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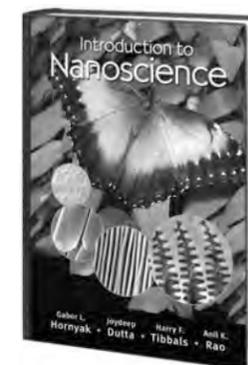


Taking Nanotechnology from the Promise to the Page

Dr. G. Louis Hornyak Innovates the Education of Small Things

“Be a Scientist; Save the World!”

Richard E. Smalley’s words serve as a perpetual source of inspiration for Dr. G. Louis Hornyak. With a career in nanoscience and technology that now spans over 20 years, he is certainly on his way to changing the world, not only with technological developments but also through the education of next generation nanoscientists. Rooted in the interdisciplinary foundation that is so typical of nano, Dr. Hornyak has drawn from diverse disciplines to become a renowned innovator and exceptional educator.



Dr. Hornyak’s journey began in San Diego in the aerospace industry. Working with protective anodic alumina films, his research led to the discovery that porous anodic aluminas were nanostructured. He would go on to study the optical properties of gold nanoparticles, while obtaining his Ph.D. in chemistry. During his post doctoral years, he worked with gold-55 quantum dots under Dr. Günter Schmidt at the University of Essen. At the renewable energy laboratory in Golden, Colorado, he helped develop methods to synthesize single-walled carbon nanotubes. Hornyak currently serves as vice president at NanoThread Inc., which he co-founded. His research efforts focus on fabricating extremely long single or multi-walled carbon nanotubes that are uniform in every way imaginable. “A certified holy grail of carbon nanotubes,” says Hornyak.

“What happens to nanoscience outside the laboratory is everyone’s business”

In addition to his many technological contributions, Dr. Hornyak is editor of a new groundbreaking series from CRC Press on the societal perspectives of nanoscience and technology. The

Perspectives in Nanotechnology Series provides unique insight into how the nano revolution will affect the cultural, ethical, economic, and legal facets of society. A technology primed for worldwide application, nanoscience is sure to effect the lives of people around the globe. As Dr. Hornyak states, “What happens to nanoscience outside the laboratory is everyone’s business”.

Along with H.F. Tibbals and J. Dutta, Dr. Hornyak is the co-author of Introduction to Nanoscience (CRC Press, May 2008). In the fall, the three will issue a second volume, Fundamentals of Nanotechnology. Together, the two books will serve the needs of a year-long program in nano. Each text offers color illustrations, text boxes, and a solutions manual. While there is much debate on how to teach nano, Dr. Hornyak’s pedagogy strikes a delicate balance, offering a

story continued on pg. 2 (Dr. G. Louis Hornyak)

**Nano 2008:
New Perspectives**

Moving Beyond Science & Technology

More than just a technical conference, NSTI’s Nanotech has evolved into the largest and most comprehensive nano event held in the entire world. The growth in the conference reflects the diversity that is nano and the widespread proliferation of nano through all levels of society. Today, nano impacts all of science and technology; in a tomorrow soon to come, it will be an integral part of everyone’s daily life. These developments are reflected in the diverse directions taken by the conference.

The Emergence of a Nano Savvy Society

While fuel cells and new pharmaceuticals will continue to occupy center stage, technology must now share that stage with other perspectives, including legal, ethical, and business ones. That’s why this issue of NanoNews focuses on Perspectives in Nanotechnology, a new series from CRC Press. In this issue, you will find articles addressing the business and legal aspects of nano, as well as an article on series editor Louis Hornyak, who has also authored two new nano textbooks. Dr. Hornyak talks about his most important mission: developing nano literate students.

To gain a well-rounded perspective, stop by the CRC Press booth in the conference reception area where you can examine all of our new nanotech resources. As always, nano publisher Nora Konopka will be offering a variety of specials during the conference. Come by and visit with her, exchange your thoughts, ideas you might have for a book, and meet the various CRC Press authors. We’re willing to bet that by the end of the conference, you too will have an expanded perspective on nano...

