FINAL PROGRAM

MAY 16-20, 2022
THE WESTIN CARLSBAD RESORT | SAN DIEGO, CA

ORGANIZED BY:

smstevent.org  #smst2022
Nitinol. Let’s shape the future together.

A melt-to-finish supplier of Nitinol, we are helping advance the performance of the world’s most demanding applications. Because we custom manufacture Nitinol in multiple finishes and forms, including wire, bar, and shape-set parts, you can rely on us for material solutions to support an array of projects. And if your needs are particularly high-tech, we got you covered — we provide research and development support and prototyping services.

Explore how we can assist you at fwmetals.com/nitinol.
WELCOME TO SMST 2022: 60 YEARS OF NITINOL and counting…

After a few abnormal years of pandemic life, we are excited to welcome you to the beautiful coastal getaway of Carlsbad, CA, home of SMST 2022. This year marks an event like no other with a tribute to the 60th YEAR OF NITINOL with exclusive programming, new awards category, and some very special guests that you won’t want to miss. If you are looking to improve, design, or apply with shape memory materials, you will find the preeminent experts at SMST!

We will kick off the pre-conference with the highly recommended education workshop on Nitinol technology led by none other than Dr. Alan Pelton, along with some very passionate instructors. We have a VIP lineup of keynote speakers, starting with Dr. Riki Banerjee. She will talk about a novel neurological device that uses thin film Nitinol to help people with paralysis, including results from their Phase I clinical trials. On Wednesday, Prof. Aaron Stebner will take us through a journey on 3D printing of Nitinol. We will learn about the challenges facing this technique and paths toward commercialization. On Thursday, Prof. Ichiro Takeuchi will discuss vastly growing elastocaloric cooling systems, including new materials and how a 50-watt water chiller was developed. Our keynote lineup concludes with Dr. Koichi Tsuchiya speaking on research trends in shape memory alloys and related activities in Japan; a talk you can’t miss.

If that is not enough, we also have TWO panel discussions to kick off the afternoons. Both panels, one on medical devices and the other on aerospace, feature panelists that represent key stakeholders in the industry from regulatory agencies to device manufacturers.

Don’t forget to attend the expositions, networking receptions, and a very special award ceremony. We will also host the CASMART 5th Student Design Competition on Thursday night. Come listen to some talented young professionals present their projects. We made sure to include some free time during the conference to explore the area, visit LEGOLAND, go for a swim, or play golf at The Crossings at Carlsbad course.

All of this is made possible because of you. To both the veteran SMST attendees and the newcomers, thank you for your contributions and looking forward to meeting you in person.

Your SMST 2022 Chairs,

Conference Chair
Othmane Benafan

Conference Co-Chair
Srinidhi Nagaraja

#smst2022
GENERAL INFORMATION

CONFERENCE REGISTRATION HOURS

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<thead>
<tr>
<th>DAY/DATE</th>
<th>HOURS</th>
<th>LOCATION</th>
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<tr>
<td>Monday, May 16, 2022</td>
<td>5:00 p.m. – 7:00 p.m.</td>
<td>Grand Ballroom Foyer</td>
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<tr>
<td>Tuesday, May 17, 2022</td>
<td>7:00 a.m. – 5:00 p.m.</td>
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<tr>
<td>Wednesday, May 18, 2022</td>
<td>7:30 a.m. – 12:00 p.m.</td>
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<td>Thursday, May 19, 2022</td>
<td>7:30 a.m. – 5:00 p.m.</td>
<td>Sunset Ballroom Foyer</td>
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<tr>
<td>Friday, May 20, 2022</td>
<td>7:30 a.m. – 12:00 p.m.</td>
<td>Sunset Ballroom Foyer</td>
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EXHIBITION DATES AND TIMES
The Show Directory can be found on page 41.

MONDAY, MAY 16
Welcome Reception .......................................................... 5:30 p.m. – 7:00 p.m.

TUESDAY, MAY 17
Exhibits Open ....................................................................... 9:30 a.m. – 7:00 p.m.
Morning Refreshment Break .................................................. 10:00 a.m. – 10:30 a.m.
Lunch .................................................................................. 12:15 p.m. – 1:15 p.m.
Afternoon Refreshment Break .............................................. 3:15 p.m. – 3:45 p.m.
Expo/Poster Reception .......................................................... 5:30 p.m. – 7:00 p.m.

WEDNESDAY, MAY 18
Exhibits Open ....................................................................... 9:30 a.m. – 1:00 p.m.
Morning Refreshment Break .................................................. 10:00 a.m. – 10:30 a.m.
Lunch .................................................................................. 12:15 p.m. – 1:15 p.m.

SESSION CHAIRS
REMINDER: Pick up your session packet at Registration the morning of your session. Within your packet, you will receive instructions and program information relevant to the day for you to pass along to your speakers. Twenty (20) minutes prior to the start of your session, please meet your speakers in the meeting room you are assigned to review necessary conference information and to assist them in uploading their PowerPoint presentations.

SPEAKERS
REMINDER: All speakers must meet in the room of your presentation twenty (20) minutes prior to the start of the session. This will allow all speakers the opportunity to meet their session chair, go over any final conference details and audio-visual concerns and upload your PowerPoint presentation.

CONFERENCE PROCEEDINGS
Conference Proceedings are available to all registered attendees. A link to the conference proceedings is included in the KNOW BEFORE YOU GO email sent out the week before the event. Please let us know if you did not receive the email and we will resend.
INTERNET
Complimentary wireless internet is available in The Westin Carlsbad Resort meeting rooms.

POLICY ON AUDIO AND VIDEO RECORDING
SMST reserves the right to any audio and video reproduction of presentations at every technical session. Recording of sessions (audio, video, still photography, etc.) intended for personal use, distribution, publication or copyright without the express written consent of SMST and the individual is strictly prohibited.

POLICY ON CELLULAR PHONE USAGE
In consideration of fellow event attendees and presenters, show management kindly requests your cooperation in minimizing disturbances which may occur during technical sessions. We ask that cellular phones or other electronic devices be placed in “silent mode” while you are in the meeting rooms. Please step outside the meeting room if you need to have a conversation.

AMERICANS WITH DISABILITIES
In accordance with the Americans with Disabilities Act (ADA) of 1990, SMST is striving to accommodate all of our guests with special needs. If a disability requires that you have access to modified housing, transportation or other assistance, please inform the conference staff.

EMERGENCY PROCEDURES DURING THIS ASM EVENT
During this ASM event attendees are to follow the established emergency guidelines of the facility where the emergency occurs. Based on the location of the incident, report emergencies to the nearest venue representative and/or security personnel if available, or report to the ASM operations office onsite.

Should a catastrophic event occur, attendees should follow the safety and security instructions issued by the facility at the time of the event. This includes listening for instructions provided through the public address system and following posted evacuation routes if required.

