

little book on Einstein the experimenter and inventor, *The Practical Einstein: Experiments, Patents, Inventions*. Illy is a senior editor on the Einstein Papers Project. With a lean and matter-of-fact prose, he takes us through a long history of such things as Einstein's many expert opinions on everything from gyrocompasses and pile drivers to an "electroponic piano" and a makeup mirror. We learn about Einstein's own inventions, ranging from an airfoil and a refrigerator to an altimeter and a light-intensity self-adjusting camera. The book concludes with the most complete history ever written of Einstein's work for the US Navy during World War II on magnetic-influence proximity fuses for torpedoes—work that also involved another Nobel Prize recipient, John Bardeen.

Both books were published by the Johns Hopkins University Press, to which we owe a debt for its continuing commitment to publishing high-quality history of science in an ever-more challenging marketplace. All the more unfortunate, therefore, that I must record that Gimbel's is the most poorly copy-edited book I have read in many years, the errors and infelicities being so numerous as seriously to interfere with one's enjoyment of what is, otherwise, a very nice book.

Pierre-Gilles de Gennes A Life in Science

Laurence Plévert
World Scientific, Hackensack, NJ,
2011. \$48.00 (372 pp.).
ISBN 978-981-4355-25-4 (paper)

Pierre-Gilles de Gennes was one of the greatest scientists in the modern era of physics. Single-handedly, he revolutionized the way we think about such complex day-to-day phenomena as how liquids stick to surfaces; how viscous, solid-like polymers flow; how liquid crystals organize to enable display devices; and how pockets of oil, once knitted together by percolation, can be squeezed from submerged wells. By combining microscopic descriptions

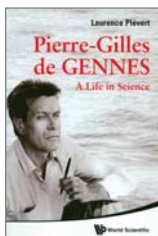
and a superb mastery of theoretical-physics tools, he portrayed the macroscopic properties of complex systems with poetic elegance. He was awarded the 1991 Nobel Prize in Physics for generaliz-

ing methods developed for ordering phenomena in simple systems to complex forms of matter such as liquid crystals and polymers.

Not only did he define and introduce the field of soft matter to the practitioners of theoretical and experimental physics, but he also built bridges between theoretical physics and real-world, industrial problems. He expressed big ideas without masking clarity with complicated mathematical technology. An example is the coining of the word "reptation" to describe the

dynamics of a string-like polymer chain in an entangled collection of many such chains. The tantalizing imagery of snake-like motion and the simplicity of his mapping it into a one-dimensional random walk were so powerful that even a novice could understand the phenomenon. Naturally, he became a rock star to a large number of theorists and experimentalists who understood his ideas and subsequently made use of them.

Writing a biography for such a giant as de Gennes, who radiated so many



Current Preamplifiers

Low Noise & High Bandwidth models



SR556 ... \$1095 (US list)

- 1 V/nA gain
- 5 fA/√Hz input noise
- Bias voltage input
- 3 kHz bandwidth

The new SR555 & SR556 Current Preamplifiers are low-noise, high-bandwidth, fixed-gain transimpedance amplifiers that are designed to work with all SRS lock-ins. These small preamplifiers can provide gain where you need it — close to your detector.

The SR556 provides a gain of 10^9 V/A and has extremely low input noise, while the SR555 provides a gain of 10^7 V/A and has unusually wide bandwidth. Both instruments are near the theoretical Johnson noise limit for resistive transimpedance amplifiers.

- 10 V/μA gain
- 120 kHz bandwidth
- Bias voltage input
- 42 fA/√Hz input noise



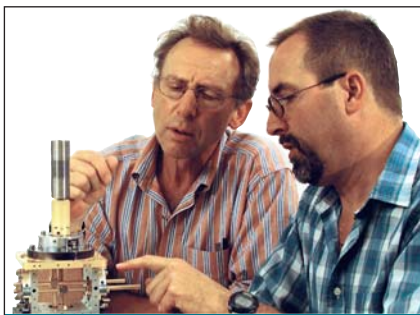
SR555 ... \$1095 (US list)