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Don't waste time reading what you already know. Check out the latest nano-related news online at NanoScienceWorks.org. Offering cutting-edge information you can trust, the site is run by and for nano researchers. Sign up today for free membership.

Nano Flakes May Revolutionize Solar Cells

Newly-discovered nano flakes could convert up to 30% of solar energy into electricity – doubling today's solar efficiencies – with no added cost.

Moving NanoScale Discoveries to High-Rate Manufacturing

Dr. Ahmed A. Busnaina speaks with NanoScienceWorks about bringing valuable nanoscale discoveries from the lab to high-volume manufacturing.

New Ultrathin Wafer Bonding Boosts MEMS/NEMS Apps

Advanced semiconductors, packaging, MEMS, and silicon-on-insulator applications gets a boost from new ultrathin wafer bonding technology.

Nanoscale Tags for Encoding Data onto DNA

University of California (Riverside) researchers cross disciplines to develop a way to tag DNA strands with additional information, eliminating the need for expensive DNA sequencing equipment.

Nano-Magnets Fight Disease

Researchers at Children's Hospital in Boston explore magnetic control at the single-cell level, which could lead to finely-tuned noninvasive treatments.

Hydrogen-Powered Cars Break the 200-Mile Barrier

Researchers at UCLA turn to molecular simulations to tackle a long-standing obstacle of hydrogen storage.

Rice: Buckeyballs May Offer Vast Hydrogen Storage

According to followers of Richard Smalley, buckeyballs may be able to hold out-of-this-world densities of hydrogen leading to expanded storage for clean-fuel vehicles.

Promising Tumor Cell Selectivity

A nanoparticle drug delivery system designed for brain tumor therapy has show promising tumor cell selectivity in a novel cell culture model.

Fusing Spider Silk and Silica Creates New Protein

A new fusion protein combining the toughness of spider silk and the complex structure of silica has been created at Tufts University.

Project Targets Prostate Cancer

The Prostate Cancer Foundation commits \$5 million to explore nanomedicine detection and treatment.

nanoHUB.org/Taylor & Francis Group Partnership Has an Impact

The nanotechnology community continues to make increasing use of nanoHUB.org and its innovative ways of delivering research, simulation, and teaching tools. Its partnership with Taylor & Francis Group is a key component of this innovation. Of the 359 resources added between April 2007

and March 2008, an important one is a pdf of "Resistance of a Molecule" from the **Handbook of Nanoscience, Engineering, and Technology, Second Edition**, CRC Press / Taylor & Francis Group, by Magnus Paulsson, Ferdows Zahid, and Supriyo Datta. The chapter explains the work behind the nanoHUB tool, MolCToy, a collection of simple theoretical models simulating electrical conduction through individual molecules between two contacts. "I use nanoHUB routinely to disseminate research results and teaching tools," said Professor Supriyo Datta. "I believe broad dissemination of my simulation tools, courses, and educational materials on nanoHUB contributed greatly to my being named the recipient of the 2008 IEEE Leon K. Kirchmayer Graduate Teaching Award."

Source: George B. Adams III, Assoc. Director for Programs, Network for Computational Nanotechnology, home of nanoHUB.org., gba@purdue.edu

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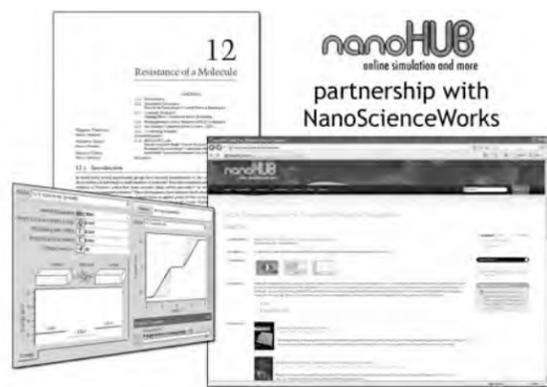
Network for Computational Nanotechnology: www.ncn.purdue.edu