ASM ANTI-HARASSMENT POLICY
ASM International is dedicated to providing harassment-free events for everyone, regardless of age, race, religion, disability, gender, gender identity or sexual orientation. We do not tolerate harassment in any form from anyone attending an ASM event. Harassing behaviors include: offensive verbal comments related to age, race, religion, disability, gender, gender identity or sexual orientation; the use or display of sexual images, activities or commentary in public spaces; deliberate intimidation; stalking or following; harassing photography or recording; sustained disruption of events; or inappropriate physical contact. Participants asked to stop any harassing behavior are expected to comply immediately. Participants violating this policy may be sanctioned or expelled from the event or the membership at the discretion of ASM leadership.

ASM’S DEI STATEMENT
As an organization, ASM International recognizes that our members, volunteers, and employees come from a wide variety backgrounds and ethnicities, and we embrace and value the diversity of all our members. It is ASM’s commitment to be inclusive and mindful of this diversity in our policies, programs, courses, and interactions with others. As an organization, we affirm all people regardless of their age, culture, abilities, ethnic origin, gender identity, marital status, nationality, race, religion, sexual orientation, education level, and socioeconomic status.

If you have a report or concern about the conduct of any party that you feel is related to the ASM event or function please reach out by phone at 440-338-5151 or email at memberservicecenter@asminternational.org.

For anonymous reports please use the Hotline:
SAFEHOTLINE.COM
CALL OR TEXT: 1-855-662-SAFE
ASM ID Number 7446018727
SMST 2022 ORGANIZING COMMITTEE

SMST 2022 Conference Chair:
Dr. Othmane Benafan
NASA Glenn Research Center

SMST 2022 Conference Co-Chair
Dr. Srinidhi Nagaraja
G. RAU Inc.

Steering Committee

Dr. Tom Duerig
Confluent Medical Technologies Inc.

Dr. Darel E. Hodgson, FASM
Nitinol Technology

Dr. Alan R. Pelton, FASM
G. Rau Inc.

Dr. Jeremy Schaffer
Fort Wayne Metals

Dr. Aaron Stebner
Georgia Institute of Technology

Dr. Jochen Ulmer
Euroflex GmbH

SAVE THE DATE!

Recharge in the company of visionaries, connect with other materials executives who share your fire about the future of the materials world, and unlock new thinking to spark innovation.

This year’s summit will convene a powerful collection of groundbreaking innovators and top subject-matter experts, focused on the following domains:

- Materials 4.0 — Materials Genome Deployment
- Nexus of Data Science and Materials Science
- Industry 4.0 — the New Manufacturing Landscape
- Materials Sustainability in the 21st Century

Registration opens Summer 2022.

asmsummitevent.org

December 6-8, 2022
Ritz Carlton, Naples, FL
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<td>Registration Open</td>
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<tr>
<td>8:00 a.m. – 8:10 a.m.</td>
<td>Opening Remarks</td>
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<tr>
<td>8:10 a.m. – 9:00 a.m.</td>
<td>Plenary Session: Riki Banerjee</td>
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<td>Production and processing I</td>
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<tr>
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<td>Fatigue and facture I</td>
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<tr>
<td>10:30 a.m. – 12:15 p.m.</td>
<td>Production and processing II</td>
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<tr>
<td>12:15 p.m. – 1:15 p.m.</td>
<td>Lunch with Exhibitors</td>
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<td>1:15 p.m. – 1:55 p.m.</td>
<td>Panel Discussion: Medical</td>
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<tr>
<td>2:00 p.m. – 3:15 p.m.</td>
<td>Alloy development and future alloys I</td>
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<td>2:00 p.m. – 3:15 p.m.</td>
<td>Fatigue and fracture III</td>
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<td>3:15 p.m. – 3:45 p.m.</td>
<td>Afternoon Refreshment Break</td>
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<td>3:45 p.m. – 5:30 p.m.</td>
<td>Innovations in medical devices</td>
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<tr>
<td>3:30 p.m. – 5:30 p.m.</td>
<td>Alloy development and future alloys II</td>
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<td>Founders’ Grant Update</td>
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<td>Plenary Session: Aaron Stebner</td>
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<td>Surface engineering, corrosion and biocompatibility I</td>
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<td>Plenary Session: Ichiro Takeuchi</td>
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<td>Beyond alloys: Shape memory polymers and ceramics I</td>
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<td>Registration Open</td>
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<td>7:50 a.m. – 8:10 a.m.</td>
<td>CASMART Awards</td>
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<td>8:10 a.m. – 9:00 a.m.</td>
<td>Plenary Session: Koichi Tsuchiya</td>
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<tr>
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<td>Modeling of shape memory alloys I</td>
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REFRESHMENT BREAKS
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THURSDAY, MAY 19
Morning Refreshment Break................................................................. 10:00 a.m. – 10:30 a.m.
Afternoon Refreshment Break............................................................ 3:15 p.m. – 3:45 p.m.
FRIDAY, MAY 20
Morning Refreshment Break................................................................. 10:00 a.m. – 10:30 a.m.

LUNCHES
Tuesday, May 17 ..................................................................................... 12:15 p.m. – 1:15 p.m.
Wednesday, May 18 ............................................................................... 12:00 p.m. – 1:15 p.m.
Thursday, May 19 ....................................................................................

WELCOME RECEPTION
MONDAY, MAY 16, 2022 ...................................................................... 5:30 p.m. – 7:00 p.m.
Grand Terrace
Sponsored by: Euroflex
Join us at your leisure for a chance to network and meet with your colleagues and the SMST exhibitors as people arrive and get settled at The Westin Carlsbad Resort. Casual attire please.

EXHIBITOR & POSTER RECEPTION
TUESDAY, MAY 17, 2022 ..................................................................... 5:30 p.m. – 7:00 p.m.
Pacific Grand Ballroom
Sponsored by: Cirtec
Vascoumbe

AFTERNOON FREE TIME
WEDNESDAY, MAY 18, 2022 ................................................................. 1:15 p.m. – 6:00 p.m.
The afternoon has been left open for you to explore Carlsbad and surrounding areas to see a variety of local attractions.

EVENING SOCIAL EVENT
WEDNESDAY, MAY 18, 2022 ................................................................. 6:00 p.m. – 9:00 p.m.
Grand View atrium
Sponsored by: ADMEDES
Resonetics
This year’s Social Event will be at The Westin Carlsbad Resort in the Grand View atrium. Enjoy an evening with your colleagues as you relax with dinner, drinks and entertainment.
Ticketed Event
Cost: $85
Dress: Casual
NEW ORLEANS AWAITS!

The 2022 International Materials, Applications, & Technologies Conference (IMAT) will be held in the heart of New Orleans, September 12–15. The city is home to Creole cuisine, rich with history, and offers unmatched hospitality. So come for IMAT—the programming, exhibits, and networking—and stay to enjoy the culture, food, sights, and sounds of this unique cultural hub.

OUR MEMBERS SAY...

