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Trading at the Speed of Light

How Ultrafast Algorithms Are Transforming Financial Markets

Princeton University Press **A remarkable look at how the growth, technology, and politics of high-frequency trading have altered global financial markets In today's financial markets, trading floors on which brokers buy and sell shares face-to-face have increasingly been replaced by lightning-fast electronic systems that use algorithms to execute astounding volumes of transactions. Trading at the Speed of Light tells the story of this epic transformation. Donald MacKenzie shows how in the 1990s, in what were then the disreputable margins of the US financial system, a new approach to trading—automated high-frequency trading or HFT—began and then spread throughout the world. HFT has brought new efficiency to global trading, but has also created an unrelenting race for speed, leading to a systematic, subterranean battle among HFT algorithms. In HFT, time is measured in nanoseconds (billionths of a second), and in a nanosecond the fastest possible signal—light in a vacuum—can travel only thirty centimeters, or roughly a foot. That**

makes HFT exquisitely sensitive to the length and transmission capacity of the cables connecting computer servers to the exchanges' systems and to the location of the microwave towers that carry signals between computer datacenters. Drawing from more than 300 interviews with high-frequency traders, the people who supply them with technological and communication capabilities, exchange staff, regulators, and many others, MacKenzie reveals the extraordinary efforts expended to speed up every aspect of trading. He looks at how in some markets big banks have fought off the challenge from HFT firms, and how exchanges sometimes engineer technical systems to favor certain types of algorithms over others. Focusing on the material, political, and economic characteristics of high-frequency trading, *Trading at the Speed of Light* offers a unique glimpse into its influence on global finance and where it could lead us in the future.

War at the Speed of Light

Directed-Energy Weapons and the Future of Twenty-First-Century Warfare

U of Nebraska Press **War at the Speed of Light** explores the revolutionary role of directed-energy weapons in warfare and their threat to disrupting the doctrine of Mutually Assured Destruction.

God at the Speed of Light

The Melding of Science and Spirituality

Createspace Independent Pub **Respected television producer Barbara Hall** cited *God at the Speed of Light* as one of the inspirations for her creation of the CBS TV series "Joan of Arcadia" (2003-05). The unique and supernatural characteristics of light that influenced Hall have equally served to inspire the likes of Copernicus, Ole Romer, Michelson/Morley, Sir Edwin Hubble, and Albert Einstein. Einstein, for instance, frequently envisioned what it would be

like to ride on the back of a photon as it sped across the Universe at the speed of light--a speed at which Einstein calculated that time ceased to exist. Since Einstein first entertained his special theory, science has repeatedly verified the cessation of time at this singular velocity. The term "light speed" has paradoxically become the ultimate oxymoron: a velocity of 186,000 miles per second in a setting where time doesn't exist. The ramifications are profound and are the topic of this book--ramifications so profound, in fact, to convince this author, your ultimate skeptic, that an Eternal, Intelligent Power must exist. Once Lee Baumann came to fully accept these scientifically-proven, yet supernatural qualities of light, his further research only solidified the truly metaphysical nature of this ubiquitous form of universal energy. Suddenly, descriptions of "the light" in the near-death experience and the Earth's sacred texts (e.g., "I am the light of the world") required no further explanation. God shares an intimate relationship with light. Baumann's *God at the Speed of Light* will complement and strengthen the spiritual foundation of any religious view.

Trading at the Speed of Light

How Ultrafast Algorithms Are Transforming Financial Markets

Princeton University Press "Trading at the Speed of Light tells the story of how many of our most important financial markets have transformed from physical trading floors on which human beings trade face-to-face, into electronic systems within which computer algorithms trade with each other. Tracing the emergence of ultrafast, automated, high-frequency trading (HFT) since the early 2000s, Donald MacKenzie draws particular attention to the importance of what he deems the 'material political economy' of twenty-first century finance. Fast transmission of price data used to involve fibre-optic cables, but the strands in such cables are made of materials (usually a specialised form of glass) which slow light down to around two-thirds of its speed in free space. By contrast, microwave and other wireless signals used in HFT travel through the atmosphere at nearly full light speed. At these nanosecond speeds, the physical nature of information transmission and the precise spatial location of the equipment involved become hugely important, thus creating inevitable pinch points in the system. MacKenzie details the ways in which these pinch points - individual frequency bands, specific locations on the roofs of computer data centres, and particular sites for