Dr. G. Louis Hornyak (continued from pg. 1)

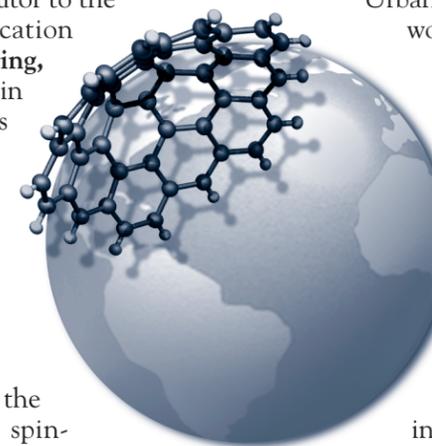
nano-focused education that includes a clear differentiation of the core disciplines of physics, chemistry, and biology. "Our book is designed to accommodate a student's needs and answer potential inquiries," Dr. Hornyak explains. It is one of the first texts to focus primarily on the pure science of nano without delving into technological developments.

From his early research to his most recent ventures at NanoThread Inc., Dr. Hornyak has seen the field of nanoscience advance in great strides. He has been at the forefront of technological innovation many times, yet he believes his greatest achievement lies in the inspiration of future pioneers. When asked, Dr. Hornyak explains that motivating others to go into nanoscience will "supersede any and all technological breakthroughs in which I was fortunate enough to be involved."

For more information on **Introduction to Nanoscience**, visit www.nanoscienceworks.org/textbookcommunity/introtonanoscience.

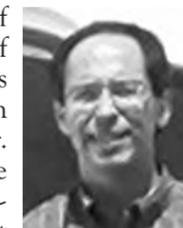


Theorist in residence at Syracuse University in Syracuse, New York, **Damian G. Allis** possesses vast research interests, ranging from computational quantum chemistry to molecular nanotechnology, with a special interest in the design and modeling of nanostructures from molecular building blocks. He holds patents in molecular building block approaches to nanostructure assembly and molecular nonlinear optical materials. His professional activities include active membership in the Technology Roadmap for Productive Nanosystems, the International Society of Nanoscale Science Computation and Engineering, the American Association for the Advancement of Science, and the American Chemical Society. Dr. Allis earned a B.S. in Chemistry as well as his Ph.D. in Physical Inorganic/Computational Quantum Chemistry from Syracuse. He is a contributor to the recently updated CRC Press publication **Handbook of Nanoscience, Engineering, and Technology, Second Edition**. He is in demand as a keynote lecturer in the areas of nanotechnology and materials detection via terahertz spectroscopy and is the author of more than 20 peer-reviewed articles in such areas as molecular nanotechnology, spectroscopy, molecular electronics, and pharmaceutical design.



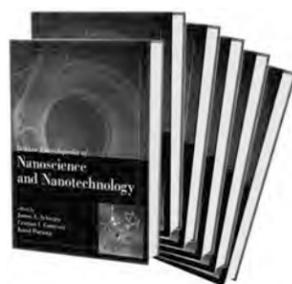
Recognized as one of the pioneering fathers of spintronics, **Supriyo Bandyopadhyay** is a professor of Electrical and Computer Engineering and professor of Physics at Virginia Commonwealth University in Richmond where he directs the nanotechnology research efforts of the Quantum Device Laboratory. Prior to joining VCU, he served as a visiting faculty member at Purdue University in Indiana and as faculty member at University of Notre Dame and University of Nebraska-Lincoln. As one of the authors of **Introduction to Spintronics** (CRC Press, 2008) a contributor to the **Handbook of Nanoscience, Engineering, and Technology, Second Edition** (CRC Press, 2007), Professor Bandyopadhyay has authored and co-authored over 300 research publications and given more than 80 invited talks and colloquia across four continents. He also served as the North American guest editor for three special issues of *The Journal of Electronic Materials*, which were devoted to the science and engineering of quantum dots. He is co-chairing the special symposium on Nano Electronics & Photonics at Nanotech 2008.