"I am looking forward to returning to IMAT this fall to be a part of the presentations in the symposia of the Failure Analysis Society and the ASM Emerging Professionals Committee. These presentations are always among the most interesting and most representative of practical applications to improve safety and engineering while also being great opportunities to meet with my peers, mentors, and mentees. I am also looking forward to the Women in Engineering Breakfast, where we will honor our important innovators and leaders of the future, while striving to create and retain all engineers practicing materials science."

Erik M. Mueller, Ph.D., P.E.
Materials Engineer, National Transportation Safety Board
Graduate Student, University of the District of Columbia

"Facilitating the DomesDay Geodesic Dome Design Competition is a highlight of our year. We use an MTS Criterion Test System to evaluate the structural integrity of student-designed domes, and it is always fun to see which designs can withstand the pressure and win the contest."

MTS Systems
IMAT Exhibitor

"To keep America competitive, we at universities must be aware of the current technologies, be able to capture the emerging ones, and be able to envision the future. IMAT meetings are an ideal venue for all three purposes, and I am looking forward to exploring these topics with my fellow academics and researchers in New Orleans."

Hanchen Huang, FASM
Professor and Dean of Engineering
University of North Texas

"QuesTek is looking forward to attending IMAT again this year. It is a great venue for meeting our existing clients and expanding our network, across a wide range of materials-intensive industries. We anticipate identifying numerous new business opportunities for QuesTek to resolve pressing materials problems by leveraging our computational materials engineering technologies."

Jeff Grabowski
Manager of Business Development
QuesTek Innovations LLC

For more information and to register today, visit imatevent.org
Nitinol Workshop  
**Monday, May 16, 2022 | The Westin Carlsbad Resort**  
Carlsbad A&B | 9:00 a.m. – 5:00 p.m.

An optional all-day education course on Nitinol Technology will be held for those who wish to gain a more fundamental understanding of shape memory and superelasticity.

Course topics will include:

- How Nitinol works: Basic thermal and mechanical properties
- Medical Applications of Nitinol: Design, processing, and properties to optimize in vivo performance of medical devices
- Actuator Applications of Nitinol: Design, processing, and properties to optimize performance of actuators
- Advanced Nitinol Topics: Additive manufacturing, thin films, elastocaloric, and magnetorestriction applications with processing and properties

This course is an excellent opportunity for attendees to strengthen their understanding of shape memory and superelastic materials in advance of the technical sessions.

**WORKSHOP ORGANIZER**  
Dr. Alan R. Pelton  
Chief Technical Officer  
G. RAU, Inc.

**INSTRUCTORS/TOPICS**

- Dr.–Ing. Jan Frenzel, Ruhr University Bochum — Introduction to Shape Memory and Superelasticity
- Dr. Othmane Benafan, NASA Glenn Research Center — Introduction to Shape Memory Actuators
- Brian Berg, Ph.D., Boston Scientific — Introduction to Nitinol Medical Devices
- Prof. Aaron Stebner, Georgia Institute of Technology — Introduction to Advanced SMA Applications

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**2021 SMST FOUNDERS’ GRANT**

**Wednesday, May 18, 2022 | 7:45 a.m.**

The intent of the SMST Founders’ Grant is to provide funding for early, exploratory research related to shape memory and superelasticity. It is expected that the funds will be used as a “seed grant,” used to test a concept and lay a foundation for obtaining further funding from industry or government agencies.

**William LePage**  
University of Tulsa – Mechanical Engineering  
Towards understanding the initiation and growth of fatigue failures at defects and inclusions in NiTi

This talk will provide a status update for work that has commenced as part of the SMST Founders’ grant titled “Zooming in on inclusions and their role in the fatigue of NiTi devices.”

It is known that failure in cardiovascular implants is often due to inclusions in NiTi, rather than the NiTi itself. To understand these defects better, this work is probing the initiation and growth of fatigue cracks in and around inclusions and particle-void assemblies. Our approach is utilizing a combination of fatigue testing, scanning electron microscopy (SEM), both optical and SEM digital image correlation (DIC), and focused ion beam milling (FIB).

Samples in tensile dogbone and Z/diamond strut shapes are being examined. For the tensile dogbones, the samples include ones produced from NiTi tube with stringer inclusions. The dogbones were laser cut in two geometries: stringers along the tensile axis, and stringers perpendicular to the tensile axis. Furthermore, the investigation includes FIB milling of two types: first, to study the 3D cross-sectional view under and through particle-void assemblies; and second, to use FIB to prescribe surface defects of particular geometries and study their effects in device-like sample dimensions.

The results will include SEM-DIC strain maps presented at different stages in the fatigue life of the samples, to investigate crack initiation and propagation. Analyses will include defect populations statistics with information from the SEM-DIC in the early phases of damage accumulation, with the goal of seeing damage forming and identifying critical inclusions even before cracks are visible.
SMST 2022 FINAL PROGRAM

SHAPE MEMORY AND SUPERELASTICITY
BEST PAPER AWARDS

Shape Memory and Superelasticity is pleased to announce the winners of the 2019 Best Paper Award and the 2020 Best Paper Award. The award, in addition to the recognition, includes a plaque and $1000 worth of ASM International products and services.

2019 Best Paper Award

“B2⇒B19′⇒B2T Martensitic Transformation as a Mechanism of Plastic Deformation of NiTi”
Volume 5, Issue 4, December 2019

Dr. Petr Šittner and Dr. Luděk Heller, Nuclear Physics Institute of the CAS, Husinec, Řež, and Institute of Physics of the CAS, Prague, Czech Republic; Dr. Petr Sedlák, Nuclear Physics Institute of the CAS, Husinec, Řež, and Institute of Thermomechanics of the CAS, Prague, Czech Republic; Dr. Yuchen Chen, State Key Laboratory of Mechanics and Control of Mechanical Structures, Nanjing University of Aeronautics and Astronautics, Nanjing 210016, China; Ondřej Tyc, Institute of Physics of the CAS, Prague, and Faculty of Nuclear Sciences and Physical Engineering, CTU Prague, Prague 2, Czech Republic; Dr. Orsolya Molnárová, Institute of Physics of the CAS, Prague, Czech Republic; Lukáš Kadeřávek, Institute of Physics of the CAS, Prague, and Faculty of Nuclear Sciences and Physical Engineering, CTU Prague, Prague 2, Czech Republic; and Dr. Hanus Seiner, Institute of Thermomechanics of the CAS, Prague, Czech Republic.

2020 Best Paper Award

“Investigation and Composition Characterization of a ‘NiTi-like’ Alloy Combining High Temperature Shape Memory and High Entropy”
Volume 6, Issue 2, June 2020

Laurent Peltier, Paul Lohmuller, Fodil Meraghni, Sophie Berveiller, and Pascal Laheurte, Arts et Métiers Institute of Technology, Université de Lorraine, Metz, France; and Etienne Patoor, Georgia Tech-Lorraine, Metz, France.