microwave towers - are especially advantageous, making it possible for those who control them to profit from that control. The book draws from over 300 interviews conducted with high-frequency traders around the world, the people who supply them with technological systems and communication links, exchange staff and regulators, as well as with others who function within markets that have not yet become dominated by HFT. MacKenzie focuses most closely upon the four main sites of international HFT - Chicago, New York, Amsterdam, and London - and examines both the technology and the politics underpinning modern financial markets"--

Physics of Light and Optics (Black & White)

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CNPS Proceedings 2017

Lulu.com The John Chappell Natural Philosophy Society (CNPS) provides an open forum for the study, debate, and presentation of serious scientific ideas, theories, philosophies, and experiments that are not commonly accepted in mainstream science. The CNPS uses the term "Natural Philosophy" in its broader sense which includes physics, cosmology, mathematics, and the philosophy of science. Our goal is to return to the basics where things went wrong and start anew.

Life at the Speed of Light

From the Double Helix to the Dawn of Digital Life

Penguin "Venter instills awe for biology as it is, and as it might become in our hands." —Publishers Weekly On May 20, 2010, headlines around the world announced one of the most extraordinary accomplishments in modern science: the creation of the world's first synthetic lifeform. In *Life at the Speed of Light*, scientist J. Craig Venter, best known for sequencing the human genome, shares the dramatic account of how he led a team of researchers in this pioneering effort in synthetic genomics—and how that work will have a profound impact on our existence in the years to come. This is a fascinating and authoritative study that provides readers an opportunity to ponder afresh the age-old

question “What is life?” at the dawn of a new era of biological engineering.

War at the Speed of Light

Directed-Energy Weapons and the Future of Twenty-First-Century Warfare

U of Nebraska Press **War at the Speed of Light** explores the revolutionary role of directed-energy weapons in warfare and their threat to disrupting the doctrine of Mutually Assured Destruction.

Performance of Light Aircraft

AIAA **Pilots, aviation students, kitplane builders, aircraft fleet operators and aeronautical engineers can all determine how their propeller-driven airplanes will perform, under any conditions, by using the step-by-step bootstrap approach introduced in this book. A few routine flying manoeuvres (climbs, glides, a level speed run) will give the necessary nine numbers. High-school level calculations then give performance numbers with much greater detail and accuracy than many other methods - for the reader's individual aircraft.**

Physics Quick Study Guide & Workbook

Trivia Questions Bank, Worksheets to Review

Homeschool Notes with Answer Key

Bushra Arshad **Physics Quick Study Guide & Workbook: Trivia Questions Bank, Worksheets to Review Homeschool Notes with Answer Key PDF (Physics Notes, Terminology & Concepts about Self-Teaching/Learning)** includes revision notes