Frank Gaitan is Associate Professor of Physics and Adjunct Associate Professor of Computer Science at Southern Illinois University. Long interested in quantum computing and quantum control, Dr. Gaitan's involvement deepened when he became familiar with the proof of the accuracy threshold theorem, which shows that quantum computation is possible under appropriate conditions, even in the presence of noise and imperfect quantum gates. While approximate calculations of this threshold value are small, the fact that it is non-zero, according to Dr. Gaitan, "indicates that building a quantum computer would be technically challenging, but not impossible." The author of **Quantum Error Correction and Fault Tolerant Quantum Computing** (CRC Press, March 2008), Dr. Gaitan received his Ph.D. from the University of Illinois at Urbana-Champaign. Career highlights include his work with Boston College, the Abdus Salam International Center for Theoretical Physics, and the University of British Columbia. His research has proven significant enough to receive funding from the National Science Foundation and the Army Research Office.



With 30 years experience in the health care industry, **Deb Bennett-Woods** brings an interesting combination of experience in strategic leadership, organizational development, management theory, and applied ethics to her work in the area of emerging technologies. She holds a B.S. in psychology and vocational rehabilitation, an M.A. in Counseling Psychology, and a doctorate in Educational Leadership from the University of Northern Colorado. She is the author of the forthcoming publication **Nanotechnology: Ethics and Society** (CRC Press, May 2008) as well as a contributor to the upcoming **Introduction to Nanoscience and Nanotechnology** (CRC Press, Fall 2008). An associate professor in the Department of Health Care Ethics at Regis University in Denver, Colorado, her interests lie with health care technologies especially the convergence of emerging technologies such as nano, biotech, artificial intelligence, cognitive science, and robotics as they relate to health care, social policy, and deeper philosophical questions regarding the enhancement and extension of human life.





Award-Winning Encyclopedia Continues to Pace the Field

With its original publication, the Dekker Encyclopedia of Nanoscience and Nanotechnology immediately became the reference against which all other nano references are measured. Noting that the encyclopedia was being assembled by leading authorities at an early stage in the field's development, Sir Harry Kroto, 1996 Nobel Prize winner in Chemistry, rightfully predicted that the encyclopedia would bring together key advances in a "coherently organized framework." Continuing to cover the field as no other resource, the six-volume second edition, due to publish in September (CRC Press), crosses disciplines to examine fundamental nano principles, theories, and methodologies, as well as the latest information on nano-relevant properties. It also covers advances in nanoscale engineering, newly developed simulation tools, and emerging computational methods. As with the first edition, it will be available both in print and as a fully searchable online version. Among other accolades, this million-dollar bestseller has gone on to win an *Outstanding Academic Book Award* from CHOICE magazine.

For more information or to order your copy, visit www.dekker.com.

NSTI: Staying Current with the Progress and Promise of Nano

NSTI's nanotechnology conferences have built a tradition of being the most prestigious forum in the world for leading nano scientists and Nanotech 2008 is no exception. Top nano scientists offer an up-to-date global perspective on the latest developments in nanotechnology. Information from past conferences has been compiled into authoritative and comprehensive compendiums and made available at crcpress.com. Last year, a four-volume set was produced. 2007 also saw the launch of a separate volume based on the parallel Cleantech conference. All five 2007 volumes are also available on CD. The 2008 volumes will be available directly following the conference. More than mere precedings, these volumes cut across every scientific and engineering discipline to provide the most complete record of current accomplishment in nanotech and cleantech. Visit www.crcpress.com to order volumes from this and earlier years.

Taylor & Francis Journals – Pushing the Boundries at the Bottom

International and multidisciplinary, the *Journal of Experimental Nanoscience* showcases advances in the experimental sciences underlying nanotechnology and nanomaterials. Under the editorial aegis of Nick Quirke, the journal brings together significant papers that make original contributions to nanoscience in a range of fields including biology and biochemistry, physics, chemistry, materials, pharmaceuticals, and medicine, as well as chemical, electrical, and mechanical engineering.