KEYNOTE PRESENTATIONS

Tuesday, May 17 | 8:10 a.m. – 9:00 a.m.

Dr. Riki Banerjee
Synchron
Endovascular Brain Computer Interface (BCI) for severe paralysis: First in human experience

Riki Banerjee has recently joined Synchron as the Vice President of Research and Development. She is a passionate technical leader and brings 12 years of demonstrated experience from Medtronic Neuromodulation where she had contributions as an engineer and manager commercializing products across many therapies including deep brain stimulation, sacral nerve modulation, and spinal cord stimulation. As a leader, she has enjoyed creating and leading high performing teams with cultures of effective decision making and building high trust cross functional relationships across all levels in an organization. Riki has led teams across engineering and scientific disciplines to translate medical technology to commercialized product. She started her career as an engineer in corporate research and technology at 3M Company. She received a PhD and Masters of Electrical Engineering from the University of Minnesota in 2005 and 2003, respectively. She completed her bachelor’s degree in Electrical Engineering from University of Wisconsin-Madison in 2000.
### Wednesday, May 18 | 8:10 a.m. – 9:00 a.m.

**Prof. Aaron Stebner**  
*Georgia Institute of Technology*  
**3D Printing Nitinol: The Past, Present, and Future**

Prof. Stebner works at the intersection of manufacturing, machine learning, materials, and mechanics. Prof. Stebner joined the Georgia Tech faculty as an Associate Professor of Mechanical Engineering and Materials Science and Engineering in 2020. Previously, he was the Rowlinson Associate Professor of Mechanical Engineering and Materials Science at the Colorado School of Mines (2013 – 2020), a postdoctoral scholar at the Graduate Aerospace Laboratories of the California Institute of Technology (2012 – 2013), a Lecturer in the Segal Design Institute at Northwestern University (2009 – 2012), a Research Scientist at Telezygology Inc. establishing manufacturing and “internet of things” technologies for shape memory alloy-secured latching devices (2008-2009), a Research Fellow at the NASA Glenn Research Center developing smart materials technologies for morphing aircraft structures (2006 – 2008), and a Mechanical Engineer at the Electric Device Corporation in Canfield, OH developing manufacturing and automation technologies for the circuit breaker industry (1995 – 2000). He has won numerous awards, including an NSF-Career award (2014), Economic Developer of the Year award for Jefferson County, Colorado (2016), the Colorado School of Mines Researcher of the Year Award (2017), and a Visiting Professor Fellowship from the Japan Society for the Preservation of Science (JSPS, 2019). Stebner serves as a board member and a past-president of the ASM International Organization on Shape Memory and Superelastic Technologies (SMST) and as an international advisory committee member of the International Conference on Martensitic Transformations (ICOMAT).

### Thursday, May 19 | 8:00 a.m. – 9:00 a.m.

**Prof. Ichiro Takeuchi**  
*University of Maryland*  
**Development of compression-based elastocaloric cooling systems based on superelastic shape memory alloys**

Ichiro Takeuchi is a professor of materials science and engineering and affiliate professor of physics at the University of Maryland. He received his Ph.D. in physics from the University of Maryland in 1996. Prior to joining the University of Maryland faculty, he was a postdoctoral research associate at Lawrence Berkeley National Laboratory, where he was engaged in the pioneering work on combinatorial materials synthesis. Previously, Takeuchi has worked as a member of the research staff at NEC Corporation in Japan. Takeuchi’s research program is focused on combinatorial exploration of novel functional materials, development of elastocaloric materials and systems, and superconducting devices. Takeuchi is a fellow of the American Physical Society.

### Friday, May 20 | 8:10 a.m. – 9:00 a.m.

**Dr. Koichi Tsuchiya**  
*National Institute for Materials Science*  
**(V) Research and Activities on Shape Memory Alloys in Japan**

Dr. Koichi Tsuchiya is the Managing Director of International Center for Young Scientists (ICYS) in National Institute for Materials Science (NIMS), Japan. He is also a managing researcher in Research Center for Structural Materials in NIMS and a Professor in the Graduate School of Pure and Applied Sciences, the University of Tsukuba. He is currently the president of Association of Shape Memory Alloys (ASMA), Japan. He is also a delegate member of The Japan Institute of Metals and Materials, and active member of The Iron and Steel Institute of Japan and TMS.

He obtained his Ph. D. in Materials Science and Engineering from Northwestern University in 1991, after his MS in Applied Physics (1986) and BS (1984), both from Hokkaido University.
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PANEL DISCUSSIONS

**Medical Panel**
Tuesday, May 17  |  1:15 p.m. – 1:55 p.m.

**Moderators**
Dorothy Abel, Syntactx
Brian Berg, Boston Scientific Corporation

**Panelists**
Jen Bolton, Boston Scientific Corporation
Katy Kringle, Boston Scientific Corporation
Christine Trepanier, Confluent Medical
Robert Whirley, Arterica
Ben Wolf, NAMSA

From concept to approval to sustained on-the-market, bringing medical devices to physicians and their patients takes a lot of skill and work. This panel will provide some stories and advice on best practices and common errors from concept assessments through prototyping, animal studies, regulatory approvals, manufacturing and sustaining activities. Questions and comments on what tools need improvement or what are overly burdensome barriers will be especially welcome.

**State of SMAs in Aerospace**
Thursday, May 19  |  1:15 p.m. – 1:55 p.m.

**Moderator**
Tad Calkins, The Boeing Company

**Panelists**
Ciera Balkenbusch, Fort Wayne Metals
Saverio Dagostino, NASA JPL
Doug Nicholson, Boeing

The history of SMA is closely tied to aerospace starting with the invention of NiTi at the Naval Ordnance Laboratory and including applications on aircraft and spacecraft. Aerospace applications have pushed the field to develop everything from new commercialized alloys, design tools, supply chains, regulatory governance to system solutions. Panel members from across the aerospace industry will explore past successes, current challenges, and the future opportunities that will continue driving the SMA field.
Plenary Session: Riki Banerjee
8:10 a.m.–9:00 a.m.  |  Meeting Room: Sunset Ballroom
Endovascular Brain Computer Interface (BCI) for severe paralysis: First in human experience: Dr. Riki Banerjee, Synchron, Brooklyn, NY

Fatigue and Fracture I
9:00 a.m.–10:00 a.m.  |  Meeting Room: Sunset Ballroom

Co-Chairs:
Prof. Huseyin Sehitoglu
University of Illinois at Urbana-Champaign
Urbana, IL USA

Dr. Dhiraj Catoor
Medtronic
Minneapolis, MN USA

9:00 a.m.
Introduction of a normalized measure of functional fatigue for the benchmark of cyclic stability of pseudoelastic NiTi wires: Dr. Burkhard Maass1, Dr. Christian Grossmann1, Dr. André Kortmann1, Dr. Alexander Paulsen1, Prof. Jan Frenzel2 and Prof. Gunther Egelter2, 1Ingpuls GmbH, Bochum, Germany, 2Institute for Materials, Ruhr University Bochum, Bochum, Germany