for problem solving with 600 trivia questions. Physics quick study guide PDF book covers basic concepts and analytical assessment tests. Physics question bank PDF book helps to practice workbook questions from exam prep notes. Physics quick study guide with answers includes self-learning guide with 2000 verbal, quantitative, and analytical past papers quiz questions. Physics trivia questions and answers PDF download, a book to review questions and answers on chapters: Energy mass and power, forces in physics, kinematics, light, mass weight and density, physics measurements, pressure, temperature, thermal properties of matter, transfer of thermal energy, turning effects of forces, waves worksheets for high school and college revision notes. Physics revision notes PDF download with free sample book covers beginner's questions, textbook's study notes to practice worksheets. Physics study guide PDF includes high school workbook questions to practice worksheets for exam. Physics notes PDF, a workbook with textbook chapters' notes for NEET/MCAT/SAT/ACT/GATE/IPhO competitive exam. Physics workbook PDF covers problem solving exam tests from physics practical and textbook's chapters as: Chapter 1: Energy Mass and Power Worksheet Chapter 2: Forces in Physics Worksheet Chapter 3: Kinematics Worksheet Chapter 4: Light Worksheet Chapter 5: Mass Weight and Density Worksheet Chapter 6: Physics Measurements Worksheet Chapter 7: Pressure Worksheet Chapter 8: Temperature Worksheet Chapter 9: Thermal Properties of Matter Worksheet Chapter 10: Transfer of Thermal Energy Worksheet Chapter 11: Turning Effects of Forces Worksheet Chapter 12: Waves Worksheet Solve Energy Mass and Power quick study guide PDF, worksheet 1 trivia questions bank: energy in physics, power in physics, work in physics. Solve Forces in Physics quick study guide PDF, worksheet 2 trivia questions bank: force and motion, forces, friction and its effects. Solve Kinematics quick study guide PDF, worksheet 3 trivia questions bank: acceleration of free fall, distance time and speed, speed time graphs, speed velocity and acceleration. Solve Light quick study guide PDF, worksheet 4 trivia questions bank: converging lens, endoscope, facts of light, ray diagram for lenses, reflection of light, refraction at plane surfaces, refractive index, total internal reflection, what is light. Solve Mass Weight and Density quick study guide PDF, worksheet 5 trivia questions bank: density, inertia, mass and weight. Solve Physics Measurements quick study guide PDF, worksheet 6 trivia questions bank: measurement of length, measurement of time, physical quantities and si units, what is physics. Solve Pressure quick study guide PDF, worksheet 7 trivia questions bank: gas pressure, pressure in liquids, pressure in physics. Solve Temperature quick study guide PDF, worksheet 8 trivia questions bank: common temperature scales, pressure in gases, states of matter, temperature and measuring instruments, temperature scales conversion, thermocouple thermometer. Solve Thermal Properties of Matter quick study guide PDF, worksheet 9 trivia questions bank: boiling and condensation, evaporation, heat capacity, latent heat, melting and solidification, sat physics practice test, sat physics subjective test, thermal energy,

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Testing at the Speed of Light

The State of U.S. Electronic Parts Space Radiation Testing Infrastructure

National Academies Press **Spacecraft depend on electronic components that must perform reliably over missions measured in years and decades. Space radiation is a primary source of degradation, reliability issues, and potentially failure for these electronic components. Although simulation and modeling are valuable for understanding the radiation risk to microelectronics, there is no substitute for testing, and an increased use of commercial-off-the-shelf parts in spacecraft may actually increase requirements for testing, as opposed to simulation and modeling. Testing at the Speed of Light evaluates the nation's current capabilities and future needs for testing the effects of space radiation on microelectronics to ensure mission success and makes recommendations on how to provide effective stewardship of the necessary radiation test infrastructure for the foreseeable future.**

Programming at Light Speed

Lulu.com **Millions of people sit down at their computer every day, and create new things with a few taps of their fingers. How, you ask? By programming. Through this book, you too will be able to create many amazing new things, such as a full web server and website, and host it on the web, learn how the operating system that you use every day handles memory and data, and discover the joys of programming for fun. Whether you're 12 or 120, this book is designed for**

all ages, so don't be afraid to jump into the fray and give it a shot. You don't know what you're capable of until you try. In Chapter 1, we'll overview the basics of computational thinking and syntax using Python. In Chapter 2, the wonders of Javascript and NodeJS will be revealed, and server programming unveiled. In Chapter 3, you'll program a fully working web server, and host it online. Finally, in Chapter 4, C++ will show you how the OS handles your commands and holding data. Then, you'll be programming at light speed.

