2011 physics nobel prize

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

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Abstract: The 2011 Physics Nobel Prize was awarded to Saul Perlmutter, Brian P. Schmidt, and Adam G. Riess for their groundbreaking discoveries concerning the accelerating expansion of the Universe. This article delves into the historical context of this discovery, explaining the meticulous observations and sophisticated analysis that led to the startling conclusion that the expansion of the universe is not slowing down, as previously believed, but is actually accelerating. We will explore the implications of this finding for our understanding of dark energy, a mysterious force that constitutes approximately 70% of the universe's energy density and remains one of the biggest enigmas in modern physics. The lasting impact of the 2011 Physics Nobel Prize on cosmological research and future avenues of inquiry will also be discussed.

The Expanding Universe: A Historical Perspective

The idea of an expanding universe wasn't conceived overnight. Early 20th-century cosmology was dominated by the static universe model. However, observations by Edwin Hubble in the 1920s revealed a relationship between a galaxy's distance and its redshift (the stretching of light waves as it travels through expanding space), suggesting that the universe is indeed expanding. This led to the development of the Big Bang theory.

However, a crucial question remained: Would this expansion continue indefinitely, or would gravity

eventually halt and reverse it? This question formed the backdrop against which the research that led to the 2011 Physics Nobel Prize unfolded. The prevailing belief in the late 20th century was that the expansion rate should be slowing due to the gravitational attraction between all matter in the universe.

The 2011 Physics Nobel Prize: Unveiling the Accelerating Universe

The 2011 Physics Nobel Prize recognized the independent work of two teams, led by Perlmutter and by Schmidt and Riess, who, through meticulous observation of distant Type Ia supernovae, provided compelling evidence for an accelerating universe. Type Ia supernovae, resulting from the explosion of white dwarf stars, are remarkable because they possess remarkably consistent intrinsic brightness. This makes them excellent "standard candles" for measuring cosmic distances.

By observing these distant supernovae, both teams were able to measure the expansion rate of the universe at different epochs. Their painstaking analysis, involving correcting for various factors like interstellar dust, revealed a surprising result: the expansion rate was faster in the distant past than it is today. This implied that the expansion wasn't slowing down as expected, but rather accelerating.

The Enigma of Dark Energy

This discovery had profound implications, suggesting the existence of a mysterious force counteracting gravity and driving the accelerated expansion. This force, termed "dark energy," is currently one of the most significant unsolved problems in cosmology. The 2011 Physics Nobel Prize highlighted the urgent need to understand dark energy's nature and its role in the evolution of the cosmos. The precise nature of dark energy remains a subject of intense debate and ongoing research. It could be a property of space itself, a manifestation of unknown particles, or something entirely different.

The Legacy of the 2011 Physics Nobel Prize

The 2011 Physics Nobel Prize was not just a recognition of a singular achievement but a testament to the power of meticulous observation, sophisticated data analysis, and collaborative scientific endeavor. The award spurred further research into dark energy and its implications for the fate of the universe. Several large-scale cosmological surveys, such as the Dark Energy Survey (DES) and the Euclid mission, have been launched to probe the nature of dark energy with even greater precision. These efforts aim to refine measurements of the expansion rate, constrain the properties of dark energy, and potentially uncover clues about its fundamental nature. Understanding dark energy is crucial not only for completing our understanding of the universe's evolution but also for addressing fundamental questions about the nature of gravity and spacetime.

Conclusion

The 2011 Physics Nobel Prize, awarded for the discovery of the accelerating expansion of the universe, represents a landmark achievement in cosmology. The meticulous work of Perlmutter, Schmidt, and Riess revolutionized our understanding of the universe's composition and evolution. Their groundbreaking research unveiled the enigma of dark energy, a force that dominates the universe's energy density and remains one of the most profound challenges to modern physics. The legacy of this prize continues to inspire and guide ongoing research, shaping our quest to unravel the mysteries of the cosmos and our place within it.

FAQs

1. What are Type Ia supernovae, and why are they important for measuring cosmic distances? Type Ia supernovae are stellar explosions with remarkably consistent intrinsic brightness, making them ideal "standard candles" for measuring distances to distant galaxies. Their consistent brightness allows astronomers to calculate distances based on their apparent brightness.

1. What is redshift, and how is it used to determine the expansion of the universe? Redshift is the stretching of light waves as they travel through expanding space. The greater the redshift, the further away the object is and the faster it's receding from us. This relationship is a key piece of evidence for the expanding universe.

