

March 26-27, 2008

The Westin Poinsett
Hotel

Greenville,
South Carolina

“Outstanding Conference!
The combination of up-to-date technology innovations in the Medical Textile Arena, both Wovens and Non-wovens, and the exciting tour of the Bio-engineering Department of Clemson University makes this conference outstanding.”

—Grace Howe, President,
TEGS Limited, Woodland Hills, CA

“As usual, the Clemson Conference was excellent. The information given is pertinent, leading edge, and diverse. The conference is critical to companies with vision for survival. I learned a lot. Clemson Conferences are my benchmarks for other conference.”

—Jamie Johnson, Technical Sales,
Regal Mfg. Co., Inc., Hickory, NC

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THE 2008 CLEMSON UNIVERSITY
ANNUAL CONFERENCE ON

OPPORTUNITIES AND MARKETS FOR MEDICAL MATERIALS AND TECHNOLOGIES

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Delve into the Latest Issues and Critical New Areas of Development Including...

- Antimicrobial Protective Fabrics
- Risk Management's Impact Throughout
- Product Realization Processes
- Medical Applications for Nanomaterials
- Benchmarking Using Industry Data
- New Generation of Fiber-Based Materials
- Copper Impregnated Antimicrobial Textiles
- Ex Vivo composite Tissue Test Systems
- Opportunities and Risks of Sourcing from China
- Evolution and Future Development of Sutures
- Gecko-Inspired Adhesives
- Reusable Surgical Fabrics
- Selection and Use of Thermoplastic Engineering Resins
- Latest Advances in Intelligent Textiles
- UHMWPE Fibers in the Orthopedic Market
- Latest Ultrasonic Techniques in Bonding and Lamination
- Hernia Meshes and Peritoneal Damage
- Absorbable Composite Knitted Meshes
- Absorbable Composite Braided Sutures
- Benefits of Walk-Off Mats

Benchmark **20**
More Than
Presentations from
Business, Technical,
Research, and Academic
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- Milliken & Company
- Czuba Enterprises, Inc.
- Poly-Med, Inc.
- Winovia, LLC
- Clemson University
- Cupron, Inc.
- Teleflex Medical OEM
- Standard Textile, Co., Inc.
- SABIC Innovative Plastics
- J. Hagewood, LLC
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OPPORTUNITIES AND MARKETS FOR MEDICAL MATERIALS AND TECHNOLOGIES

The application of materials and new product development in healthcare, medicine, surgery, biomedicine, and bioengineering continues to be one of the fastest growing and innovative market sectors with the potential to be one of the most profitable specialized areas in the confluence of science, engineering and textiles

Dramatic advances are being reported every day as new research and development is being undertaken, new materials are being launched, new manufacturing or testing processes are being introduced, and exciting new applications evolve.

About the Conference

Over the course of only two days you will have the opportunity to learn about the latest developments in medical materials and products in this growing field in the medical and textiles sector. You will receive valuable insight into the latest studies and research of materials for medical applications and useful information for adopting these materials into many applications within the medical field.

As a conference participant you will discover how new technology and its application can transform a medical field. You will be provided with information on the latest advances in the control of bacterial infections, drug delivery-absorption, biosensor supports for point-of-care devices, surgical meshes uniquely designed for hernial tissue repair, and suture fibers for the orthopedic market. You will hear results of a study of in vitro and in vivo performance of composite sutures, and how the climbing ability of the gecko lizard inspired a study of its adhesive system. You also will examine the pros and cons of sourcing from China, how to utilize risk management tools to optimize product realization processes, how hospitals and healthcare laundries can benefit from partnering, and how the science, engineering, and medical fields are tackling the complexities of regenerative medicine.

Special Opportunity

As a participant in Clemson's conference you will have the opportunity to tour world leader, St. Jude Medical's Cardiac Rhythm Management Plant in Liberty, SC. This state-of-art facility manufactures products which are implanted in people whose health and wellbeing depend on the quality performance of St. Jude.