9:15 a.m.
Crack Growth under Actuation Loading in a NiTiHf High Temperature Shape Memory Alloy: Mr. Benjamin Young1, Dr. Behrouz Haghgoyn2, Prof. Theocharis Baxevanis3, Dr. Dimitris Lagoudas2, Dr. Ibrahim Karaman1 and Mr. Roberto Orostieta, Doctoral Student4,
1Materials Science and Engineering, Texas A&M University, College Station, TX, 2Aerospace Engineering, Texas A&M University, COLLEGE STATION, TX, 3Mechanical Engineering, University of Houston, Houston, TX, 4Materials science and engineering, Texas A&M University, College Station, TX

9:30 a.m.
Extending the Fatigue Life of NiTiHf High Temperature Shape Memory Alloys through Partial Thermal Cycling: Mr. Alexander Demblon, Mr. James H Mabe and Dr. Ibrahim Karaman, Materials Science and Engineering, Texas A&M University, College Station, TX

9:45 a.m.
Effect of Thickness on Fracture Toughness of NiTi Shape Memory Alloy: Mrs. Basak Abut1, Dr. Behrouz Haghgoyn2, Dr. Ibrahim Karaman1 and Dr. Dimitris Lagoudas3, 1Materials Science and Engineering, Texas A&M University, College Station, TX, 2Aerospace Engineering, Texas A&M University, College Station, TX, 3Texas A&M University, College Station, TX

Production and Processing I
9:00 a.m.–10:00 a.m.  |  Meeting Room: Carlsbad A & B

Co-Chairs:
Dr. Marcus L. Young
University of North Texas
Denton, TX USA

Dr. Alberto Coda
SAES Getters S.p.A.
Lainate, Italy

9:00 a.m.
Melting and Processing of Shape Memory Alloys: A CASMART Review: Ms. Faith Gantz1, Dr. Nathan A. Ley1, Dr. Marcus L. Young1, Mr. Alexander Demblon1, Mr. Jacob L. Minge1, Dr. Hande Ozcan1, Dr. Raj Vaidyanathan1, Dr. Othmane Benafan1, Mr. Glen S Bigelow6, Dr. Travis L Turner1, Dr. Robert W. Wheeler1, Dr. Mathew Carl1, Mr. Micheal Bass1,2, Dr. Frederick Calkins1,2, Dr. Douglas E Nicholson1,2, Mr. Jeff Brown1,2 and Dr. Mohammad Ibraheem Khan1,4, 1Materials Science and Engineering, University of North Texas, Denton, TX, 2Materials Science and Engineering, Texas A&M University, College Station, TX, 3Materials Science & Engineering, Texas A&M University, College Station, TX, 4Mechanical Engineering, Texas A&M University, College Station, TX, 5University of Central Florida, Orlando, FL, 6Materials and Structures Division, NASA Glenn Research Center, Cleveland, OH, 1Structural Acoustics Branch, NASA Langley Research Center, Hampton, VA, 2Sandia National Laboratories, Livermore, CA, 3Materials Science and Engineering, ATI Specialty Alloys and Components, Albany, OR, 4The Boeing Company, Berkeley, MO, 5Boeing Research and Technology, The Boeing Company, Seattle, WA, 6Boeing Research and Technology, The Boeing Company, Berkeley, MO, 7DYNALLOY, Inc., Irvine, CA, 8Smarter Alloys, Waterloo, ON, Canada

9:15 a.m.
The Assessment of Physical and Mechanical Property Variability in a New Generation of Low Inclusion NiTi Alloy: Dr. Weimin Yin, Mr. Frank Szerzenie and Rich Lafond, SAES Smart Materials, New Hartford, NY

9:30 a.m.
Laser Processing of Hf-Lean NiTiHf Alloy to Induce High Temperature Shape Memory Effects: Mr. Siu Kei Tang1, Dr. Jak Li1, Dr. Michael L Kuntz2, Dr. Othmane Benafan1 and Dr. Mohammad Ibraheem Khan1, 1Smarter Alloys, Waterloo, ON, Canada, 2Materials and Structures Division, NASA Glenn Research Center, Cleveland, OH

9:45 a.m.
Variation of material properties in tilt-cast Cu-Al-Ni alloy: Mr. Benjamin Schelnberger1, Dr. Romina Krieg1, Dr. Ralf Thiéb1 and Dr. Peter Dültgen1, 1FGW Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V., Remscheid, Germany, 2Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V., Remscheid, Germany
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• Plot boundaries (min/max AREA, min/max TEMP) can be adjusted separately for each object.
• Full control over rate of heating, and the test stops automatically when it reaches the user-defined end-temp.
• Each item’s graph Start and Finish AF temperatures can be saved as a report.

### Specification:

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Morning Refreshment Break  
10:00 a.m.–10:30 a.m.  
Meeting Room: Grand Pacific Ballroom

Fatigue and Fracture II  
10:30 a.m.–12:15 p.m.  
Meeting Room: Sunset Ballroom

Co-Chairs:  
Prof. Huseyin Sehitoglu  
University of Illinois at Urbana-Champaign  
Urbana, IL USA

Dr. Dhiraj Catoor  
Medtronic  
Minneapolis, MN USA

10:30 a.m.  
Nitinol Fatigue: What Do We Really Understand?: Dr. Alan R. Pelton, G.RAU Inc., Scotts Valley, CA

11:00 a.m.  
Considerations on Tension-Tension Fatigue Predictions for Nitinol: Dr. Maximilien E. Launey, Dr. Brian T. Berg, Mr. Payman Saffari, Prof. Aaron Stebner and Dr. Alan R. Pelton, Glassimetal Technology, Inc., Pasadena, CA, Boston Scientific Corporation, Maple Grove, MN, Engage Medical Device Services, Newport Beach, CA, Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA, G.RAU Inc., Scotts Valley, CA

11:15 a.m.  
Direct Experimental Evaluation of High-cycle Fatigue Indicator Parameters in Nickel-Titanium Shape Memory Alloys: Mr. Andreas Keck, Mrs. Katarzyna Plaskonka-Weisenburger, Dr. Jochen Ulmer, Dr. Alan R. Pelton, G.RAU GmbH & Co. KG, Pforzheim, Germany, G.RAU Inc., Scotts Valley, CA

11:30 a.m.  
Experimental and Computational Rotary Bend Fatigue to Characterize Very High Cycle Fatigue of Nitinol: Dr. Jason D Weaver, Dr. Kenneth I Aycock, Ms. Grazziela Sena, Dr. Shiril Sivan, Dr. Terry O Woods, Dr. Charlie Yongpratav, Dr. Finn Donaldson, Dr. Brian T. Berg, Dr. Andrew Roiko, Mr. Anthony Bauer and Dr. Wayne Falk, Center for Devices and Radiological Health, Office of Science and Engineering Laboratories, U.S. Food and Drug Administration, Silver Spring, MD, Center for Devices and Radiological Health, Office of Product Evaluation and Quality, U.S. Food and Drug Administration, Silver Spring, MD, Boston Scientific Corporation, Maple Grove, MN, Medtronic, Mounds View, MN