Space at the Speed of Light

The History of 14 Billion Years for People Short on Time

From the big bang to black holes, this fast-paced illustrated tour of time and space for the astro-curious unlocks the science of the stars to reveal fascinating theories, surprising discoveries, and ongoing mysteries in modern astronomy and astrophysics. Before the big bang, time, space, and matter didn't exist. In the 14 billion years since, scientists have pointed their telescopes upward, peering outward in space and backward in time, developing and refining theories to explain the weird and wonderful phenomena they observed. Through these observations, we now understand concepts like the size of the universe (still expanding), the distance to the next-nearest star from earth (Alpha Centauri, 26 trillion miles) and what drives the formation of elements (nuclear fusion), planets and galaxies (gravity), and black holes (gravitational collapse). But are these cosmological questions definitively answered or is there more to discover? Oxford University astrophysicist and popular YouTube personality Dr. Becky Smethurst presents everything you need to know about the universe in ten accessible and engagingly illustrated lessons. In *Space at the Speed of Light: The History of 14 Billion Years for People Short on Time*, she guides you through fundamental questions, both answered and unanswered, posed by space scientists. Why does gravity matter? How do we know the big bang happened? What is dark matter? Do aliens exist? Why is the sky dark at night? If you have ever looked up at night and wondered how it all works, you will find answers--and many more questions--in this pocket-sized tour of the universe!

Light Speed

Ultimate Destiny

Save My Dreams **Bill Gates and Paul Allen, in the twentieth century, built a new technology that would change the world. In the twenty-first century, two young entrepreneurs, Kenneth Shepherd and Bernard Rush, form a space company in New Boston, Massachusetts, to exploit the riches of the asteroid belt. In a bitter disagreement, Bernard leaves Shepherd Industries to start his own competing company. After five decades of fierce competition, Shepherd Industries discovers faster-than-light travel, an achievement that Bernard Rush wants to claim for himself. He resorts to espionage, kidnapping, and even murder to get what he wants. But when Rush kidnaps the girlfriend of the new captain of the Star Ship Destiny, Captain John Burke isn't about to let Rush win this time.**

Popular Science

Popular Science gives our readers the information and tools to improve their technology and their world. The core belief that Popular Science and our readers share: The future is going to be better, and science and technology are the driving forces that will help make it better.

The Facts on File Dictionary of Physics, Fourth Edition

Infobase Publishing **An illustrated dictionary containing over 2,800 entries explaining physics terms and concepts.**

O Level Physics Quick Study Guide & Workbook

Trivia Questions Bank, Worksheets to Review Homeschool Notes with Answer Key

Bushra Arshad **O Level Physics Quick Study Guide & Workbook: Trivia Questions Bank, Worksheets to Review Homeschool Notes with Answer Key PDF (Cambridge Physics Self Teaching Guide about Self-Learning)** includes revision notes for problem solving with 900 trivia questions. O Level Physics quick study guide PDF book covers basic concepts and analytical assessment tests. O Level Physics question bank PDF book helps to practice workbook questions from exam prep notes. O level physics quick study guide with answers includes self-learning guide with 900 verbal, quantitative, and analytical past papers quiz questions. O Level Physics trivia questions and answers PDF download, a book to review questions and answers on chapters: Electromagnetic waves, energy, work, power, forces, general wave properties, heat capacity, kinematics, kinetic theory of particles, light, mass, weight, density, measurement of physical quantities, measurement of temperature, melting and boiling, pressure, properties and mechanics of matter, simple kinetic theory of matter, sound, speed, velocity and acceleration, temperature, thermal energy, thermal properties of matter, transfer of thermal energy, turning effects of forces, waves tests for school and college revision guide. O Level Physics interview questions and answers PDF download with free sample book covers beginner's questions, textbook's study notes to practice worksheets. Cambridge IGCSE GCSE Physics study material includes high school question papers to review workbook for exams. O level physics workbook PDF, a quick study guide with textbook chapters' tests for IGCSE/NEET/MCAT/SAT/ACT/GATE/IPhO competitive exam. O Level Physics book PDF covers problem solving exam tests from physics practical and textbook's chapters as: Chapter 1: Electromagnetic Waves Worksheet Chapter 2: Energy, Work and Power Worksheet Chapter 3: Forces Worksheet Chapter 4: General Wave Properties Worksheet Chapter 5: Heat Capacity Worksheet Chapter 6: Kinematics Worksheet Chapter 7: Kinetic Theory of Particles Worksheet Chapter 8: Light Worksheet Chapter 9: Mass, Weight and Density Worksheet Chapter 10: Measurement of Physical Quantities Worksheet Chapter 11: Measurement of Temperature Worksheet Chapter 12: Measurements Worksheet Chapter 13: Melting and Boiling Worksheet Chapter 14: Pressure Worksheet Chapter 15: Properties and Mechanics of Matter Worksheet Chapter 16: Simple Kinetic Theory of Matter Worksheet Chapter 17: Sound Worksheet Chapter 18: Speed, Velocity and Acceleration Worksheet Chapter 19: Temperature Worksheet Chapter 20: Thermal Energy Worksheet Chapter 21: Thermal Properties of Matter Worksheet Chapter 22: Transfer of Thermal Energy Worksheet