Who Should Attend

- Manufacturers and Marketers of Health Care Products and Medical Devices
- Manufacturers and Marketers of Special Products for Medical Applications
- Product Development and R&D Personnel in Medical Textiles
- Doctors, Surgeons, and Bioengineers
- Hospital and Biomedical Product Suppliers
- Hospital Procurement Officers or Buyers
- Textile Product Design Engineers
- Presidents
- Vice Presidents
- Business Development Managers
- Industry Consultants
- Project Managers
- Technical Specialists
- Quality Assurance Specialists
- Healthcare Laundry Professionals
- Chemists

What Your Colleagues Are Saying About This Conference

"An excellent chance to network with people in a wide variety of backgrounds and expertise."

*Ben Matthew, Engineer,
Novtex Corporation., Adams, MA*

"I look forward to this conference each year. I am able to meet new folks with new ideas that solve old problems."

*Rick Sargent, President,
Peach State Labs, Rome, GA*

"This was an excellent conference that was not only educational and informative but presented outstanding networking opportunities."

*Roger Walker, Quality Manager,
Schneider Mills, Inc., Taylorsville, NC*

"High quality content, professionalism of all speakers, and the ability to "network" and build new relationships within the industry."

*Brendan O'Neill, E-Comm/Logistics
Manager, London Hospital Linen Service,
London, Ontario, Canada*

Conference Agenda

Wednesday – March 26, 2008

7:30 am

Sign-in and Receive Materials at the Westin Poinsett Hotel

Join your Conference Colleagues for Continental Breakfast and Informal Discussion.

8:15 am

Welcome to the Conference and Opening Remarks

Helena C. Douglas, Clemson University, Executive Director, Professional Advancement and Continuing Education
Announcements and Introduction of Moderator

James C. Burns, Consultant

Moderator: Deborah Lickfield, Principal
Lickfield Consultants

8:30 am

Sourcing Materials and Products from China – Opportunities and Risks

Czuba Enterprises, Inc.

Len Czuba, President

The trend to outsource manufacturing of goods and services from North America to Asia, particularly to China, has grown increasingly popular in the last decade. The migration of manufacturing presents significant opportunities but it also carries great risk. The need for adequate quality control systems is critical, especially for components or products used in the healthcare industry. Recent quality problems have shown that some companies have neglected this part of the equation. You will review what testing is needed in the medical device industry to assure products are safe and effective. And you will learn that regardless of what part of the world in which testing is done that with the right testing you can achieve quality standards.

9:00 am

BioSmart Antimicrobial Protective Fabrics
Milliken & Company

Piyush Shukla, Ph.D, Advanced Development Chemist

J. Travis Greer, Senior Business Development Technologist

The potential for cross-contamination and the spread of bacterial infections, including MRSA, *Pseudomonas* and *Acinetobacter* is of great concern to the healthcare industry. Nosocomial infections, acquired by approximately 10% of American hospital patients are responsible for around 20,000 deaths in the U.S. annually. While estimates of the annual cost range from \$4.5 billion to \$11 billion and higher, one third of nosocomial infections are considered preventable. Textile substrates provide a very favorable environment for the growth of bacterial colonies and represent a large surface area with high potential for cross-contamination. This environment can be controlled. You will discover how BioSmart technology, a rechargeable and durable treatment which protects the wearer by readily binding the chlorine available in the bleach cycle during a wash, and for the life of the garment, is highly efficacious against *S. Aureus* and *K. Pneumoniae* and other infections. Your presenters will also share information on field trial results and clinical data collected from a hospital environment.

NOTE: Dress is business casual.

Enroll Today! Call Kay James

Conference Chairpersons: Helena C. Douglas, Professional Advancement and Continuing Education, Clemson University
Howard M. Zins, Principal, Howard M. Zins Associates

9:30 am *Faces and Places*

Enjoy this time meeting your conference associates and learning about their company and work responsibilities.

9:45 am

Risk Assessment of Absorbable Polymeric Biomaterial

Poly-Med, Inc.

Elizabeth A. Nichter, M.T., M.S., CQM (ASQ), Regulatory Affairs and Quality Systems Manager

Risk management activities...risk analysis, risk evaluation and risk control along with records are required throughout medical device product realization. You will discover the extent to which the results of these activities influence an organization's product realization processes, including determining the nature and extent of purchasing controls, influencing supplier approval activities, providing important design inputs, serving as criteria for evaluating design outputs, establishing the need for design change, helping to determine production and process control requirements, and monitoring and measurement device controls as well as acceptance activities. You'll also hear case studies which demonstrate the usefulness of Failure Mode and Effects Analysis in risk assessment of absorbable polymeric biomaterials.

