Dark Matter Astrophysical Observations Dark Matter

Right here, we have countless ebook **Dark Matter Astrophysical Observations Dark Matter** and collections to check out. We additionally pay for variant types and plus type of the books to browse. The customary book, fiction, history, novel, scientific research, as with ease as various additional sorts of books are readily simple here.

As this Dark Matter Astrophysical Observations Dark Matter, it ends up subconscious one of the favored ebook Dark Matter Astrophysical Observations Dark Matter collections that we have. This is why you remain in the best website to look the unbelievable books to have.

Observations and Implications Springer
Indirect detection is the search for the particle nature of dark matter with astrophysical probes. Manifestly, it exists right at the intersection of particle physics and astrophysics, and the discovery potential for dark matter can be greatly extended using insights from both disciplines. This thesis provides an exploration of this philosophy. On the one hand, I will show how astrophysical observations of dark matter, through its gravitational interaction, can be exploited to determine the most promising locations on the sky to observe a particle dark matter signal. On the other, I demonstrate that refined theoretical calculations of the expected dark matter interactions can be used disentangle signals from astrophysical backgrounds. Both of these approaches will be discussed in the context of general searches, but also applied to the case of an excess of photons observed at the center of the Milky Way. This galactic center excess represents both the challenges and joys of indirect detection. Initially thought to be a signal of annihilating dark matter at the center of our own galaxy, it now appears more likely to be associated with a population of millisecond pulsars. Yet these pulsars were completely unanticipated, and highlight that indirect detection can lead to many new insights about the universe, hopefully one day including the particle nature of dark matter.

An Astrophysics Detective Story Cambridge University Press
This book shows how modern cosmology has led to the idea of dark matter in the universe, and presents a new theory to explain it.

MDPI
What is the dark matter that fills the Universe and binds together galaxies? How was it produced? What are its interactions and particle properties? The paradigm of dark matter is one of the key developments at the interface of cosmology and elementary particle physics. It is also one of the foundations of the

standard cosmological model. This book presents the state of the art in building and testing particle models for dark matter. Each chapter gives an analysis of questions, research directions, and methods within the field. More than 200 problems are included to challenge and stimulate the reader's knowledge and provide guidance in the practical implementation of the numerous "tools of the trade" presented. Appendices summarize the basics of cosmology and particle physics needed for any quantitative understanding of particle models for dark matter. This interdisciplinary textbook is essential reading for anyone interested in the microscopic nature of dark matter as it manifests itself in particle physics experiments, cosmological observations, and high-energy astrophysical phenomena: from graduate students and advanced undergraduates to cosmologists and astrophysicists interested in particle models for dark matter and particle physicists interested in early-universe cosmology and high-energy astrophysics. Request Inspection Copy

The complete guide to astrophysics, including galaxies, dark matter and relativity World Scientific

Illuminating Dark MatterProceedings of a Simons SymposiumSpringer Nature

An Introduction to Particle Dark Matter CRC Press

An important, open research topic today is to understand the relevance that dark matter halo substructure may have for dark matter searches. In the standard cosmological model, halo substructure or subhalos are predicted to be largely abundant inside larger halos, for example, galaxies such as ours, and are thought to form first and later merge to form larger structures. Dwarf satellite galaxies—the most massive exponents of halo substructure in our own galaxy—are already known to be excellent targets for dark matter searches, and indeed, they are constantly scrutinized by current gamma-ray experiments in the search for dark matter signals. Lighter subhalos not massive enough to have a visible counterpart of stars and gas may be good targets as well, given their typical abundances and distances. In addition, the clumpy distribution of subhalos residing in larger halos may boost the dark matter signals considerably. In an era in which gamma-ray experiments possess, for the first time, the exciting potential to put to test the preferred dark matter particle theories, a profound knowledge of dark matter astrophysical targets and scenarios is mandatory should we aim for accurate predictions of dark matter-induced fluxes for investing significant telescope observing time on selected targets and for deriving robust conclusions from our dark matter search efforts. In this regard, a precise characterization of the statistical and structural properties of subhalos becomes critical. In this Special Issue, we aim to summarize where we stand today on our knowledge of the different aspects of the dark matter halo substructure; to identify what are the remaining big questions, and how we could address these; and, by doing so, to find new avenues for research.

Evidence for the Big Bang, Dark Matter and Dark Energy Springer

Written for the educated non-scientist

and scientist alike, it spans a variety of scientific disciplines, from observational astronomy to particle physics. Concepts that the reader will encounter along the way are at the cutting edge of scientific research. However the themes are explained in such a way that no prior understanding of science beyond a high school education is necessary.