Stanford Research Systems

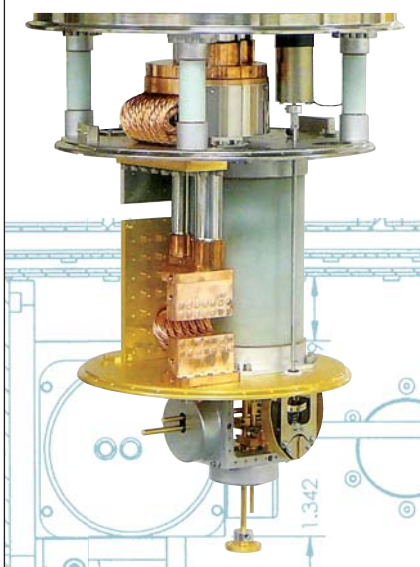
1290-D Reamwood Ave., Sunnyvale, CA 94089

Tel: (408)744-9040 • www.thinkSRS.com



The ADR CRYOSTAT PROS

Four cryogen-free Adiabatic Demagnetization Refrigerator models. A range of options to choose from. A team of experts that can design and build a cryostat for your specific needs. **HPD. The world leader in ADR.**



303-447-2558



HPD

High Precision Devices, Inc.
Boulder, Colorado USA
www.hpd-online.com

rich facets of life, is a daunting task. Laurence Plévert's *Pierre-Gilles de Gennes: A Life in Science* does a superb job in portraying the genius with vivid details of his personal attributes and professional accomplishments. The story is mostly through de Gennes's own words, gathered from many personal interviews conducted by the biographer. The rest of the information was synthesized from interviews with colleagues and friends who witnessed his charisma, intellect, simplicity, and kindness. The chronologically organized chapters allow the reader to see de Gennes growing into a great scientist, and follow his scientific accomplishments and his contributions to his country. De Gennes's recollections are inspiring and reveal the inner workings of a great scientific mind passionate about future generations of scientists.

De Gennes grew up amidst French aristocracy, with a childhood punctuated by anxieties associated with wartime challenges, family separations, and poor health. His mother was essentially the sole navigator of his childhood. As de Gennes acknowledged, she was "strict in her principles," she instilled in him the "drive to be the best," and she taught him "not to waste time in self-indulgence." She nurtured her child with a continuous stream of private lessons in art, literature, mathematics, and the sciences. Anecdotes of how proud she was of her son are vividly described in the book. De Gennes was a spectacular student throughout his school and college days. The author's description of his subject's years working toward a doctoral thesis is a testament to both de Gennes's prowess as a young intellect and the greatness of the French educational system.

His first appointment as a professor was at the Université Paris-Sud (in Orsay) following a brief postdoctoral tenure with Charles Kittel—whose lucid style turned out to be quite influential on de Gennes's own scientific approach—and a term of military service involving the testing of France's first atomic bomb. His first project at Orsay was to initiate an experimental laboratory on superconductivity. In all projects he supervised, theorists and experimentalists worked together, and that first effort was no exception.

Despite several failures as an experimentalist, de Gennes preferred experiments and the secrets hidden in them to sophisticated mathematical formalisms. For the first thesis project for his doctorate he made an ingenious but

failed attempt to synthesize magnesium oxide crystals. And de Gennes's next major experimental project was his attempts to take measurements during the first 30 seconds of France's first atomic bomb detonation in the Algerian Sahara. He recollected that he "did everything wrong, especially standing up and watching the explosion."

Throughout his career, he surrounded himself with experimentalists who were more than eager to work with him. He was not afraid of complex industrial problems either. In taking them on, he broke down the barriers between fundamental and applied sciences. De Gennes heavily promoted younger scientists. His passion to create jobs for fresh doctorates and young research teams propelled him to oppose big science projects such as synchrotron facilities, which he thought would syphon away scarce resources. His great success in science was intertwined with a dedication to reform education and research in France; in political circles, he leveraged his Nobel status for the good of French science. However, his reform efforts faced strong opposition from a substantial representation of that science community. The book presents a balanced description of the frustrations on both sides of the debate. The story is also a revelation of the way science has been managed in modern France.

It seems that de Gennes loved the media attention he received through his telegenic appeal in many television shows. His on stage enthusiasm, clarity of explanations, and endorsement of colleagues were so fascinating that his influence over the audience was called the "de Gennes effect." He was not afraid of making mistakes in exploring new approaches, and he was even less concerned about admitting his mistakes with statements such as "our article was a complete turkey." In spite of his gigantic stature, he had no illusions about himself. When a member of the Nobel Committee described him as the "Isaac Newton of our time," de Gennes called that characterization "Nordic lyricism."