10:00 am *Networking Stretch Break*

10:15 am

Smart, Functional, High Performance Textiles Using Nanomaterials

Winovia LLC, Vincent Sastri, Ph.D., President

Nanomaterials continue to be used as additives or coatings in fibers, fabrics and textiles for various applications in several industries. Advantages in using nanomaterials include tailoring and engineering the performance characteristics and functional diversity of fibers. Vinny will discuss the practical aspects of how nanomaterials are incorporated into or coated onto fibers and textiles referencing potential medical applications.

10:45 am

Benchmarking Using Industry Data

Encompass, LLC

Janice Carter Larson, Managing Director, Cost Management Services and Training

Janice will reveal the various industry benchmarking tools available to help you make actionable decisions concerning how hospitals and healthcare laundries can work in partnership to manage linen utilization and reduce cost.

11:25 am *Stretch Break*

11:30 am

New Generation of Fiber-Based Materials for Medical Textiles

Clemson University, School of Materials Science and Engineering

Konstantin Kornev, Ph.D., Associate Professor

Recent advances in fiber science open up new avenues for fabrication of fiber-based materials with high surface-to-volume ratio. These materials constitute new vehicles for drug delivery-absorption and new biosensor supports for point-of-care devices. Dr. Kornev will describe a new fiber-based platform aimed at building up novel generations of wearable biosensors and detectors embeddable in everyday household fibrous materials. You will observe a dem-

onstration of the robustness of this platform when there is a need to probe small amounts of liquids.

12:00 Noon

Roundtable Networking Luncheon with Speakers and Conference Attendees

1:15 PM

From Treatment to Prevention: Ex Vivo Composite Tissue Test Systems

Clemson University, Department of Bioengineering

Karen J.L. Burg, Ph.D., Professor and Hunter Endowed Chair

Regenerative medicine is the field at the confluence of science, engineering, and medicine which encompasses the creation of biological substitutes to augment or replace damaged tissues or organs, often using a biomaterial template. The early concept of developing tissue for reconstructive purposes has evolved to include the construction of test tissues systems for therapeutic development, developmental cell biology studies, and disease prevention. The viability of a tissue engineered product relies on cell-biomaterial interaction and the design of an appropriate 3-D in vitro environment. Karen will highlight the interdisciplinary approach used to attack these massively complex problems.

1:45 PM

Medical Applications of Copper Impregnated Antimicrobial Textiles

Cupron, Inc., Gadi Borkow, Ph.D., Chief Medical Scientist

A platform technology has been developed in which copper oxide is impregnated or plated into polymeric or cotton fibers, endowing the fibers with potent broad-spectrum anti-bacterial, anti-viral, anti-fungal and anti-mite properties. This technology enables the mass production of woven and non-woven fabrics with no requirement for alteration of industrial procedures or machinery, including the production of anti-viral gloves and filters which deactivate HIV-1 and other viruses; anti-bacterial self-sterilizing fabrics which kill antibiotic resistant bacteria, including MRSA and VRE; anti-fungal socks which alleviate symptoms of athletes foot; anti-dust mite mattress covers which reduce mite-related allergies, and gauze which is highly effective in promoting skin regeneration, closure of chronic wounds and the alleviation of bed sores. You'll also discover potential additional applications of copper which address viral transmissions, nosocomial infections, wound healing and the spread of antibiotic resistant bacteria.

2:15 pm *Refreshment Break*

2:30 pm

Board Buses for Tour of St. Jude Medical

3:00 pm *Tour of St. Jude Medical*

St. Jude Medical is a \$3.3 billion medical products company with 12,000 associates world-wide. *Fortune* magazine recently named St. Jude Medical the most admired medical products and equipment company in 2007. During your tour of the Liberty, SC plant you will observe the design, development, and manufacturing of aluminum electrolytic capacitors for St. Jude Medical Implantable Defibrillators.

5:30 pm

Networking Wine and Cheese Social Hour at the 4-Diamond, Westin Poinsett Hotel

Network with your industry peers and speakers in a relaxing environment at the historic Westin Poinsett Hotel.