1. What is dark energy, and how does it relate to the accelerating expansion of the universe? Dark energy is a mysterious force that counteracts gravity and is responsible for the accelerated expansion of the universe. Its nature is still unknown.

1. What were the main experimental techniques used to make the discovery of the accelerating expansion? The main technique involved precisely measuring the apparent brightness and redshift of distant Type Ia supernovae.

1. How did the two independent teams reach similar conclusions? Both teams used similar methods and data but had different observational strategies, independently reaching the same surprising conclusion.

1. What are some of the ongoing research efforts related to dark energy? Large-scale surveys like the Dark Energy Survey (DES) and the Euclid mission aim to constrain the properties of dark energy and understand its nature better.

1. What are the implications of the accelerating expansion for the future of the universe? The accelerating expansion suggests the universe will continue to expand indefinitely, potentially leading to a "Big Freeze" scenario.

1. What is the significance of the 2011 Nobel Prize in Physics in the broader context of scientific discovery? The prize highlights the importance of meticulous observation, data analysis, and international collaboration in unraveling the mysteries of the universe.

1. How did the 2011 Physics Nobel Prize impact cosmological research funding and public interest in astronomy? The prize significantly increased funding for dark energy research and boosted public interest in astronomy and cosmology, inspiring a new generation of scientists.

Related Articles

1. "Supernova Cosmology: The High-Z Supernova Search Team": This article details the methodology employed by the High-Z Supernova Search Team, led by Saul Perlmutter.

1. "Observations of High-Redshift Supernovae": This article provides a detailed account of the observational data collected by the Supernova Cosmology Project, led by Brian Schmidt and Adam

Riess.

1. "Dark Energy: The Biggest Mystery in Cosmology": An overview of dark energy and its implications for the fate of the universe.

1. "The Accelerating Expansion of the Universe: A Review": A comprehensive review of the evidence for accelerating expansion, including the contributions of the 2011 Nobel laureates.

1. "The Impact of the 2011 Nobel Prize in Physics on Cosmology Research": This article analyzes the impact of the 2011 Nobel Prize on funding, research direction, and public perception of cosmology.

1. "Type Ia Supernovae as Standard Candles: Calibration and Limitations": An in-depth look at the use of Type Ia supernovae as standard candles and the associated uncertainties.

1. "The Hubble Constant: Measuring the Expansion Rate of the Universe": This article explains how the Hubble constant is determined and how it relates to the accelerating expansion.

1. "The Future of Cosmological Surveys: Probing Dark Energy": A look at upcoming cosmological surveys designed to further probe the nature of dark energy.

1. "The 2011 Nobel Prize in Physics: A Biographical Perspective on the Laureates": Biographical sketches of Perlmutter, Schmidt, and Riess, highlighting their scientific journeys and contributions.

2011 physics nobel prize: 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 physics nobel prize: Visions of Discovery Raymond Y. Chiao, 2011 World-leading researchers, including Nobel Laureates, explore the most basic questions of science, philosophy, and the nature of existence.

2011 physics nobel prize: *Cycles of Time* Roger Penrose, 2011-09-06 From Nobel prize-winner Roger Penrose, this groundbreaking book is for anyone who is interested in the world, how it works, and how it got here (New York Journal of Books). Penrose presents a new perspective on three of cosmology’s essential questions: What came before the Big Bang? What is the source of order in our universe? And what cosmic future awaits us? He shows how the expected fate of our ever-accelerating and expanding universe—heat death or ultimate entropy—can actually be reinterpreted as the conditions that will begin a new “Big Bang.” He details the basic principles beneath our universe, explaining various standard and non-standard cosmological models, the fundamental role of the cosmic microwave background, the paramount significance of black holes, and other basic building blocks of contemporary physics. Intellectually thrilling and widely accessible, Cycles of Time is a welcome new contribution to our understanding of the universe from one of our greatest mathematicians and thinkers.

2011 physics nobel prize: 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.

2011 physics nobel prize: How to Win a Nobel Prize Barry Marshall, 2018-04-02 Mary has always wanted to win a Nobel Prize. She loves running her own science experiments at home. But how can she become a real scientist and win the greatest prize of all? One day Mary stumbles on a secret meeting of Nobel Prize winners. Swearing her to secrecy, Professor Barry Marshall agrees to be her guide as she travels around the world and through time to learn the secrets behind some of the most fascinating and important scientific discoveries. They talk space and time with Albert Einstein, radiation with Marie Curie, DNA with Crick, Watson and Wilkins – and much more. Join Mary on her time-travel adventure – and do your own experiments along the way!