Dark Matter Constrains from High Energy Astrophysical Observations Springer Nature

"Dark Matter: The evidence for the existence of Dark Matter is compelling based on observations in Astrophysics and Cosmology, while the nature of Dark Matter in Particle Physics is still unclear. Direct Detection is a promising method to detect the recoil energy of nucleons from the scattering of Dark Matter, and indirect searches for Dark Matter put constraints on Dark Matter annihilation and decay, and they give hints about the properties of Dark Matter. We proposed a Millicharged Atomic Dark Matter model, in which the dark constituents of the hidden sector are bound into dark atoms by an unbroken hidden U(1) gauge field. This model is consistent with cosmological and astrophysical constraints, it has the potential to explain the results from the CoGeNT experiment, and it relaxes some tensions from other direct search experiments.UV/IR Divergences in Inflation: Studying the quantum corrections to the two point correlation function of curvature perturbations is an essential step to understand perturbation theory in curved space time. IR divergences may lead to possibly observable consequences in cosmology. By finding the correct way to impose UV and IR cutoffs, we manage to reach a consistent result that all three regularization schemes commonly used -- brute-force cutoff, dimensional regulation, and Pauli-Villars regularization -- all give the same quantum correction to the correlation function. By considering the IR divergences from entropy fields, we explore the effective field theory of inflation in the presence of such fields." --

Modern Cosmology and the Dark Matter Problem Cambridge University Press

This thesis explores the possibility of searching for new effects of dark matter that are linear in g, an approach that offers enormous advantages over conventional schemes, since the interaction constant g is very small, g “ 1. Further, the thesis employs an investigation of linear effects to derive new limits on certain interactions of dark matter with ordinary matter that improve on previous limits by up to 15 orders of magnitude. The first-ever limits on several other interactions are also derived. Astrophysical observations indicate that there is five times more dark matter—an ‘ invisible ’ form of matter, the identity and properties of which still remain shrouded in mystery—in the Universe than the ordinary ‘ visible ’ matter that makes up stars, planets, dust and interstellar gases. Conventional schemes for the direct detection of dark matter involve processes (such as collisions with, absorption by or inter-conversion with ordinary matter) that are either quartic (g4) or quadratic (g2) in an

underlying interaction constant g.

The Role of Halo Substructure in Gamma-Ray Dark Matter Searches CRC Press

One of the major open questions in high energy physics and cosmology is the nature and origin of dark matter. Dark Matter in Astrophysics and Particle Physics 1998 provides a comprehensive overview of the current status of research in this topical field. The book brings together leading researchers from around the world to review recent progress and future directions for research in the different approaches to the dark matter problem. It collects results from cosmology, large-scale structure, and accelerator and nonaccelerator physics. The book also reviews the correlations between and the virtues of each of the fields for the determination of abundance, nature, and origin of dark matter.

New Worlds, New Horizons in Astronomy and Astrophysics Springer Nature

Advances made by physicists in understanding matter, space, and time and by astronomers in understanding the universe as a whole have closely intertwined the question being asked about the universe at its two extremes â €"the very large and the very small. This report identifies 11 key questions that have a good chance to be answered in the next decade. It urges that a new research strategy be created that brings to bear the techniques of both astronomy and sub-atomic physics in a cross-disciplinary way to address these questions. The report presents seven recommendations to facilitate the necessary research and development coordination. These recommendations identify key priorities for future scientific projects critical for realizing these scientific opportunities.

Baryonic Dark Matter Springer Science & Business Media

A vast number of independent astrophysical and cosmological observations suggest that the dominant form of matter in the Universe, known as dark matter, is neither luminous nor baryonic. Despite nearly half a decade of research, the non-gravitational nature of dark matter, if any, remains a mystery. Motivated primarily by preferred theoretical extensions of the Standard Model and a relatively simple production mechanism, the weakly interacting massive particle (WIMP) has long been considered to be among the most appealing dark matter particle candidates. This dissertation is comprised of largely independent works that focus on understanding and constraining various signals that could arise from WIMP dark matter. Specifically, Chapters 2 and 3 address the impact that non-standard astrophysics and particle physics could have on the observed scattering rate in direct dark matter detection experiments; Chapter 4 presents a halo-dependent and an halo-independent update on the viability of a dark matter interpretation of the CDMS-II-Si data; Chapter 5 generalizes the halo-independent analysis formalism such that the compatibility of multiple experiments can be assessed, and the preferred halo-independent parameter space can be identified, for

global likelihoods comprised of at least one extended likelihood; Chapter 6 discusses the prospects for detecting gamma-rays from dark matter annihilating in local dark matter subahlos; Chapter 7 presents updated constraints on simplified dark matter models that are consistent with the Galactic Center excess; and Chapter 8 discusses the extent to which future direct detection experiments may be able to elucidate the high-energy dark matter theory from observations of low-energy nuclear recoils.