Thursday, March 27, 2008

7:30 am

Convene at the 4-Diamond Westin Poinsett Hotel for Continental Breakfast and Informal Discussion

8:25 am

Announcement and Introduction of Moderator

Howard Zins Associates

Howard Zins Principal

Moderator: Beth Joiner, Technical Specialist, North American Science Associates (NAMSA)

8:30 am

Sutures: Its Evolution and Future Development

Teleflex Medical OEM

David T. Faris, Director of Sales

Historical documentation tells us that the first surgical procedures were performed by humans as far back as prehistoric times. Sutures, which were originally developed from simple natural plant and animal fibers, have advanced dramatically to include today's high tech, high strength biomaterials and designs. This morning you will discover the many facets of suture evolution and explore how this front-line surgical tool may develop for future generations.

9:00 am

Principles of Gecko-Inspired Adhesives

Clemson University, Department of Electrical and Computer Engineering

Richard Groff, Ph.D., Assistant Professor

The exceptional climbing ability of gecko lizards derives from an adhesive system consisting of arrays of hierarchically structured micro and nano-scale hairs arranged on the underside of each gecko toe. The gecko's adhesive system displays a number of remarkable properties, including: the adhesive is composed of a material that is not sticky in bulk form; the adhesive is directionally dependent; and the adhesive sheds dirt without grooming. Discover how an understanding of the physical principles underlying gecko adhesives can lead to a wide range of "unsticky" materials which can potentially be microstructured to form fiber array adhesives.

9:30 am

The Technology of Reusable Surgical Fabrics and the Transformation of an Industry

Standard Textile Co., Inc.

Bradley J. Bushman, Vice President

Brad will provide an overview of the technologies in use to provide reusable surgical products. He also will explain the driving forces which have transformed this industry from cotton to synthetic fabrics.

10:00 am *Time Out for a Stretch Break*

10:15 am

The Selection and Use of Thermoplastic Engineering Resins for Medical Devices and Fibers

SABIC Innovative Plastics

Clare Frissora, Global Market Director, Healthcare

Materials selection considerations are many due to the growing range of medical devices and their expanding requirements in response to global trends. You will learn the key attributes and alternatives for various performance criteria highlighted through case studies which address sterilization, chemical resistance, x-ray shielding, wear resistance, strength and reinforcement, regulatory and biocompatibility.

10:45 am
**Potential Uses of Nanofibers
in Medical Applications**

J. Hagewood, LLC

John Hagewood, Managing Director

You will learn the most commonly used definitions of nanofibers and the implications of the various definitions. You also will receive an update on the existing and potential techniques to produce nanofibers including the practicality, advantages and disadvantages of each manufacturing process. John will conclude the session with a discussion of potential applications of these types of fibers in textiles and nonwovens used in the medical industry.

11:15 am

*Relax, Stretch and Enjoy a Refreshment Break
with Your Conference Colleagues*

11:30 am

**Theory and Practice of Intelligent
Textiles for Medical Applications**

M & A Engineering, John Halberda, President

You will examine the latest technology advances which have made intelligent textiles more feasible and you will discover practical applications of the technologies including the most recent commercial successes.

12:00 pm *Roundtable Luncheon with
Fellow Participants and Speakers*

1:15 pm

**Sutures Containing UHMWPE Fibers:
A New Trend in the Orthopedic Market**

DSM Dyneema BV

Dr. Claudia M. Vaz, R&D Manager - Medical

Rotator cuff tears are the most common type of shoulder injury and it can lead to permanent shoulder pain and dysfunction if left untreated. Until now, tendon fixation to bone implants such as a prosthesis or bone anchors has been performed with non-absorbable polyester (PET) sutures. However, failures of the repair over time have shown that polyester sutures are the weak link in this soft-tissue repair. As a result, braided sutures made from non-absorbable ultra-high molecular weight polyethylene fibers are being used in rotator cuff repair and other sports medicine applications where high mechanical strength and abrasion resistance is required. You will hear the result of this study presented with a comprehensive set of mechanical and biological properties which support this trend in the orthopedic market using PET sutures as a reference material.

1:45 pm

**Continuous Ultrasonic Welding of Medical
Fabrics, Parts and Packages**

*Herrmann Ultrasonics, Ralf Dittmer,
Technical Sales Support Manager*

You will learn the latest ultrasonic techniques for continuous bonding and lamination of medical fabrics, as well as the creation of FDA certifiable parts. Ultrasonic bonding can replace glue and heat in bonding. You will hear how the latest technology maximizes bond quality and consistency using inherently variable materials while increasing operating speed and maintaining quality. Ralf will also share the latest techniques for embossing, lamination and welding.