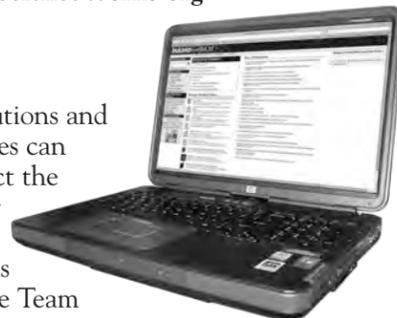
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Nothing Small about Business on the Nanoscale

After developing a novel product based on nanotechnology, scientists—often unversed in business matters—now face the dilemma of bringing that product to the marketplace. Leading you through the business process, Michael T. Burke, in his forthcoming book *Nanotechnology: The Business* (CRC Press, March 2008), offers guidelines to planning, starting, and managing a nanotechnology company.

Find a Business Savvy Partner You Are Willing to Trust

As the founder, president, and CEO of NanoThread, Inc., Burke knows firsthand what goes into starting a nanotechnology company. "Find a business person you can trust to run the company," says Burk, "someone who can understand the technology and products and can use that understanding to the company's benefit when out in the wider business and financing community. Make him a partner in the fullest sense and let him take care of the business processes, while you, the scientist, take care of the technical end. I cannot emphasize this enough! I have seen too many companies with internal problems that arise from the founding scientist second-guessing the business managers and ultimately literally chasing them out of the organization."

While some products are easier to sell than others, no product sells itself. Marketing is as much a science as chemistry and should be approached with the same rigor.

Obstacles to Nano Commercialization

According to Burke, there are three main challenges to overcome: staffing, funding, and licensing. Putting a team in place to develop a product can be tricky, especially if trained technical staff is needed to do the development. Money sources are very hesitant to invest in something they do not understand, and cutting-edge nanotechnology is not easily understood. Scientists need to provide investors with a prototype that demonstrates significant market appeal. Money is

also an important issue when trying to obtain patents. Per patent, the initial PCT filing is just a few thousand dollars, but when the national phase of the PCT process begins, the translation costs alone can run in the millions of dollars. Another concern involving patents is the complex thicket of overlapping patent claims that can lead to legal expenses and costly delays.

While nano has yet to generate the excitement among investors that other emerging technologies have, it promises to be a multitrillion dollar industry affecting every segment of the world economy.

What Lies Ahead

Burke sees the landscape of nanotechnology businesses shifting from the major markets of the United States, Europe, and Japan to China, Korea, and India. He elaborates, "In 2006, China spent more on R&D in general than any other country in the world, save the United States, surpassing Japan to take the number two spot. It is likely that within a few years they will pass the United States as well. India, seeing this and with a very well-educated population, as well as plenty of money, is also moving up in the rankings. Both countries have the equivalent of the U.S. National Nanotechnology Initiative and are putting public money into nanotechnology. Both countries are finding ways for their entrepreneurs to exploit their inventions, too, through businesses."

Even more astounding is the economic potential of the nanotechnology industry, which is expected to produce up to \$2.6 trillion in sales in another decade. "It may be sooner or it may be later than that," says Burke, "but it would still represent a significant part of the world economy. ... This will help improve not only the fortunes of nanotechnology entrepreneurs but also the economies of many nations and the lives of their populations."

Protect Your Nanotech Invention: Basic Advice from a Legal Expert

The U.S. Patent Office has shown a huge spike in nanotechnology patents. This has led to the development of a patent thicket, in which so many nanotech patents exist that it is difficult for any researcher to avoid infringing at least some of them. Patrick M. Boucher, who holds a Ph.D. in physics and works as a patent attorney in Denver, explores this issue among others in his book *Nanotechnology: Legal Aspects* (CRC Press, March 2008).

Do Not Disclose Results

"In many respects, the advice that is appropriate for nanotech scientists is the same as the advice given to any other scientist in protecting intellectual property," says Dr. Boucher. "Do not disclose results, including through publication and at conferences, until a patent application has been filed."