Advances In Astrofundamental Physics: International School Of Astrophysics "D. Chalonge" Springer

Olbers' paradox states that given the Universe is unbounded, governed by the standard laws of physics, and populated by light sources, the night sky should be ablaze with light. Obviously this is not so. However, the paradox does not lie in nature but in our understanding of physics. A Universe with a finite age, such as follows from big-bang theory, necessarily has galaxies of finite age. This means we can only see some of the galaxies in the Universe, which is the main reason why the night sky is dark. Just how dark can be calculated using the astrophysics of galaxies and stars and the dynamics of relativistic cosmology. We know from the dynamics of individual galaxies and clusters of galaxies that the majority of matter that exerts gravitational forces is not detectable by conventional telescopes. This dark matter could have many forms, and candidates include various types of elementary particles as well as vacuum fluctuations, black holes, and others. Most of these candidates are unstable to decay and produce photons. So dark matter does not only affect the dynamics of the Universe, but the intensity of intergalactic radiation as well. Conversely, we can use observations of background radiation to constrain the nature and density of dark matter. By comparing observational data with cosmological theory based on general relativity and particle physics, Dark Sky, Dark Matter reviews our present understanding of the universe and the astrophysics of the night sky and dark matter.

Proceedings of a Simons Symposium Elsevier

We present a comprehensive review of keV-scale sterile neutrino Dark Matter, collecting views and insights from all disciplines involved - cosmology, astrophysics, nuclear, and particle physics - in each case viewed from both theoretical and experimental/observational perspectives. After reviewing the role of active neutrinos in particle physics, astrophysics, and cosmology, we focus on sterile neutrinos in the context of the Dark Matter puzzle. Here, we first review the physics motivation for sterile neutrino Dark Matter, based on challenges and tensions in purely cold Dark Matter scenarios. We then round out the discussion by critically summarizing all known constraints on sterile neutrino Dark Matter arising from astrophysical observations, laboratory experiments, and theoretical considerations. In this context, we provide a balanced discourse on the possibly positive signal from X-ray observations. Another focus of the paper concerns the construction of particle physics models, aiming to explain how sterile neutrinos of keV-scale masses could

arise in concrete settings beyond the Standard Model of elementary particle physics. The paper ends with an extensive review of current and future astrophysical and laboratory searches, highlighting new ideas and their experimental challenges, as well as future perspectives for the discovery of sterile neutrinos.

Searches for the Supersymmetric Partner of the Top Quark, Dark Matter and Dark Energy at the ATLAS Experiment Icon Books

Get ready to embark on the exciting search for dark matter—the invisible mass that dominates our universe. This popular science book explains why this mysterious dark matter has been incorporated into the standard model of the universe and how scientists are able to “observe” the invisible. The book starts with the early indications of the existence of dark matter, including the strange cohesion of galaxy clusters, before moving on to modern observations like cosmic background radiation. Along the way, you will learn about the direct and indirect methods being used by researchers to track down dark matter and whatever is behind this strange phenomenon. The Mystery of Dark Matter will appeal to general readers who wish to understand what scientists actually know about dark matter, along with the methods they use to help crack the mystery. This book is a translation of the original German 1st edition Das Rätsel Dunkle Materie by Wolfgang Kapferer, published by Springer-Verlag GmbH Deutschland in 2018.The translation was done with the help of artificial intelligence (machine translation by the service DeepL.com). A subsequent human revision was done primarily in terms of content, so that the book will read stylistically differently from a conventional translation. Springer Nature works continuously to further the development of tools for the production of books and on the related technologies to support the authors.

Particle Dark Matter Springer Science & Business Media

The visible universe is a small perturbation on the material universe. Zwicky and Sinclair Smith in the 1930s gave evidence of invisible mass in the Coma and Virgo Clusters of Galaxies. Better optical data has only served to confound their critics and the X-ray data confirms that the gravitational potentials are many times larger than those predicted on the basis of the observed stars. Dynamical analyses of individual galaxies have found that significant extra mass is needed to explain their rotational velocities. On much larger scales, tens of megaparsecs, there is suggestive evidence that there is even more mass per unit luminosity. What is this non-luminous stuff of which the universe is made'? How much of it is there? Need there be only one kind of stuff? There are three basic possi bili ties:- all of it is ordinary (baryonic) matter, all of it is some other kind of (non-baryonic) matter, or some of it is baryonic and some is non-baryonic.