Chapter 23: Turning Effects of Forces Worksheet Chapter 24: Waves Physics Worksheet Solve Electromagnetic Waves study guide PDF with answer key, worksheet 1 trivia questions bank: Electromagnetic waves. Solve Energy, Work and Power study guide PDF with answer key, worksheet 2 trivia questions bank: Work, power, energy, efficiency, and units. Solve Forces study guide PDF with answer key, worksheet 3 trivia questions bank: Introduction to forces, balanced forces and unbalanced forces, acceleration of freefall, acceleration, effects of forces on motion, forces and effects, motion, scalar, and vector. Solve General Wave Properties study guide PDF with answer key, worksheet 4 trivia questions bank: Introduction to waves, properties of wave motion, transverse and longitudinal waves, wave production, and ripple tank. Solve Heat Capacity study guide PDF with answer key, worksheet 5 trivia questions bank: Heat capacity, and specific heat capacity. Solve Kinematics study guide PDF with answer key, worksheet 6 trivia questions bank: Acceleration free fall, acceleration, distance, time, speed, and velocity. Solve Kinetic Theory of Particles study guide PDF with answer key, worksheet 7 trivia questions bank: Kinetic theory, pressure in gases, and states of matter. Solve Light study guide PDF with answer key, worksheet 8 trivia questions bank: Introduction to light, reflection, refraction, converging lens, and total internal reflection. Solve Mass, Weight and Density study guide PDF with answer key, worksheet 9 trivia questions bank: Mass, weight, density, inertia, and measurement of density. Solve Measurement of Physical Quantities study guide PDF with answer key, worksheet 10 trivia questions bank: Physical quantities, SI units, measurement of density and time, precision, and range. Solve Measurement of Temperature study guide PDF with answer key, worksheet 11 trivia questions bank: Measuring temperature, scales of temperature, and types of thermometers. Solve Measurements study guide PDF with answer key, worksheet 12 trivia questions bank: Measuring time, meter rule, and measuring tape. Solve Melting and Boiling study guide PDF with answer key, worksheet 13 trivia questions bank: Boiling point, boiling and condensation, evaporation, latent heat, melting, and solidification. Solve Pressure study guide PDF with answer key, worksheet 14 trivia questions bank: Introduction to pressure, atmospheric pressure, weather, hydraulic systems, measuring atmospheric pressure, pressure in liquids, and pressure of gases. Solve Properties and Mechanics of Matter study guide PDF with answer key, worksheet 15 trivia questions bank: Solids, friction, and viscosity. Solve Simple Kinetic Theory of Matter study guide PDF with answer key, worksheet 16 trivia questions bank: Evidence of molecular motion, kinetic molecular model of matter, pressure in gases, and states of matter. Solve Sound study guide PDF with answer key, worksheet 17 trivia questions bank: Introduction to sound, and transmission of sound. Solve Speed, Velocity and Acceleration study guide PDF with answer key, worksheet 18 trivia questions bank: Speed, velocity, acceleration, displacement-time graph, and velocity-time graph. Solve Temperature study guide PDF with answer key, worksheet 19 trivia questions bank: What is

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Breakthroughs in Smart City Implementation

CRC Press **Breakthroughs in Smart City Implementation** should give answers on a wide variety of present social, political and technological problems. Green and long-lasting solutions are needed in coming 10 years and beyond on areas as green and long lasting solutions for improving air quality, quality of life of residents in cities, traffic congestions and many more. Two Conasense branches, established in China and in India, report in six book chapters on initiatives needed to overcome the obvious shortcomings at present. Three more chapters complete this fifth Conasense book: an introductory chapter concerning Smart City from Conasense perspective, a chapter showing that not technology but the people in the cities are most important and a chapter on recent results and prospects of “Human in the Loop” in smart vehicular systems.