11:45 a.m.  
Factors Impacting Nitinol Fatigue: Mr. Curtis Goreham-Voss, PhD, Dr. Cahal McVeigh, Ph.D., Mr. Matthew Ziebol and Dr. Carl F. Popelar, Ph.D., Structural Heart and Aortic, Medtronic, Mounds View, MN, Materials Engineering Department, SouthWest Research Institute, San Antonio, TX

12:00 p.m.  
Cumulative Fatigue of Nitinol due to Multiple Applied Cyclic Strains: Dr. Paul Briant, Dr. Louis G Malito, Dr. Jeremy E. Schaffer and Dr. Tom Hamilton, Exponent, Inc., Menlo Park, CA, Fort Wayne Metals Research Products Corporation, Fort Wayne, IN

Production and Processing II  
10:30 a.m.–12:15 p.m.  
Meeting Room: Carlsbad A&B

Co-Chairs:  
Dr. Alberto Coda  
SAES Getters S.p.A.  
Lainate, Italy

Dr. Marcus L. Young  
University of North Texas  
Denton, TX USA

10:30 a.m.  
The Influence of Ingot Transformation Temperatures on Plateau Strain and Stress of Nitinol Tubes: Mr. Andreas Keck, Mrs. Katarzyna Plaskonka-Weisenburger, Dr. Jochen Ulmer, Dr. Alan R. Pelton and Mr. Sean M. Pelton, G.RAU GmbH & Co. KG, Pforzheim, Germany, EUROFLEX GmbH, Pforzheim, Germany, G.RAU Inc., Scotts Valley, CA

10:45 a.m.  
Influence of femtosecond laser beam polarization on cutting thick-walled Nitinol tubing: Mr. Martin Stampfl, Mr. Kay Ole Schmid and Mr. Roland Wölzlein, Coherent Inc., Gilching, Germany

11:00 a.m.  
Hot Forming of Nitinol: Fundamental Investigations and Applications: Mr. Stefan Zende, Mr. Moritz Pohler, Mr. Lucas Bittigkoff and Dr. Nils-Agne Feth, ADMEDES GmbH, Pforzheim, Germany

11:15 a.m.  
Effect of Flash Annealing on the Microstructure and Fatigue Life of a Ni-rich NiTi-20 at.% HF High Temperature Shape Memory Alloy: Ms. Faith Gantz, Dr. Michael T. Wall, Dr. Marcus L. Young and Mr. Drew J Forbes, Materials Science and Engineering, University of North Texas, Denton, TX, Fort Wayne Metals, Fort Wayne, IN

11:30 a.m.  
Manufacture and Processing of Large Nitinol Rings for Application in Seismic Dampers: Mr. Edward Mild, M.S., Dr. Darel E. Hodgson, Ph.D., Dr. Mohammad Salehi, Ph.D., T. Kim Parnell, Ph.D., P.E., and Prof. Reginald Desroches, Ph.D., Fort Wayne Metals, Fort Wayne, IN, Nitinol Technology, Palo Alto, CA, Department of Civil and Environmental Engineering, Rice University, Houston, TX, Parnell Engineering & Consulting, Sunnyvale, CA
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- PERIPHERAL VASCULAR
- INTERVENTIONAL PULMONOLOGY

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11:45 a.m.
Melt Spun NiTiHf Ribbons for High Temperature Actuation Applications: Dr. Jak Li, Mr. Siu Kei Tang, Dr. Michael L Kuntz and Dr. Mohammad Ibraheem Khan, Smarter Alloys, Waterloo, ON, Canada

12:00 p.m.
SHAPE: Shape memory alloys via halide-activated pack equilibration: Prof. David W. Lipke 1, Mr. Andrew S. King 2 and Mr. Ryan D. Dempsey 1, 1Materials Science and Engineering, Missouri University of Science and Technology, Rolla, MO, 2Alfred University, Alfred, NY

Lunch
12:15 p.m.–1:15 p.m.
Meeting Room: Ocean Blue Terrace

Panel Discussion: Medical
1:15 p.m.–1:55 p.m.
Meeting Room: Sunset Ballroom

Moderators:
Dorothy Abel
Syntactx

Brian T. Berg
Boston Scientific Corporation

Panelists
Jen Bolton
Boston Scientific Corporation

Katy Kringle
Boston Scientific Corporation

Christine Trepanier
Confluent Medical

Robert Whirley
Arterica

Ben Wolf
NAMSA

Alloy Development and Future Alloys I
2:00 p.m.–3:15 p.m.
Meeting Room: Carlsbad A&B

Co-Chairs:
Dr. Jeremy E. Schaffer
Fort Wayne Metals Research Products Corporation
Fort Wayne, IN USA

Dr. Ronald D Noebe
NASA Glenn Research Center
Cleveland, OH USA

2:00 p.m.
Strain Glass as Potential Smart Materials: Prof. Xiaobing Ren, National Institute for Materials Science, Tsukuba, Japan

2:25 p.m.
Making Martensitic Transformation Continuous for Controlled Strain Release: Prof. Yunzhi Wang, Materials Science and Engineering, The Ohio State University, Columbus, OH

2:50 p.m.
The coefficient of refrigeration performance and stress-assisted magnetocaloric effect in metamagnetic shape memory alloys: Prof. Nickolaus M. Bruno, Ph.D., Mechanical Engineering, SD Mines, Rapid City, SD

Fatigue and Fracture III
2:00 p.m.–3:15 p.m.
Meeting Room: Sunset Ballroom

Co-Chairs:
Prof. Huseyin Sehitoglu
University of Illinois at Urbana-Champaign
Urbana, IL USA

Dr. Dhiraj Catoor
Medtronic
Minneapolis, MN USA

2:00 p.m.
Influence of Active Af on the Fatigue Performance of Peripheral Stents Subjected to Physiological Loading Conditions: Dr. Matthias Frotscher 1, Mr. Martin Kiebusch 2, Mr. Steffen Mews 1, Mr. Alexander Knopp 1 and Mrs. Doerte Serowietzki 1, 1Stent & Material Testing, CORTRONIK GmbH (BIOTRONIK Group), Rostock-Warnemünde, Germany, 2Stent & Scaffold Design, CORTRONIK GmbH (BIOTRONIK Group), Rostock-Warnemünde, Germany, 3Technology Dev. Material & Maintenance, CORTRONIK GmbH (BIOTRONIK Group), Rostock-Warnemünde, Germany