Keep Your Eye on the Competition

"Be sensitive to the need to file additional applications as the research evolves and additional results or conclusions are developed. And be generally aware of what other researchers are doing so that potential infringement issues can be addressed early rather than late."

For an interview with Dr. Boucher go online to NanoScienceWorks.org.

New and Bestselling Resources

COMMERCIALIZING MICRO-NANOTECHNOLOGY PRODUCTS

Edited by
David Tolfree
 Consultant, Manchester, UK
Mark J. Jackson
 Purdue University, West Lafayette, Indiana, USA
 Catalog no. 8315, January 2008, 288 pp.
 ISBN: 978-0-8493-8315-1, \$99.95 / £54.99

CHROMOSOME NANOSCIENCE AND TECHNOLOGY

Edited by
Kiichi Fukui
 Osaka University, Osaka, Japan
Tatsuo Ushiki
 Niigata University, Japan
 Catalog no. 44915, January 2008, 288 pp.
 ISBN: 978-1-4200-4491-1, \$139.95 / £76.99

MOLECULAR ELECTRONICS, CIRCUITS, AND PROCESSING PLATFORMS

Sergey Edward Lyshevski
 Rochester Institute of Technology, New York, USA
 Catalog no. 55291, January 2008, 296 pp.
 ISBN: 978-1-4200-5529-0, \$99.95 / £54.99

NANO AND MOLECULAR ELECTRONICS HANDBOOK

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 Sergey Edward Lyshevski
 Rochester Institute of Technology, New York, USA
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John A. Pelesko
 University of Delaware, Newark, USA
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 ISBN: 978-1-58488-687-7, \$59.95 / £28.99
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HANDBOOK OF NANOSCIENCE, ENGINEERING, AND TECHNOLOGY Second Edition

Edited by
William A. Goddard III
 California Institute of Technology, Pasadena, USA
Donald W. Brenner and Gerald J. Iafrate
 North Carolina State University, Raleigh, USA
Sergey Edward Lyshevski
 Rochester Institute of Technology, New York, USA
 Catalog no. 7563, 2007, 1080 pp.
 ISBN: 978-0-8493-7563-7, \$149.95 / £82.00

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 Universidad Complutense de Madrid, Spain
Vasudevan Lakshminarayanan
 University of Waterloo, Ontario, Canada
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Mansoor M. Amiji
 Northeastern University, Boston, Massachusetts, USA
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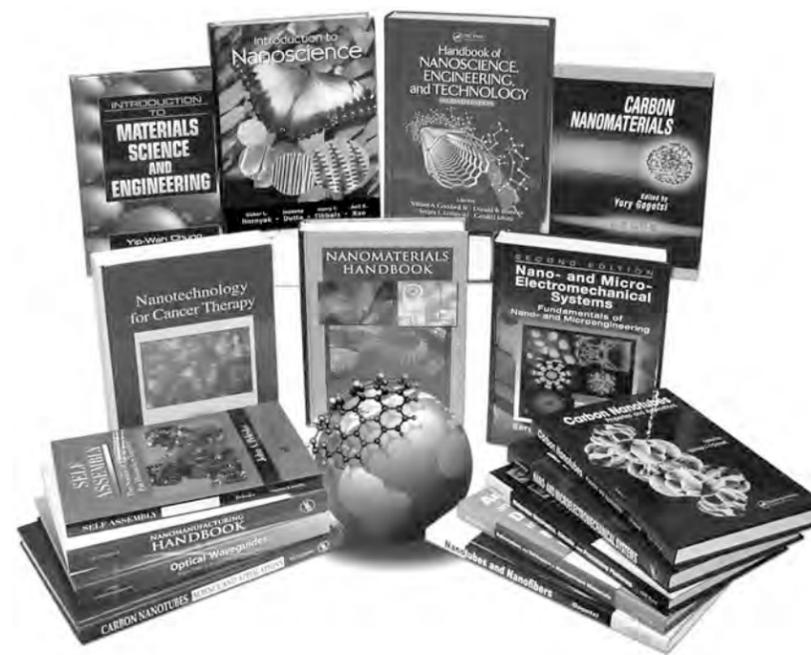
Edited by
Ahmed Busnaina
 Northeastern University, Boston, Massachusetts, USA
 Catalog no. 3326, 2007, 432 pp.
 ISBN: 978-0-8493-3326-2, \$149.95 / £85.00