Understanding Shutter Speed

Amphoto Books The first book in the Understanding Photography series, **Understanding Exposure**, was a runaway best-seller, with more than 250,000 copies sold. Now author Bryan Peterson brings his signature style to another important photography topic: shutter speed. With clear, jargon-free explanations of terms and techniques, plus compelling “before-and-after” photos that pair a mediocre image (created using the wrong shutter speed) with a great image (created using the right shutter speed), this is the definitive practical guide to mastering an often-confusing subject.

Topics include freezing and implying motion, panning, zooming, exposure, Bogen Super Clamps, and rendering motion effects with Photoshop, all with helpful guidance for both digital and film formats. Great for beginners and serious amateurs, Understanding Shutter Speed is the definitive handy guide to mastering shutter speed for superb results.

Engineering Physics Quick Study Guide & Workbook

Trivia Questions Bank, Worksheets to Review

Homeschool Notes with Answer Key

Bushra Arshad **Engineering Physics Quick Study Guide & Workbook: Trivia Questions Bank, Worksheets to Review Homeschool Notes with Answer Key PDF (Engineering Physics Notes, Terminology & Concepts about Self-Teaching/Learning)** includes revision notes for problem solving with 1400 trivia questions. Engineering Physics quick study guide PDF book covers basic concepts and analytical assessment tests. Engineering Physics question bank PDF book helps to practice workbook questions from exam prep notes. Engineering physics quick study guide with answers includes self-learning guide with 1400 verbal, quantitative, and analytical past papers quiz questions. Engineering Physics trivia questions and answers PDF download, a book to review questions and answers on chapters: Alternating fields and currents, astronomical data, capacitors and capacitance, circuit theory, conservation of energy, coulomb's law, current produced magnetic field, electric potential energy, equilibrium, indeterminate structures, finding electric field, first law of thermodynamics, fluid statics and dynamics, friction, drag and centripetal force, fundamental constants of physics, geometric optics, inductance, kinetic energy, longitudinal waves, magnetic force, models of magnetism, newton's law of motion, Newtonian gravitation, Ohm's law, optical diffraction, optical interference, physics and measurement, properties of common elements, rotational motion, second law of thermodynamics, simple harmonic motion, special relativity, straight line motion, transverse waves, two and three dimensional motion, vector quantities, work-kinetic energy theorem worksheets for college and university revision notes. Engineering Physics revision notes PDF download with free sample book covers beginner's questions, textbook's study notes to practice worksheets. Physics study guide PDF includes high school workbook questions to practice worksheets for exam. Engineering physics notes PDF, a workbook with textbook chapters' notes for competitive exam. Engineering Physics workbook PDF

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The Birth of Science

Springer Nature This book reveals the multi-generational process involved in humanity's first major scientific achievement, namely the discovery of modern physics, and examines the personal lives of six of the intellectual giants involved. It explores the profound revolution in the way of thinking, and in particular the successful refutation of the school of thought inherited from the Greeks, which focused on the perfection and immutability of the celestial world. In addition, the emergence of the scientific method and the adoption of mathematics as the central tool in scientific endeavors are discussed. The book then explores the delicate thread between pure philosophy, grand unifying theories, and verifiable real-life scientific facts. Lastly, it turns to Kepler's crucial 3rd law and shows how it was derived from a mere six data points, corresponding to the six planets known at the time. Written in a straightforward and accessible style, the book will inform and fascinate all aficionados of science, history, philosophy, and, in particular, astronomy.

Mind at Light Speed

A New Kind of Intelligence

Simon and Schuster Explains the technology and scientific principles behind the bandwidth revolution and provides an incisive look at the next generation of computers, the future of artificial intelligence, and their implications for human life.