The beautiful narration of *Pierre-Gilles de Gennes* provides a compelling and inspirational story of how hard work, disciplined self-learning, broad knowledge of literature, open-mindedness toward apparently different subjects and industrially relevant scientific challenges, and above all, a love of nature can lead to great achievements. Any young scientist seeking a role model from the modern era will find that indi-

vidual in de Gennes as illuminated in Plévert's biography.

Murugappan Muthukumar
University of Massachusetts Amherst

Introduction to Holography

Vincent Toal
CRC Press/Taylor & Francis, Boca Raton, FL, 2012. \$99.95 (472 pp.). ISBN 978-1-4398-1868-8

Last year was the 50th anniversary of Emmett Leith and Juris Upatnieks's seminal demonstration of holography, the concept that was developed in the 1940s by Dennis Gabor and that earned him the 1971 Nobel Prize in Physics. Since that crucial 1962 demonstration, numerous books have been published

that deal with different facets of holography. I vividly recall my own first steps; the excellent textbook *Optical Holography* (Academic Press, 1971) by Robert Collier, Christoph Burckhardt, and Lawrence Lin was a helpful tutor. And yet, even now, the field is far from mature. As proof, consider such impressive recent innovations and practical implementations as digital holographic microscopy, incoherent holography, x-ray holography, holographic television, and holographic tweezers. Consequently, there is room enough for a new book on the technique.

Seeking to fill that void is Dublin Institute of Technology professor Vincent Toal, who can look back to 30 years of teaching and research in optics and holography. Readers will get a sense of that experience from every page of his new text, *Introduction to Holography*. In its outline, the book is reasonably conventional. Part 1 covers the basics of optics; part 2, principles of holography; part 3, practical uses of holography; and part 4, technological applications of holography. But the execution of part 4, my favorite, is rather novel. It goes beyond discussions in existing textbooks by focusing on state-of-the-art developments of both classical and more advanced holographic applications.

It's certainly a matter of taste as to which applications must be treated and which could be omitted without loss of integrity or novelty. In my opinion, the author has found a good compromise between traditional and emerging ones. The book discusses most of the afore-

mentioned holographic innovations. It also presents solid explanations and will encourage the use of such frequently discussed applications as holographic displays, holographic data storage and information processing, computer-generated holograms, and polarization holography. Chapter 15 has a nice section about Nils Abramson's light-in-flight principle and provides a welcome way to bring the elegant visualization of holography into the classroom.

Introduction to Holography is far from being light fare. But the author presents the mathematical derivation for every basic equation that is used in the book. Moreover, the spirit of the subject is not lost in the equations; the author clearly and carefully explains the physics behind the mathematics and offers sophisticated guidance for experimental work. Problems and references for further reading are provided at the end of each chapter.

Toal has written a welcome reference for experienced explorers of the holographic wonderland. But his book will also serve another important purpose brought to mind by the Ludwig Wittgenstein quote he uses at the front of the book: "Explanations come to an end somewhere." Toal's clear presentation provides a starting point for students and other newcomers and might help orient them toward research that will uncover new explanations. In any event, the text is proof that, unlike explanations, holography is far from coming to an end.

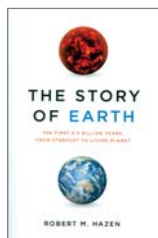
Wolfgang Osten
University of Stuttgart
Stuttgart, Germany

The Story of Earth The First 4.5 Billion Years, from Stardust to Living Planet

Robert M. Hazen
Viking, New York, 2012. \$27.95
(320 pp.). ISBN 978-0-670-02355-4

The story of Earth has been told and retold many times, using a familiar, decades-old outline that leads from its

birth by planetesimal accretion, to its molten infancy, to the origin of microbes, to a long period with no free oxygen, to the rise of oxygen and complex life—and here we are today. *The Story of*



Stay Ahead, Pick pro

Successful scientific research requires state of the art equipment in order to produce outstanding results. TOPTICA's lasers in patented >pro< design feature highest stability, best specifications and optimized ease of use – all at the same time.

For ultimate performance **pick** lasers of our **pro** series - and **stay ahead**.

pro series @ TOPTICA

- ▶ DL pro (tunable diode lasers)
- ▶ TA pro (amplified tunable diode lasers)
- ▶ DL / TA-SHG / FHG pro (frequency converted tunable diode lasers)
- ▶ FemtoFiber pro (femtosecond fiber lasers)



TOPTICA
PHOTONICS
A Passion for Precision.

www.toptica.com/pro