string cult. Imaginary friend, who art in heaven -- IV. Science tactics and strategy. Introduction. Solid state experimentalists: theory should be on tap, not on top. Shadows of doubt. The Reverend Thomas Bayes, needles in haystacks, and the fifth force. Emerging physics. On the nature of physical laws. On the unreasonable efficacy of mathematics--A proposition by Wigner. When scientists go astray. Further investigations -- V. Genius. Introduction. What mad pursuit. Complexities of Feynman coffee-table complexities. Search for polymath's elementary particles. Giant who started the silicon age. The quiet man of physics. A theoretical physicist. Some thoughtful words (not mine) on research strategy for theorists -- VI. Science wars. Introduction. They think it's all over. Science: a 'dappled world' or a 'seamless web'? Reply to Cartwright. Postmodernism, politics and religion -- VII. Politics and science. Introduction. Politics and science. The case against Star Wars. A dialogue about Star Wars. No facts, just the right answers -- VIII. Futurology. Introduction. Futurology. Dizzy with future Schlock. Einstein and the p-branes. Forecaster fails to detect any clouds -- IX. Complexity. Introduction. Physics: the opening to complexity. Is complexity physics? Is it science? What is it? Complexity II: the Santa Fe Institute. Whole truths false in part -- X. Popularization attempts. Introduction. Who or what is RVB? More on RVB. Brainwashed by Feynman? Just exactly what do you do, Dr. Anderson? What is a condensed matter theorist? Global economy II: or, how do you follow a great act?

2011 nobel prize physics: *Exploring the Quantum* Serge Haroche, Jean-Michel Raimond, 2006-08-11 The counter-intuitive aspects of quantum physics have been long illustrated by thought experiments, from Einstein's photon box to Schrödinger's cat. These experiments have now become real, with single particles - electrons, atoms, or photons - directly unveiling the strange features of the quantum. State superpositions, entanglement and complementarity define a novel quantum logic which can be harnessed for information processing, raising great hopes for applications. This book describes a class of such thought experiments made real. Juggling with atoms and photons confined in cavities, ions or cold atoms in traps, is here an incentive to shed a new light on the basic concepts of quantum physics. Measurement processes and decoherence at the quantum-classical boundary are highlighted. This volume, which combines theory and experiments, will be of interest to students in quantum physics, teachers seeking illustrations for their lectures and new problem sets, researchers in quantum optics and quantum information.

2011 nobel prize physics: *The Dialogues* Clifford V. Johnson, 2018-10-23 A series of

conversations about science in graphic form, on subjects that range from the science of cooking to the multiverse. Physicist Clifford Johnson thinks that we should have more conversations about science. Science should be on our daily conversation menu, along with topics like politics, books, sports, or the latest prestige cable drama. Conversations about science, he tells us, shouldn't be left to the experts. In The Dialogues, Johnson invites us to eavesdrop on a series of nine conversations, in graphic-novel form—written and drawn by Johnson—about “the nature of the universe.” The conversations take place all over the world, in museums, on trains, in restaurants, in what may or may not be Freud's favorite coffeehouse. The conversationalists are men, women, children, experts, and amateur science buffs. The topics of their conversations range from the science of cooking to the multiverse and string theory. The graphic form is especially suited for physics; one drawing can show what it would take many words to explain. In the first conversation, a couple meets at a costume party; they speculate about a scientist with superhero powers who doesn't use them to fight crime but to do more science, and they discuss what it means to have a “beautiful equation” in science. Their conversation spills into another chapter (“Hold on, you haven't told me about light yet”), and in a third chapter they exchange phone numbers. Another couple meets on a train and discusses immortality, time, black holes, and religion. A brother and sister experiment with a grain of rice. Two women sit in a sunny courtyard and discuss the multiverse, quantum gravity, and the anthropic principle. After reading these conversations, we are ready to start our own.

2011 nobel prize physics: Nobel Michael Worek, 2010-06-03 The story of the winners of the world's most prestigious prize, now updated to include the 2009 recipients. The Nobel Prize is widely regarded as the most prestigious award one can receive. The Prize is administered by the Nobel Foundation, and the award ceremonies receive extensive media coverage. The awards are often politically controversial, and many winners use their acceptance speech to further favorite causes. Along with background information, the book provides a look at the 200 most famous and most interesting Nobel winners. The profiles are arranged by prize and by year. A photo or illustration appears with each profiled Laureate. Other illustrations help to explain complex subjects in science and make it easier for the reader to appreciate the accomplishments for which the prize has been awarded. A number of fascinating facts emerge from this lively account. For example, only 40 of the 829 Nobel Laureates have been women, among them Marie Curie, who won twice. Linus Pauling is the only person to have been awarded two Nobel Prizes in different categories, the 1954 Nobel Prize in Chemistry and the 1962 Nobel Peace Prize. The youngest Laureate is Lawrence Bragg, who was 25 years old when he received the Nobel Prize in Physics with his father in 1915. The oldest is Leonid Hurwicz, who was 90 years old when he received the 2007 Economics Prize. Two Laureates have declined the Nobel Prize: Jean-Paul Sartre, and Le Duc Tho. Other famous names include Ernest Hemingway, Albert Einstein, Albert Schweitzer, James Watson and Francis Crick, Paul Krugman, Charles Kao, Elizabeth Blackburn and Barack Obama. Nobel: A Century of Prize Winners is sure to find a readership among the millions who follow the awards each year and want to understand more about the most important prize in the world.