Design Principles for Photography

Routledge In an age over-saturated with photographic imagery, *Design Principles for Photography* demonstrates how design awareness can add a new level of depth to your images. By adapting and experimenting with the tried and tested techniques used by graphic designers every day, you can add dynamism and impact to your imagery, whatever the style or genre - something that today's editors, curators and publishers are all crying out for. The second edition includes examples of unsuccessful compositions, annotated images highlighting key techniques and an expanded glossary. There's also a new section on movements in photography and their reflection in composition, including modernism, expressionism, and surrealism and interviews with international practitioners discussing how they've included design principles in their work. Featured topics: Basic design theory; the use of space; positional decisions; the elements of design; line; shape or form; space; texture; light; colour; pattern; rhythm; contrast; scale and proportion; abstraction; movement and flow; containment; emphasis and emotion; juxtaposition; incongruity; mood and emotion.

Broadband At the Speed of Light: How Three Communities Built Next-Generation Networks

Inst for Local Self-Reliance Frustrated by ever-increasing prices for telecommunication services and the reluctance of incumbent providers to upgrade their networks to meet 21st century needs, more than 150 communities have built their own citywide cable and FTTH networks. Against great odds and in the face of ferocious opposition by the existing telephone and cable companies in the courts, at the legislature, and in the marketplace, the vast majority have

succeeded. To understand how this has occurred and to extract lessons that might be useful for cities deciding whether to build their own networks, we undertook an in-depth examination of three municipally owned networks in Bristol Va., Chattanooga, Tenn., and Lafayette, La. Each of these communities already had access to the Internet via DSL and cable. But in the words of Lafayette City-Parish President Joey Durel, "They wanted more." Without investment in next-generation networks, these cities feared they would be left behind in the transition to the digital economy of the Internet era.

Traveling at the Speed of Thought

Einstein and the Quest for Gravitational Waves

Princeton University Press Since Einstein first described them nearly a century ago, gravitational waves have been the subject of more sustained controversy than perhaps any other phenomenon in physics. These as yet undetected fluctuations in the shape of space-time were first predicted by Einstein's general theory of relativity, but only now, at the dawn of the twenty-first century, are we on the brink of finally observing them. Daniel Kennefick's landmark book takes readers through the theoretical controversies and thorny debates that raged around the subject of gravitational waves after the publication of Einstein's theory. The previously untold story of how we arrived at a settled theory of gravitational waves includes a stellar cast from the front ranks of twentieth-century physics, including Richard Feynman, Hermann Bondi, John Wheeler, Kip Thorne, and Einstein himself, who on two occasions avowed that gravitational waves do not exist, changing his mind both times. The book derives its title from a famously skeptical comment made by Arthur Stanley Eddington in 1922--namely, that "gravitational waves propagate at the speed of thought." Kennefick uses the title metaphorically to contrast the individual brilliance of each of the physicists grappling with gravitational-wave theory against the frustratingly slow progression of the field as a whole. Accessibly written and impeccably researched, this book sheds new light on the trials and conflicts that have led to the extraordinary position in which we find ourselves today--poised to bring the story of gravitational waves full circle by directly confirming their existence for the very first time.

Theft at the Speed of Light

Lulu Press, Inc In a matter of minutes, thousands of checking accounts across America go empty. Caught up in the theft is Alex Poole, a software engineer who works on house arrest and prisoner tracking systems. As a result, he switches his account to Aspirizon Bank—an institution well known for its friendly tellers, futuristic branches, and the ever-popular “Liberty Card”. Yet when he finds the bank is run by a notorious ex-coworker and strange visitors start arriving at his door, he realizes the bank’s vision of the future may come at a price few are willing to pay.