CARBON NANOTUBES Science and Applications

Edited by
M. Meyyappan
 NASA Ames Research Center, Moffett Field, California, USA
 Catalog no. 2111, 2005, 304 pp.
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NANOMATERIALS HANDBOOK

Edited by
Yury Gogotsi
 Drexel University, Philadelphia, Pennsylvania, USA
 Catalog no. 2308, 2006, 800 pp.
 ISBN: 978-0-8493-2308-9, \$149.95 / £85.00



Textbooks

INTRODUCTION TO NANOSCIENCE

G. Louis Hornyak
 NanoThread, Inc., Golden, Colorado, USA
H.F. Tibbals
 University of Texas Southwest Medical Center, Dallas, Texas, USA
Joydeep Dutta
 Asian Institute of Technology, Pathumthani, Thailand
 Catalog no. 48058, May 2008, 856 pp.
 ISBN: 978-1-4200-4805-6, \$89.95 / £39.99

FUNDAMENTALS OF NANOTECHNOLOGY

G. Louis Hornyak, H.F. Tibbals, and Joydeep Dutta
 Catalog no. 48031, November 2008, 600 pp.
 ISBN: 978-1-4200-4803-2, \$89.95 / £39.99

INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY

G. Louis Hornyak, H.F. Tibbals, and Joydeep Dutta
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Marc J. Madou
 University of California, Irvine, USA
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QUANTUM ERROR CORRECTION AND FAULT TOLERANT QUANTUM COMPUTING

Frank Gaitan
 Southern Illinois University, Carbondale, USA
 Catalog no. 7199, February 2008, 312 pp.
 ISBN: 978-0-8493-7199-8, \$99.95 / £44.99

INTRODUCTION TO SPINTRONICS

Supriyo Bandyopadhyay
 Virginia Commonwealth University, Richmond, USA
Marc Cahay
 University of Cincinnati, Ohio, USA
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 ISBN: 978-0-8493-3133-6, \$89.95 / £39.99

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 Rochester Institute of Technology, New York, USA
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NANOTECHNOLOGY Understanding Small Systems

Ben Rogers
 University of Nevada, Reno, USA
Sumita Pennathur
 University of California, Santa Barbara, USA
Jesse Adams
 Nevada Nanotech Systems, Inc., Nevada, USA
 Catalog no. 8207, January 2008, 416 pp.

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 Arcadis, Lowell, Massachusetts, USA
Christopher MacKay and Jane Hamblen
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Lynn L. Bergeson
 Bergeson and Campbell, P.C., Washington, DC., USA
Stephen Clough
 Haley & Aldrich, Inc., Manchester, New Hampshire, USA
Marilyn Hoyt and Kim Henry
 AMEC & Earth Environmental, Westford, Massachusetts, USA
Julie Chen
 University of Massachusetts, Lowell, USA
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Krzysztof Iniewski
 CMOS Emerging Technologies Inc., Vancouver, British Columbia
 Catalog no. 70622, August 2008, 704 pp.
 ISBN: 978-1-4200-7062-0, \$149.95 / £79.00

NANOTECHNOLOGY AND TISSUE ENGINEERING The Scaffold

Edited by
Cato Laurencin and Lakshmi Nair
 University of Virginia, Charlottesville, USA
 Catalog no. 51822, June 2008, 384 pp.
 ISBN: 978-1-4200-5182-7, \$149.95 / £79.00

BIONANOTECHNOLOGY Global Prospects

David E. Reisner
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