2:15 p.m.
(V) Effects of Sample Configuration on High Cycle Fatigue Life of SE Nitinol: Mr. Paul Adler 1, Mr. Michael Quellmalz 2, Dr. Louis G Malito 3, Dr. Steven Kreuzer 3, Dr. Paul Briant 3 and Dr. Brad James 3, 1Northwestern University, Evanston, IL, 2Vactronix Scientific, Fremont, CA, 3Exponent, Inc., Menlo Park, CA

2:30 p.m.
Tension-Tension Fatigue of Physical Vapor Deposited Supereelastic Nitinol: Dr. Louis G Malito 3, Mr. Scott Carpenter 2, Mr. Christian Gastón Palma 3 and Prof. Robert O. Ritchie 3, 3Exponent, Inc., Menlo Park, CA, 2Vactronix Scientific, Fremont, CA, 3University of California, Berkeley, CA

2:45 p.m.
Fatigue Testing of a New Generation Commercial Scale Low Inclusion NiTi Alloy: Dr. Andrew Pequegnat, Mr. Walter Heitmann and Mr. Kyle Chapman, Memry Corporation, Bethel, CT
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- ASTM F 2063-18 compliance ready

<table>
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We appreciate your interest & loyalty to Furukawa Nitinol products for Medical devices and look forward to the opportunity to meet with you at San Diego!!

Web Stock Nitinol Tubes

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- Dispatch within 1~2 weeks from order

Pls contact us for more detail.

Contact:
Roy Lange, rlanege@americanfurukawa.com
3:00 p.m.
Fatigue and Fracture of Small Cracks Induced by Focused Ion Beam in Superelastic Nitinol: Dr. Louis G Malito¹, Mr. A Rosen¹, Dr. Matthew L Bowers², Dr. Paul Briant¹, Dr. Tom Duerig³ and Dr. S.W. Robertson³, ¹Exponent, Inc., Menlo Park, CA, ²Confluent Medical Technologies, Fremont, CA, ³Fathom Engineering, Berkeley, CA

Afternoon Refreshment Break
3:15 p.m.–3:45 p.m.
Meeting Room: Grand Pacific Ballroom

Alloy Development and Future Alloys II
3:45 p.m.–5:15 p.m.
Meeting Room: Carlsbad A&B

Co-Chairs:
Dr. Ronald D Noebe
NASA Glenn Research Center
Cleveland, OH USA

Dr. Jeremy E. Schaffer
Fort Wayne Metals Research Products Corporation
Fort Wayne, IN USA

3:45 p.m.
Development and Mechanical Testing of Low Hysteresis Shape Memory Alloys: Mr. Andre Montagnoli¹, Ms. Neha S. John², Dr. Marcus L. Young², Mr. F. Tad Calkins² and Dr. Douglas E Nicholson³, ¹Material Science and Engineering, University of North Texas, Denton, TX, ²Materials Science and Engineering, University of North Texas, Denton, TX, ³The Boeing Company, Berkeley, MO

4:00 p.m.
Downsizing Hysteresis in VIM melted Ni-Ti-Cu-X alloys: Dr. Alberto Coda¹, Dr. Federico Gallino¹, Mr. Alessandro Gallitognotta¹ and Dr. Jannis Lemke¹, ¹SAES Getters S.p.A., Lainate, Italy, ²SAES Getters S.p.A, Lainate, Italy

4:15 p.m.
On the influence of Ti-rich precipitations on the properties of NiTiHf High Temperature Shape Memory Alloys: Dr. Burkhard Maass¹, Mr. Mikel Perez-Cerrato¹, Mrs. Erem Choroomi¹, Dr. Christian Grossmann¹, Dr. André Kortmann¹, Prof. Maria L. Nö¹ and Prof. José M. San Juan¹, ¹Ingoluls GmbH, Bochum, Germany, ²Dpt. Fisica de la Materia Condensada, Facultad de Ciencia y Tecnologia, University of the Basque Country, Bilbao, Spain, ³Fisica Aplicada II, Universidad del Pais Vasco, Bilbao, Spain

4:30 p.m.
Mechanical and shape memory properties of high temperature Ni-Ti-Hf-Nb alloys: Dr. Jannis Lemke¹, Dr. Federico Gallino, Mr. Matteo Cresci and Dr. Alberto Coda, SAES Getters S.p.A., Lainate, Italy

4:45 p.m.
Deformation Mechanisms and Shock Loading Responses of a Tribology-Grade NiTiHf Alloy: Mr. Tyler Knapp¹ and Prof. Aaron Stebner¹, ¹Georgia Institute of Technology, Atlanta, GA, ²Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA

5:00 p.m.
Comparative Analysis of Process-Induced Strain Glass States in Austenitic and Martensitic NiTi Shape Memory Alloy Plates: Ms. Neha S. John¹, Ms. Bailey Ashmore¹, Dr. Michael T. Wall¹, Dr. Robert W. Wheeler¹, Dr. Anit Giri¹ and Dr. Marcus L. Young¹, ¹Materials Science and Engineering, Engineering, University of North Texas, Denton, TX, ²Weapons & Materials Research Directorate, Army Research Laboratory, Aberdeen, MD

5:00 p.m.
Innovations in Medical Devices
3:45 p.m.–5:00 p.m.
Meeting Room: Sunset Ballroom

Co-Chairs:
Mr. Craig Bonsignore
First Article Services LLC
Phoenix, AZ USA

Dr. Timofey Chekalkin
Tomsk State University
Tomsk, Russian Federation

3:45 p.m.
Effect of pre-strain, temperature and time on the shelf life behavior of Nitinol: Dr. Parikshith Kumar and Dr. Steve Huang, W. L. Gore & Associates, Inc., Flagstaff, AZ

4:00 p.m.
A Novel approach to controlling performance of endodontic files: Dr. Ryan Vadoni, Ms. Alexandra Legget, Dr. Michael L Kuntz and Dr. Mohammad Ibraheem Khan, Smarter Alloys, Waterloo, ON, Canada

4:15 p.m.
Flex circuits on Nitinol thin film for minimal invasive stimulation and ablation applications: Dr. Christoph Chluba, Dr. Christoph Bechtold and Dr. Rodrigo Lima de Miranda, Acquandas GmbH, Kiel, Germany

4:30 p.m.
Evaluation of Superelastic Auxetic Structures For Medical Stents and Intracardiac Devices: Ms. Duygu Dengiz, Ms. Sabrina M. Curtis, Mr. Lars Burnke, Mr. Justin Jetter and Prof. Eckhard Quandt, Chair for Inorganic Functional Materials, Institute for Materials Science, Kiel University, Kiel, Germany
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4:45 p.m.
Spiral Laminal Flow™ Technology in a Self-expanding Nitinol Stent: Investigation on the Manufacturing Process: Mrs. Martina Bernini¹, Mrs. Agnese Lucchetti², Dr. Craig Dunlop³, Dr. Rudolf Hellmuth¹, Dr. William Ronan¹ and Dr. Ted J. Vaughan¹, ¹Biomechanics Research Centre, National University of Ireland, Galway, Galway, Ireland, ²Institut für Textiltechnik of RWTH Aachen University, Aachen, Germany, ³Vascular Flow Technologies in Dundee (UK), Dundee, United Kingdom