The Speed of Light

A Novel

Ballantine Books Every family has a story. Every story, eventually, must be told. For most of their lives, Julian Perel and his sister, Paula, lived in a house cast in silence, witnesses to a father struggling with a devastating secret too painful to share. Though their father took his demons to the grave, his past refuses to rest. As adults, brother and sister struggle to find their voices. A scientist governed by numbers and logic, Julian now lives an ordered life of routine and seclusion. My father gave up his language and his homeland. But he carried his sadness with him, under his skin. It was mine now. In contrast, Paula has entered the world as eagerly as Julian retracts from it. An aspiring opera singer, she is always moving, buoyant with sound. Singing was the only gift I could offer to my father. I filled the house with music. I tried to give him joy. . . . Yet both their lives begin to change on a Wednesday, miercoles, the day that sounds like miracles. Before embarking on a European opera tour, Paula asks her housekeeper, Sola, to stay at her place--and to look after Julian in the apartment above. Yet Sola, too, has a story. I want to clean myself like the window of a house, make myself clear for things to pass through. Flat and quiet. As Paula uncovers pieces of her father's early life in Budapest and the horrifying truth of his past, Julian bears witness to Sola's story--revelations that help all three learn how to both surrender and revere the shadows that have followed them for so long. The Speed of Light is a powerful debut about three unforgettable souls who overcome the tragedies of the past to reconnect with one another and the world around them. In an extraordinary accomplishment, Elizabeth Rosner has created a novel of love and

redemption that proves the pain of the untold story is far greater than even the most difficult truth.

American Machinist

University Physics

University Physics is designed for the two- or three-semester calculus-based physics course. The text has been developed to meet the scope and sequence of most university physics courses and provides a foundation for a career in mathematics, science, or engineering. The book provides an important opportunity for students to learn the core concepts of physics and understand how those concepts apply to their lives and to the world around them. Due to the comprehensive nature of the material, we are offering the book in three volumes for flexibility and efficiency. Coverage and Scope Our University Physics textbook adheres to the scope and sequence of most two- and three-semester physics courses nationwide. We have worked to make physics interesting and accessible to students while maintaining the mathematical rigor inherent in the subject. With this objective in mind, the content of this textbook has been developed and arranged to provide a logical progression from fundamental to more advanced concepts, building upon what students have already learned and emphasizing connections between topics and between theory and applications. The goal of each section is to enable students not just to recognize concepts, but to work with them in ways that will be useful in later courses and future careers. The organization and pedagogical features were developed and vetted with feedback from science educators dedicated to the project. **VOLUME III Unit 1: Optics Chapter 1: The Nature of Light Chapter 2: Geometric Optics and Image Formation Chapter 3: Interference Chapter 4: Diffraction Unit 2: Modern Physics Chapter 5: Relativity Chapter 6: Photons and Matter Waves Chapter 7: Quantum Mechanics Chapter 8: Atomic Structure Chapter 9: Condensed Matter Physics Chapter 10: Nuclear Physics Chapter 11: Particle Physics and Cosmology**

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A Level Physics Quick Study Guide & Workbook

Trivia Questions Bank, Worksheets to Review

Homeschool Notes with Answer Key

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Special Relativity and Its Experimental Foundations

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Living at the Speed of Light

The Unlimited Power of the Present

AuthorHouse Life was not easy in the twelfth century for the latter sons of even the wealthiest of men. As King John put it, "For the fourth sons, even of a king, are among the most insignificant of God's creatures." In those days, the first born inherited everything. A late-arrival had a choice of becoming a hearth son, dependent upon the largesse of his family, or of seeking his fortune through his own abilities and talents. "The Fourth Son" is the dramatic saga of a man who chose the latter path. William Marshall succeeded so well, in fact, that he far surpassed his own family standing and left his mark on history, serving eventually as regent of England. This imaginative version is based on the life of a real flesh and blood man. The feats of the great Knight William are recorded in history throughout the tumultuous reign of the fiery Plantagenets, including the lusty Henry II and his sons, the dashing Couer de Lion and the treacherous John. Maintaining his position (and his head) in the fickle court of kings was a constant struggle what with the sibling rivalry of the king's sons and the constant friction between the English and the French, who wanted nothing less than to shove the Angevins back across the channel. But the besieged Knight William found his greatest challenge in his arranged marriage, sight unseen, to a beautiful Irish princess some twenty years his junior. To his dismay, he found his knightly prowess of no use in his relationship with the head-strong Isabel de Clare, for beneath his fierce warrior's breast there beat a tender heart with a conscience--a distinct disadvantage in those days.

Practical Engineer

All About Light and Sound

Teacher Created Materials Explains the importance of light and sound in the universe and describes what scientists have found out about them.

The American Gas Light Journal

Engineering Mechanics

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