2:15 pm

**Fabric Characteristics of Hernia Meshes
Determine Extent of Peritoneal Damage**

W.L. Gore & Associates

Janson Emmanuel, Manager, Histopathology
Laboratory

Defects of the abdominal wall (hernias) are repaired surgically by the use of various meshes composed of different biomaterials. The surgical insertion of these biomaterials to repair wall defects usually result in adhesions. Insertion of these meshes cause trauma to the peritoneum, the tissue lining the abdominal cavity. You will hear the results of the study performed to evaluate the various meshes commonly used for the repair of hernias and its effects in inciting damage to the peritoneal tissue covering the abdominal wall.

2:45 pm *Refreshment Break*

3:00 pm

Absorbable Composite Knitted Meshes

*Poly-Med, Inc., Shawn J. Peniston, M.S., Sr.
Research Engineer*

You will learn how the need by contemporary surgeons, particularly those involved in hernial tissue repair, for surgical meshes with various desirable features was the incentive for this study. And you will explore the composition and capabilities of totally absorbable composite, warp-knitted meshes in meeting the stated requirement. Shawn will share with you a comparative analysis of the in vitro properties of the new absorbable composite meshes against the sought absorption and burst strength retention profiles.

3:15 pm

Absorbable Composite Braided Sutures

*Poly-Med, Inc., M. Scott Taylor, Manager,
Device Design & Engineering*

There have been two primary features associated with absorbable sutures: breaking strength retention and mass loss profiles. Presently, there are sutures which are relatively fast absorbing with a short strength retention profile, and sutures which are slow absorbing and have a prolonged strength retention profile. For certain applications there is need to have both types of sutures simultaneously at the wound site. You will explore the study of properties of proprietary braided multifilament sutures comprised of different ratios of a relatively fast-absorbing yarn with a fast rate of strength loss and a slower-absorbing yarn with a slow strength loss and mass loss rates. You'll also examine the study of in vitro and in vivo performance of the composite sutures to obtain comparative tensile and mass loss properties, along with observations of other effects of the bimodal strength retention profiles on wound healing using rats as an animal model.

3:30 pm

Walk-Off Mats for Healthcare Facilities

Kleen-Tex Industries, Inc.

**Jocelyn Howard Scott, Marketing Manager/
Corporate Secretary**

Walk-off mats have many institutional, industrial and commercial applications. You will learn the benefits for patients, staff and residents of using walk-off mats in healthcare units including hospitals, long-term care units and other healthcare environments. Discover how these mats promote clean, safe and hygienic conditions while gaining general product knowledge, practical applications for mat placement and solutions for problem traffic areas.

4:00 pm

*Question and Answer Sessions with Speakers
and Colleagues.*

4:15 pm *Conference Adjournment*

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CONFERENCE PROCEEDINGS

If you can't attend, the proceedings for this or any other Clemson University conference are available for purchase. While not intended to be a substitute for actual attendance, these books are perfect for updating your technical library. They are professionally produced in a spiral-bound, semi-hard cover format for \$395 each (domestic postage and handling included). Call Kay James at (864) 656-2200 to place your order!

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Take Advantage of this Unique Opportunity! Register for the conference and you can display your organization's products and services. E-mail Janis Stanger at jstange@clemson.edu today and ask her to reserve a table for your organization.

Speakers

DR. GADI BORKOW obtained his Ph.D. degree in Biochemistry from the Tel Aviv University, Israel in 1994. His post-doctoral studies were conducted at McGill University AIDS Center, during which time he specialized in Human Immunodeficiency Virus Type 1 (HIV-1). In 1998 Dr. Borkow joined the Hebrew University Institute of Immunology and AIDS Center, where he studied virological and immunological aspects of HIV-1 infection. Dr. Borkow has held the position of Chief Medical Scientist at Cupron since 2002. He also teaches at the Hebrew University in Israel. He has published over 70 peer reviewed manuscripts in scientific journals, and his studies have been presented in more than 80 scientific conferences.