2011 physics nobel prize: The Road to Reality Roger Penrose, 2021-06-09 **WINNER OF THE 2020 NOBEL PRIZE IN PHYSICS** The Road to Reality is the most important and ambitious work of science for a generation. It provides nothing less than a comprehensive account of the physical universe and the essentials of its underlying mathematical theory. It assumes no particular

specialist knowledge on the part of the reader, so that, for example, the early chapters give us the vital mathematical background to the physical theories explored later in the book. Roger Penrose's purpose is to describe as clearly as possible our present understanding of the universe and to convey a feeling for its deep beauty and philosophical implications, as well as its intricate logical interconnections. The Road to Reality is rarely less than challenging, but the book is leavened by vivid descriptive passages, as well as hundreds of hand-drawn diagrams. In a single work of colossal scope one of the world's greatest scientists has given us a complete and unrivalled guide to the glories of the universe that we all inhabit. 'Roger Penrose is the most important physicist to work in relativity theory except for Einstein. He is one of the very few people I've met in my life who, without reservation, I call a genius' Lee Smolin

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

2011 physics nobel prize: Reinventing Discovery Michael Nielsen, 2020-04-07 Reinventing Discovery argues that we are in the early days of the most dramatic change in how science is done in

more than 300 years. This change is being driven by new online tools, which are transforming and radically accelerating scientific discovery--

2011 physics nobel prize: 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 physics nobel prize: *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 physics nobel prize: 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 physics nobel prize: Beyond Smoke and Mirrors Burton Richter, Global climate change is one of the most important issues humanity faces today. This updated, second edition assesses the sensible, senseless and biased proposals for averting the potentially disastrous consequences of global warming, allowing the reader to draw their own conclusions on switching to more sustainable energy provision. Burton Richter is a Nobel Prize-winning scientist who has served on many US and international review committees on climate change and energy issues. He provides a concise overview of our knowledge and uncertainties within climate change science, discusses current energy demand and supply patterns, and the energy options available to cut emissions of greenhouse gases. Written in non-technical language, this book presents a balanced view of options for moving from our heavy reliance on fossil fuels into a much more sustainable energy system, and is accessible to a wide range of readers without scientific backgrounds - students, policymakers and the concerned citizen.

2011 physics nobel prize: 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 physics nobel prize: Quantum Man: Richard Feynman's Life in Science (Great Discoveries) Lawrence M. Krauss, 2011-03-21 A worthy addition to the Feynman shelf and a welcome follow-up to the standard-bearer, James Gleick's Genius. —Kirkus Reviews Perhaps the

greatest physicist of the second half of the twentieth century, Richard Feynman changed the way we think about quantum mechanics, the most perplexing of all physical theories. Here Lawrence M. Krauss, himself a theoretical physicist and a best-selling author, offers a unique scientific biography: a rollicking narrative coupled with clear and novel expositions of science at the limits. From the death of Feynman's childhood sweetheart during the Manhattan Project to his reluctant rise as a scientific icon, we see Feynman's life through his science, providing a new understanding of the legacy of a man who has fascinated millions.

2011 physics nobel prize: *Why Nations Fail* Daron Acemoglu, James A. Robinson, 2013-09-17 Brilliant and engagingly written, Why Nations Fail answers the question that has stumped the experts for centuries: Why are some nations rich and others poor, divided by wealth and poverty, health and sickness, food and famine? Is it culture, the weather, geography? Perhaps ignorance of what the right policies are? Simply, no. None of these factors is either definitive or destiny. Otherwise, how to explain why Botswana has become one of the fastest growing countries in the world, while other African nations, such as Zimbabwe, the Congo, and Sierra Leone, are mired in poverty and violence? Daron Acemoglu and James Robinson conclusively show that it is man-made political and economic institutions that underlie economic success (or lack of it). Korea, to take just one of their fascinating examples, is a remarkably homogeneous nation, yet the people of North Korea are among the poorest on earth while their brothers and sisters in South Korea are among the richest. The south forged a society that created incentives, rewarded innovation, and allowed everyone to participate in economic opportunities. The economic success thus spurred was sustained because the government became accountable and responsive to citizens and the great mass of people. Sadly, the people of the north have endured decades of famine, political repression, and very different economic institutions—with no end in sight. The differences between the Koreas is due to the politics that created these completely different institutional trajectories. Based on fifteen years of original research Acemoglu and Robinson marshall extraordinary historical evidence from the Roman Empire, the Mayan city-states, medieval Venice, the Soviet Union, Latin America, England, Europe, the United States, and Africa to build a new theory of political economy with great relevance for the big questions of today, including: - China has built an authoritarian growth machine. Will it continue to grow at such high speed and overwhelm the West? - Are America's best days behind it? Are we moving from a virtuous circle in which efforts by elites to aggrandize power are resisted to a vicious one that enriches and empowers a small minority? - What is the most effective way to help move billions of people from the rut of poverty to prosperity? More philanthropy from the wealthy nations of the West? Or learning the hard-won lessons of Acemoglu and Robinson's breakthrough ideas on the interplay between inclusive political and economic institutions? Why Nations Fail will change the way you look at—and understand—the world.