Cosmological Clues Springer Science & Business Media

Based on a Simons Symposium held in 2018, the proceedings in this volume focus on the theoretical, numerical, and observational quest for dark matter in the universe. Present ground-based and satellite searches have so far severely constrained the long-

proposed theoretical models for dark matter. Nevertheless, there is continuously growing astrophysical and cosmological evidence for its existence. To address present and future developments in the field, novel ideas, theories, and approaches are called for. The symposium gathered together a new generation of experts pursuing innovative, more complex theories of dark matter than previously considered.This is being done hand in hand with experts in numerical astrophysical simulations and observational techniques—all paramount for deciphering the nature of dark matter. The proceedings volume provides coverage of the most advanced stage of understanding dark matter in various new frameworks. The collection will be useful for graduate students, postdocs, and investigators interested in cutting-edge research on one of the biggest mysteries of our universe.

Dark Matter Signals Bold Type Books

Driven by discoveries, and enabled by leaps in technology and imagination, our understanding of the universe has changed dramatically during the course of the last few decades. The fields of astronomy and astrophysics are making new connections to physics, chemistry, biology, and computer science. Based on a broad and comprehensive survey of scientific opportunities, infrastructure, and organization in a national and international context, New Worlds, New Horizons in Astronomy and Astrophysics outlines a plan for ground- and space- based astronomy and astrophysics for the decade of the 2010's. Realizing these scientific opportunities is contingent upon maintaining and strengthening the foundations of the research enterprise including technological development, theory, computation and data handling, laboratory experiments, and human resources. New Worlds, New Horizons in Astronomy and Astrophysics proposes enhancing innovative but moderate-cost programs in space and on the ground that will enable the community to respond rapidly and flexibly to new scientific discoveries. The book recommends beginning construction on survey telescopes in space and on the ground to investigate the nature of dark energy, as well as the next generation of large ground-based giant optical telescopes and a new class of space-based gravitational observatory to observe the merging of distant black holes and precisely test theories of gravity. New Worlds, New Horizons in Astronomy and Astrophysics recommends a balanced and executable program that will support research surrounding the most profound questions about the cosmos. The discoveries ahead will facilitate the search for habitable planets, shed light on dark energy and dark matter, and aid our understanding of the history of the universe and how the earliest stars and galaxies formed. The book is a useful resource for agencies supporting the field of astronomy and astrophysics, the Congressional committees with jurisdiction over those agencies, the scientific community, and the public.

Knowledge in a Nutshell: Astrophysics National Academies Press

Proceedings of the NATO Advanced Study Institute, Erice, Sicily, Italy, June 20-30, 1992

Manifestations of Dark Matter and Variations of the Fundamental Constants in Atoms and Astrophysical Phenomena
Springer Nature
At least eighty percent of the mass of the universe consists of some material which, unlike ordinary matter, neither emits nor absorbs light. This book collects key papers related to the discovery of this astonishing fact and its profound implications for astrophysics, cosmology, and the physics of elementary particles. The book focuses on the likely possibility that the dark matter is composed of an as yet undiscovered elementary particle, and examines the boundaries of our present knowledge of the properties such a particle must possess.

The Hidden 95% of the Universe
Springer
From a star theoretical physicist, a journey into the world of particle physics and the cosmos—and a call for a more liberatory practice of science. A Finalist for the 2022 PEN/E.O. Wilson Literary Science Writing Award A Finalist for the 2021 Los Angeles Times Book Prize in Science & Technology A Smithsonian Magazine Best Science Book of 2021 A Symmetry Magazine Top 10 Physics Book of 2021 An Entropy Magazine Best Nonfiction Book of 2020-2021 A Publishers Weekly Best Nonfiction Book of the Year A Kirkus Reviews Best Nonfiction Book of 2021 A Booklist Top 10 Sci-Tech Book of the Year In The Disordered Cosmos, Dr. Chanda Prescod-Weinstein shares her love for physics, from the Standard Model of Particle Physics and what lies beyond it, to the physics of melanin in skin, to the latest theories of dark matter—along with a perspective informed by history, politics, and the wisdom of Star Trek. One of the leading physicists of her generation, Dr. Chanda Prescod-Weinstein is also one of fewer than one hundred Black American women to earn a PhD from a department of physics. Her vision of the cosmos is vibrant, buoyantly nontraditional, and grounded in Black and queer feminist lineages. Dr. Prescod-Weinstein urges us to recognize how science, like most fields, is rife with racism, misogyny, and other forms of oppression. She lays out a bold new approach to science and society, beginning with the belief that we all have a fundamental right to know and love the night sky. The Disordered Cosmos dreams into existence a world that allows everyone to experience and understand the wonders of the universe.