KAREN J.L. BURG, Ph.D. is a graduate of North Carolina State University and Clemson University. She completed a tissue engineering postdoctoral fellowship at Carolinas Medical Center before joining the faculty at Clemson University. Dr. Burg has given over 160 invited presentations and has authored over 60 peer reviewed publications pertaining to injectable tissue engineered systems. She is the Executive Editor of the Society For Biomaterials' *Biomaterials Forum* and is the Editor-in-Chief of the National Society for Histotechnology's *Journal of Histotechnology*. Honors to Dr. Burg include a Presidential Early Career Award for Scientists and Engineers, awarded by the President of the United States, the Inaugural AORF Prize, awarded by the AO Foundation in Switzerland, a United States Department of Defense Era of Hope Scholarship, recognition as a Massachusetts Institute of Technology's TR100 Young Innovator, and election to the American Institute of Medical and Biological Engineering College of Fellows.

BRADLEY J. BUSHMAN is Vice President of Technical Affairs at Standard Textile Co., Inc. His responsibilities include technical services, product development, and regulatory affairs. He currently serves as Vice President of the American Reusable Textile Association and is an instructor for NAIMS's educational program at the American Laundry and Linen College. For more than 12 years Brad has taken an active role in U.S. standard setting activities through the American National Standards Institute and the Association for the Advancement of Medical Instrumentation.

LEN CZUBA is the President and owner of the product development firm, Czuba Enterprises, Inc. He uses his new product development experience working with partner firms to take products, especially medical devices, from concept to market. He has more than 30 years of experience in polymer synthesis, compounding and material development in the medical device industry. He holds 15 US patents for his work. In 2004, Len Czuba was honored as one of the 100 *Medical Device & Diagnostic Industry* Most Notable Persons in the medical device industry. He also is a frequent seminar instructor throughout the country. He also has spoken abroad. Mr. Czuba is a long time member of the Society of Plastics Engineers and has served on the Board of Directors of the Medical Plastics Division since 1985 and has twice served as the Division Chairman. He also was the Society's President. In May of 2000, Mr. Czuba was inducted to the ranks of Honored Service Member of SPE.

RALF DITTMER has more than 10 years experience in the polymer industry. In his current position he is responsible for developing Ultrasonic processes or continuous manufacturing. In previous positions at BASF, Thyssen-Krupp Polymer and EWIKON, Ralf developed extensive knowledge in customer service and polymer development for injection molding and extrusion processes.

JANSON EMMANUEL is Manager of the Histopathology Lab at W.L. Gore & Associates. For more than 22 years he has studied tissue response of various biomaterials in anatomic sites including hip and knee prosthesis in orthopedics, fabrics in vascular, cardiovascular and soft tissue applications. Currently, he is working on the applications of resorbable materials and polymers in various medical problems. Janson has published in orthopedic journals, presented predominantly at the Society for Biomaterials as well as to other groups.

DAVID FARIS is Director of the Sales and Management team within the OEM sales division of Teleflex Medical for the eastern region of the United States, Europe, Asia, Latin America & the Middle East. With over 20 years of experience in the medical device industry, Dave's career trajectory includes nine years in operations and 11 years in sales and marketing specializing in sutures, orthopedics, and interventional vascular access devices.

CLARE FRISSORA, Global Market Director, Healthcare for SABIC Innovative Plastics, formerly GE Plastics, was with GE for 20 years with diverse responsibilities in multiple businesses, locations and functions before joining GE Plastics in 2001. Clare completed GE's Financial Management Program and held assignments in Hong Kong and Tokyo. She joined GE Capital as an investment analyst and later transferred to GE Lighting to assist with integration of the Tungsram Lighting acquisition in Budapest, Hungary. While at Lighting, she transitioned to Supply Chain Management to lead the consolidation of warehousing and logistics operations for GE Lighting Europe, working in Austria, the U.K., and France. Returning to the U.S., she led product management and marketing for GE Lighting's Specialty Incandescent product

lines. In this role, she created a new product line, GE Reveal, and developed its launch. While at GE Financial Assurance, in her position as Manager, E-Commerce Business Development, she led the creation of The Savvy Investor Annuity, an entirely internet-driven and operated annuity product. At GE Plastics, Clare worked as a Supply Chain Manager with the Specialty Film and Sheet business, then as leader for the Consumer & Industrial marketing group. In 2003, she was appointed to lead GE Plastics' global healthcare industry marketing team.