2011 physics nobel prize: Mapping the Heavens Priyamvada Natarajan, 2016-04-28 A theoretical astrophysicist explores the ideas that transformed our knowledge of the universe over the past century. The cosmos, once understood as a stagnant place, filled with the ordinary, is now a universe that is expanding at an accelerating pace, propelled by dark energy and structured by dark matter. Priyamvada Natarajan, our guide to these ideas, is someone at the forefront of the research—an astrophysicist who literally creates maps of invisible matter in the universe. She not only explains for a wide audience the science behind these essential ideas but also provides an understanding of how radical scientific theories gain acceptance. The formation and growth of black holes, dark matter halos, the accelerating expansion of the universe, the echo of the big bang, the discovery of exoplanets, and the possibility of other universes—these are some of the puzzling cosmological topics of the early twenty-first century. Natarajan discusses why the acceptance of new ideas about the universe and our place in it has never been linear and always contested even within the scientific community. And she affirms that, shifting and incomplete as science always must be, it offers the best path we have toward making sense of our wondrous, mysterious universe. "Part history, part science, all illuminating. If you want to understand the greatest ideas that shaped our current cosmic cartography, read this book."—Adam G. Riess, Nobel Laureate in Physics, 2011 "A

highly readable, insider's view of recent discoveries in astronomy with unusual attention to the instruments used and the human drama of the scientists."—Alan Lightman, author of The Accidental Universe and Einstein's Dream

2011 physics nobel prize: 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

2011 physics nobel prize: The Politics of Excellence Robert Marc Friedman, 2001-01-01 Reveals all the politics & personal agendas that dictate who has been awarded the Prize, & just as importantly, who has not. Published in conjunction with the 100th anniversary of the Prizes.

2011 physics nobel prize: *A Different Universe* Robert B. Laughlin, 2005-03 Proposes a new way of understanding and interpreting the fundamental laws of science that will open up human thinking to the vast possibilities of the universe.

2011 physics nobel prize: Lectures On Computation Richard P. Feynman, 1996-09-08 Covering the theory of computation, information and communications, the physical aspects of computation, and the physical limits of computers, this text is based on the notes taken by one of its editors, Tony Hey, on a lecture course on computation given b

2011 physics nobel prize: 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 physics nobel prize: The Realm of the Nebulae Edwin Powell Hubble, 1982-01-01 No modern astronomer made a more profound contribution to our understanding of the cosmos than did Edwin Hubble, who first conclusively demonstrated that the universe is expanding. Basing his theory on the observation of the change in distanct galaxies, called red shift, Hubble showed that this is a Doppler effect, or alteration in the wavelength of light, resulting from the rapid motion of celestial objects away from Earth. In 1935, Hubble described his principal observations and conclusions in the Silliman lectures at Yale University. These lectures were published the following year as The Realm of the Nebulae, which quickly became a classic work.

2011 physics nobel prize: 100 Years of Superconductivity Horst Rogalla, Peter H. Kes, 2011-11-11 Even a hundred years after its discovery, superconductivity continues to bring us new surprises, from superconducting magnets used in MRI to quantum detectors in electronics. 100 Years of Superconductivity presents a comprehensive collection of topics on nearly all the subdisciplines of superconductivity. Tracing the historical developments in supe

2011 physics nobel prize: 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.

2011 physics nobel prize: Nobel Life Stefano Sandrone, 2021-06-17 Lively and engaging conversations with 24 Nobel Prize winners, revealing their stories and providing inspiration for the next generation.

2011 physics nobel prize: *How Old Is the Universe?* David A. Weintraub, 2011 Tells the story of how astronomers solved one of the most compelling mysteries in science and, along the way, introduces readers to fundamental concepts and cutting-edge advances in modern astronomy--From publisher description.