2011 nobel prize physics: How the Hippies Saved Physics David Kaiser, 2012-06-29 Today, quantum information theory is among the most exciting scientific frontiers, attracting billions of dollars in funding and thousands of talented researchers. But as MIT physicist and historian David Kaiser reveals, this cutting-edge field has a surprisingly psychedelic past. How the Hippies Saved Physics introduces us to a band of freewheeling physicists who defied the imperative to shut up and calculate and helped to rejuvenate modern physics. For physicists, the 1970s were a time of stagnation. Jobs became scarce, and conformity was encouraged, sometimes stifling exploration of the mysteries of the physical world. Dissatisfied, underemployed, and eternally curious, an eccentric group of physicists in Berkeley, California, banded together to throw off the constraints of the physics mainstream and explore the wilder side of science. Dubbing themselves the Fundamental Fysiks Group, they pursued an audacious, speculative approach to physics. They studied quantum entanglement and Bell's Theorem through the lens of Eastern mysticism and psychic mind-reading, discussing the latest research while lounging in hot tubs. Some even dabbled with LSD to enhance

their creativity. Unlikely as it may seem, these iconoclasts spun modern physics in a new direction, forcing mainstream physicists to pay attention to the strange but exciting underpinnings of quantum theory. A lively, entertaining story that illuminates the relationship between creativity and scientific progress, How the Hippies Saved Physics takes us to a time when only the unlikeliest heroes could break the science world out of its rut.

2011 nobel prize physics: *Les Prix Nobel* Nobelstiftelsen, 1907 Vol. for 1901 has a sketch of Alfred Nobel and his works, by P.T. Cleve.

2011 nobel prize physics: The Handy Physics Answer Book Paul W Zitzewitz, 2011-02-01 Eschewing the usual mathematical explanations for physics phenomena, this approachable reference explains complicated scientific concepts in plain English that everyone can understand. Tackling the big issues such as gravity, magnetism, sound, and what really happens in the Large Hadron Collider, this engaging look at physics also spells out why cats always land on their feet, why people appear to have red eyes in photographs, and the real danger of looking at an eclipse. For everyone who ever wondered how a light bulb works or how squirrels avoid electrocution on the power lines, this handbook supplies answers on the physics of everyday life and examines the developments in the exploration of subatomic particles. In addition to the question-and-answer section, an addendum of facts about physicists explains what the Nobel prize is and who has won it, and tells the story of the scientist who was incarcerated for agreeing with Copernicus. Answers more than eight hundred questions about physics, ranging from everyday life applications to the latest explorations in the field.

2011 nobel prize physics: The Half-Finished Heaven Tomas Transtromer, 2017-05-09 The contemporary Swedish poet Tomas Tranströmer has a prestigious worldwide reputation-- many expect that he will someday win the Nobel Prize for Literature. Robert Bly, a longtime friend and confidant of Tranströmer’s, as well as one of his first translators, has carefully chosen and translated the finest of Tranströmer’s poems to create this collection.

2011 nobel prize physics: Gödel, Escher, Bach Douglas R. Hofstadter, 2000 'What is a self and how can a self come out of inanimate matter?' This is the riddle that drove Douglas Hofstadter to write this extraordinary book. In order to impart his original and personal view on the core mystery of human existence - our intangible sensation of 'I'-ness - Hofstadter defines the playful yet seemingly paradoxical notion of 'strange loop', and explicates this idea using analogies from many disciplines.

2011 nobel prize physics: *Einstein and the History of General Relativity* Don Howard, John Stachel, 1989 Based upon the proceedings of the First International Conference on the History of General Relativity, held at Boston University's Osgood Hill Conference Center, North Andover, Massachusetts, 8-11 May 1986, this volume brings together essays by twelve prominent historians and philosophers of science and physicists. The topics range from the development of general relativity (John Norton, John Stachel) and its early reception (Carlo Cattani, Michelangelo De Maria, Anne Kox), through attempts to understand the physical implications of the theory (Jean Eisenstaedt, Peter Havas) and to quantize it (Peter G. Bergmann), to elaborations of the theory into a unified theory of electromagnetism and gravitation (Vladimir P. Vizgin, Michel Biezunski), and considerations of its cosmological extensions (Pierre Kerszberg, George F.R. Ellis). This is the first volume to survey many of the most important questions in the history of general relativity, with many of the contributions drawing upon such original resources as the Einstein Archive. It is hoped that it will stimulate much-needed further research in this hitherto neglected area.

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