RICHARD GROFF is an Assistant Professor in the Holcombe Department of Electrical and Computer Engineering at Clemson University. He received a B.S. in Engineering Science & Mechanics and a B.S. in German from Pennsylvania State University in 1996. He earned his M.S. degree and Ph.D. degree in Electrical Engineering and Computer Science with specialization in control systems from the University of Michigan in 1998 and 2003, respectively. Before joining Clemson University in 2006 he worked as an IC Postdoctoral Research Fellow at the University of California Berkeley.

TRAVIS GREER is Senior Business Development Technologist at Milliken for one of their newest branded chemical technologies, BioSmart.TM Previously, Travis worked at Milliken's Gillespie Manufacturing Plant as facilities and environmental engineer where he was a key member of Milliken's process water reduction initiative serving as the leader of a 'zero discharge' pilot project. After holding positions in supply chain and production leadership, he joined Milliken Research Corporation in 2000. Over the last seven years he has worked to commercialize multiple research and development projects centered around specialized mechanical finishing processes and durable chemical treatments on textiles. He has co-authored seven pending U.S. patents.

JOHN HAGEWOOD began his career with NASA and Boeing in the Apollo moon program in the design of the rocket propulsion systems. John worked for Dupont for 14 years in product development of polyester fibers, spunbonds, composites and specialty fibers. Later, he became Vice President of McCoy-Elison where he was involved in the development and marketing of draw warping equipment. John has served as President of Fiber Associates and Allied Engineering, Business Unit Director for Hills, Inc. and Associate Director of the Nonwovens Cooperative Research Center. Recently, John formed JHagewood LLC, a consulting firm.

JOHN R. HALBERDA is President of M&A Engineering, a management consulting firm specializing in new business development and strategic planning. John has been the president of four companies in the materials engineering business. He has held positions in new business development, R&D, marketing, operations, and finance in publicly traded and private companies. He has experience in a wide array of industry sectors supporting the medical textile market, including pulp and paper, woven and non-woven textiles, elastomers and polymers and fibers.

BETH JOINER is a Technical Specialist for NAMSAs. Beth analyzes the technical appropriateness of client requests and advises clients and NAMSAs associates on technical issues. She has 28 years of experience in the field of Microbiology; four years with Custom Biologics and the Murray State University Diagnostic and Research Center, as well as 24 years with NAMSAs. Beth is a member of the Association of Textile Chemists and Colorists and American Society of Microbiology. She is a registered microbiologist with the National Registry of Microbiologists. She published an article on Determining Antimicrobial Efficacy, in the September 1998 issue of *Nonwovens Industry Magazine* and wrote chapter 12 on "Determining Antimicrobial Efficacy and Biocompatibility of Treated Articles Using Standard Test Methods in the ACS Symposium Series 792 Bioactive Fibers and Polymers."

KONSTANTIN KORNEV, Ph.D. graduated from the Department of Mechanics and Mathematics at Kazan State University (KSU) in Russia in 1988. From 1988 until 1990, he worked at the Institute of Mechanics and Mathematics at KSU. In 1990 he was invited to join the Institute for Problems in Mechanics, RAS, the leading institution of the Russian Academy of Sciences in the field of mechanics. While at RAS, he worked as an Associate Professor of Physics at the University of Aircraft Technology in Moscow. In 2000, he joined the Textile Research Institute in Princeton, NJ. Presently, Dr. Kornev is an Associate Professor in the School of Materials Science and Engineering at Clemson University. He is an expert in Hele-Shaw flows, flows through porous media, phase transitions in forced flows, flow and rheology of complex fluids, and micro and nanofluidics. He has written a monograph on the subject of foams in porous media and has authored more than 60 technical papers

JANICE CARTER LARSON, BA, CLLM, is Managing Director of Cost Management Services and Training for Encompass, LLC. She began her business career with Baxter Healthcare in international sales and progressed to management positions in business development and corporate consulting. She joined the Hospitex division of Baxter (now Encompass Group LLC) in 1994 as the first Cost Management Consultant for the ten Kaiser Permanente Hospitals in Southern California and the five University of California Hospitals in Southern

California. Janice presently manages the Encompass clinical consulting team. She has taught Total Quality Management (TQM), Continuous Quality Improvement (CQI) and Linen Management in hospitals throughout the continental United States and Hawaii, and is on the faculty of the American Linen and Laundry College at Eastern Kentucky University. Janice has presented papers at many industry conferences.