2011 physics nobel prize: 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.

2011 physics nobel prize: 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 physics nobel prize: The First Three Minutes Steven Weinberg, 2022-04-26 A Nobel Prize-winning physicist explains what happened at the very beginning of the universe, and how we know, in this popular science classic. Our universe has been growing for nearly 14 billion years. But almost everything about it, from the elements that forged stars, planets, and lifeforms, to the fundamental forces of physics, can be traced back to what happened in just the first three minutes of its existence. In this book, Nobel Laureate Steven Weinberg describes in wonderful detail what happened in these first three minutes. It is an exhilarating journey that begins with the Planck Epoch - the earliest period of time in the history of the universe - and goes through Einstein's Theory of Relativity, the Hubble Red Shift, and the detection of the Cosmic Microwave Background. These incredible discoveries all form the foundation for what we now understand as the standard model of the origin of the universe. The First Three Minutes examines not only what this model looks like, but also tells the exciting story of the bold thinkers who put it together. Clearly and accessibly written, The First Three Minutes is a modern-day classic, an unsurpassed explanation of where it is that everything really comes from.

2011 physics nobel prize: Nobel Prize Women in Science Sharon Bertsch McGrayne, 2001-04-12 Since 1901 there have been over three hundred recipients of the Nobel Prize in the sciences. Only ten of themâ€about 3 percentâ€have been women. Why? In this updated version of Nobel Prize Women in Science, Sharon Bertsch McGrayne explores the reasons for this astonishing disparity by examining the lives and achievements of fifteen women scientists who either won a Nobel Prize or played a crucial role in a Nobel Prize - winning project. The book reveals the relentless discrimination these women faced both as students and as researchers. Their success was due to the fact that they were passionately in love with science. The book begins with Marie Curie,

the first woman to win the Nobel Prize in physics. Readers are then introduced to Christiane Nusslein-Volhard, Emmy Noether, Lise Meitner, Barbara McClintock, Chien-Shiung Wu, and Rosalind Franklin. These and other remarkable women portrayed here struggled against gender discrimination, raised families, and became political and religious leaders. They were mountain climbers, musicians, seamstresses, and gourmet cooks. Above all, they were strong, joyful women in love with discovery. Nobel Prize Women in Science is a startling and revealing look into the history of science and the critical and inspiring role that women have played in the drama of scientific progress.

2011 physics nobel prize: The Periodic Table and a Missed Nobel Prize Ulf Lagerkvist, 2012 In a relatively brief but masterful recounting, Professor Ulf Lagerkvist traces the origins and seminal developments in the field of chemistry, highlighting the discoveries and personalities of the individuals who transformed the ancient myths of the Greeks, the musings of the alchemists, the mystique of phlogiston into the realities and the laws governing the properties and behavior of the elements; in short, how chemistry became a true science. A centerpiece of this historical journey was the triumph by Dmitri Mendeleev who conceived the Periodic Law of the Elements, the relation between the properties of the elements and their atomic weights but more precisely their atomic number. Aside from providing order to the elements known at the time, the law predicted the existence and atomic order of elements not then known but were discovered soon after.An underlying but explicit intent of Lagerkvist's survey is to address what he believes was a gross injustice in denying Mendeleev the Nobel Prize in Chemistry in 1905 and again in 1906. Delving into the Royal Swedish Academy of Sciences' detailed records concerning the nominations, Lagerkvist reveals the judging criteria and the often heated and prejudicial arguments favoring and demeaning the contributions of the competing contenders of those years. Lagerkvist, who was a member of the Swedish Academy of Sciences and has participated in judging nominations for the chemistry prize, concludes It is in the nature of the Nobel Prize that there will always be a number candidates who obviously deserve to be rewarded but never get the accolade -- Mendeleev was one of those.

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of Wyoming. He spent the summer of 1988 as a visiting scientist at Lawrence Berkeley National Lab, where he helped found the Supernova Cosmology Project (SCP). He continued to work as a member of the SCP group while a faculty member at Harvey Mudd College, the US Air Force Academy, and Colorado College. The 2011 Nobel Prize in Physics was awarded to the leader of the SCP for the group's discovery of the accelerating expansion of the Universe through observations of distant supernovae. During his career, Professor Burns has observed using essentially all of the world's great observatories, including the Keck Observatory and the Hubble Space Telescope.

2011 physics nobel prize: 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.

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