DEBORAH LICKFIELD received her Ph.D. degree in Textile and Polymer Science and her MS and BS degrees in microbiology from Clemson University. Deborah has extensive experience in the textile industry including academic service. Deborah has worked in research and development at Kimberly-Clark, BBA Nonwovens and PGI. She owns a consulting firm which offers services in product development and market research. Additionally, she sub-specializes in intellectual property management, prior art searches, technical opinions and application drafting, and formal proposal writing. Deborah holds 6 U.S. patents and has published in numerous industry journals.

ELIZABETH A. NICTER, MT, MS, CQM (ASQ), is Manager of Regulatory Affairs and Quality Systems at Poly-Med, Inc. After completing clinical training and earning certification as a Medical Technologist, she spent eight years working in the Immunopathology Department at Anderson Area Medical Center before assuming an administrative position as quality assurance coordinator for the clinical laboratory and reference laboratory. At Poly-Med, Inc. she is responsible for developing and implementing the quality management system for the medical device company in compliance with FDA regulations and international standards ISO 9001 and ISO 13485. She has written and presented several papers on quality

SHAWN J. PENISTON is a Senior Research Engineer with Poly-Med, Inc. He has a degree in Mechanical Engineering from the University of Wisconsin, Platteville and a master's of science degree from the University of Massachusetts Lowell in Plastics Engineering. He is nearing completion of his doctorate degree in Bioengineering at Clemson University. His industrial and research experience is concentrated in the areas of design, development, processing, and analysis of polymers with emphasis on absorbable materials.

VINCENT SASTRI, Ph.D is President of WINOVIA, LLC., a firm which provides customized, sustainable solutions and strategies in new product development, quality improvement and high performance materials. Prior to starting his own consulting company, Vinny held global leadership positions in technology, quality, and marketing at BASF, Honeywell and General Electric Plastics. He holds 5 patents and has more than 20 publications in his name.

JOCELYN HOWARD SCOTT is the Marketing Manager of Kleen-Tex Industries, is responsible for all marketing functions of the company. Kleen-Tex is a world leader in the manufacture of floor mats, including walk-off, scraper, anti-fatigue and personalized logo mats. Jocelyn is an active member of the Textile Rental Services Association and the Uniform and Textile Service Association marketing committees.

PIYUSH SHUKLA is employed at Milliken & Company as an Advanced Development Chemist in the Apparel and Specialty Fabrics Division where he is involved in bringing three multi-million dollar projects to market. While in graduate school at the University of Texas at Austin he developed aminolanes for use in the transformation of ketones to imines. Upon the completion of his Ph.D. in 2003, he was awarded a Los Alamos National Laboratory post-doctoral fellow.

M. SCOTT TAYLOR is Manager of Medical Device Engineering and Design at Poly-Med, Inc. At Poly-Med, Inc., Scott has an integral role in increasing intellectual property, as well as assisting in the development of a number of medical devices from initial concept to final product.

CLÁUDIA M. VAZ, Ph.D. Applied Research Manager for DSM Dyneema Medical in the Netherlands, is responsible for know-how management, project management and product development. She also serves as Application Development Manager. She has 10 years of experience in the biomedical field in three countries – Portugal, the United Kingdom and the Netherlands. Cláudia is the author of more than 50 international publications, including scientific papers, book chapters, patents and communications. She also has won 3 international scientific prizes.

HOWARD M. ZINS is the principal of Howard M. Zins Associates, a consulting organization offering the textile and apparel industries, research and development support. The firm also delivers technical service and regulatory response/lobbying support programs. His previous business experience includes positions held with Angelica Corporation and Milliken, Inc. As past president of the American Reusable Textile Association (ARTZ), Zins continues to serve on ARTA's board of directors and as that organization's Legislative Director. In addition, he is a member of ASTM's F23 Protective Apparel Committee and has also served as a member of the AAMI (Association for the Advancement of Medical Instrumentation) Protective Barriers Working Group. A co-chairperson of the Clemson University Medical Textile Conference since 2002, Zins has also been a longstanding participant in these programs.

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