**SMST 2022 FINAL PROGRAM**

**TECHNICAL PROGRAM**

4:45 p.m.
Spiral Laminal Flow™ Technology in a Self-expanding Nitinol Stent: Investigation on the Manufacturing Process: Mrs. Martina Bernini¹, Mrs. Agnese Lucchetti², Dr. Craig Dunlop³, Dr. Rudolf Hellmuth¹, Dr. William Ronan¹ and Dr. Ted J. Vaughan¹, ¹Biomechanics Research Centre, National University of Ireland, Galway, Galway, Ireland, ²Institut für Textiltechnik of RWTH Aachen University, Aachen, Germany, ³Vascular Flow Technologies in Dundee (UK), Dundee, United Kingdom

**Expo & Poster Reception**
5:30 p.m.–7:00 p.m.
Meeting Room: Grand Pacific Ballroom

Poster Session
5:30 p.m.–7:00 p.m.

Crystal plasticity modelling framework for fully implicit time integration of coupled phase transformation and slip in shape memory alloys: Mr. Rupesh K. Mahendran, Prof. Aaron Stebner and Surya R. Kalidindi, Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA

Effects of thermal cycling on Active Af of nickel-titanium superelastic wires: Dr. Dimitri ASLANIDIS¹, Mr. Stepanus Widjaja¹, Mr. Godric Chen¹, Mr. Chenbing Huang¹ and Mr. Todd Dickson², ¹Lumenous Peiertech, Jiangyin, Jiangsu, China, ²Lumenous Device Technologies, Inc., Sunnyvale, CA

Quantitative XRD and microstructure characterization of Ni-Ti-Cu shape memory alloys: Dr. Jannis Lemke, Dr. Federico Gallino and Dr. Alberto Coda, SAES Getters S.p.A., Lainate, Italy

Role of nickel-titanium wire surface on laser marking: Dr. Dimitri ASLANIDIS¹, Mr. Chenbing HUANG¹, Mr. Stepanus Widjaja¹, Mr. Godric Chen¹ and Mr. Todd Dickson², ¹Lumenous Peiertech, Jiangyin, Jiangsu, China, ²Lumenous Device Technologies, Inc., Sunnyvale, CA

Studying HT-SMAs in compression: Dr. Alberto Coda¹, Mr. Matteo Cresci¹, Mr. Luca Fumagalli² and Dr. Jannis Lemke¹, ¹SAES Getters S.p.A., Lainate, Italy, ²SAES Getters S.p.A, Lainate, Italy

Combination of solid and porous Nitinol implants in surgical treatment of extensive post-excision thoracic defects in cancer patients: Dr. Evgeniy Topolnitskiy¹, Dr. Timofey Chekalkin²,³, Dr. Ekaterina Marchenko⁴, Dr. Yuri Yasenchuk⁵, Dr. Ji-Hoon Kang² and Dr. L’Hocine Yahia⁴, ¹Department of Surgery, Siberian State Medical University, Tomsk, Russian Federation, ²R&D Center, TiNiKo Co., Cheongju-si, Korea, Republic of (South), ³Tomsk State University, Tomsk, Russian Federation, ⁴Laboratory of Innovation and Analysis of Bioperformance, Polytechnique Montreal, Montreal, QC, Canada

High Cycle Fatigue Evaluation of Laser Cut Nitinol Coupons at Varying Mean Strains: Mr. Matthew Ziebol and Mr. Curtis Goreham-Voss, PhD, Structural Heart and Aortic, Medtronic, Mounds View, MN

Nitinol Continuously Flat-Rolled Sheet and their Properties: Mr. Andreas Keck¹, Mrs. Katarzyna Plaskonka-Weisenburger¹, Dr. Jochen Ulmer², Dr. Alan R. Pelton³ and Dr. Stefan Knoll¹, ¹G.RAU GmbH & Co. KG, Pforzheim, Germany, ²EUROFLEX GmbH, Pforzheim, Germany, ³G.RAU Inc., Scotts Valley, CA, ⁴G. Rau GmbH & Co. KG, Pforzheim, Germany

An elastocaloric air cooler with low-force bending actuation: Mr. Xueshi LI and Prof. Qingping Sun, Department of Mechanical and Aerospace Engineering, The Hong Kong University of Science and Technology, Hong Kong, China

A Comparison of Linear Elastic and Super Elastic Binary Nickle Titanium: Mr. Dave Plumley, Engineering, Fort Wayne Metals, Fort Wayne, IN

Influences of Ni/Ti ratio on NiTiTa alloys: Dr. S. Cai and Dr. Jeremy E. Schaffer, Fort Wayne Metals, Fort Wayne, IN
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Founders’ Grant Update  
7:45 a.m.–8:10 a.m.  
Meeting Room: Sunset Ballroom

Towards understanding the initiation and growth of fatigue failures at defects and inclusions in NiTi:  
Mr. Nathan Rendon, Ms. Emma Daharsh and Prof. William LePage, Mechanical Engineering, University of Tulsa, Tulsa, OK

Plenary Session: Aaron Stebner  
8:10 a.m.–9:00 a.m.  
Meeting Room: Sunset Ballroom

3D Printing Nitinol: The Past, Present, and Future:  
Prof. Aaron Stebner, Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA

Advanced Manufacturing I  
9:00 a.m.–10:00 a.m.  
Meeting Room: Sunset Ballroom

Co-Chairs:  
Prof. Aaron Stebner  
Georgia Institute of Technology  
Atlanta, GA USA

Prof. Eckhard Quandt  
Kiel University  
Kiel, Germany

9:00 a.m.  
Enabling High Power Additively Manufactured SMA Actuators with Internal Liquid Metal Channels:  
Mr. Jacob L. Mingear¹, Mr. Brady K. Allen², Ms. Jessica J. Zamarripa³ and Dr. Darren J. Hartl³, ¹Materials Science & Engineering, Texas A&M University, College Station, TX, ²Aerospace Engineering, Texas A&M University, College Station, TX

9:30 a.m.  
Transmission electron microscopy analysis of melt pool and cellular dendritic boundaries of laser processed Ti-Nb SMA:  
Mr. Wenhao Lin, Dr. Helge Heinrich and Dr. Ji Ma, Material Science & Engineering Department, University of Virginia, Charlottesville, VA

9:45 a.m.  
How do advanced micromachining technologies affect the performance of nitinol medical devices?  
Mr. Lucas Bittigkoffer, Mr. Martin Baumann and Dr. Nils-Agne Feth, ADMEDES GmbH, Pforzheim, Germany

Surface Engineering, Corrosion and Biocompatibility I  
9:00 a.m.–10:00 a.m.  
Meeting Room: Carlsbad A&B

Co-Chairs:  
Prof. Andreas Undisz  
Technische Universität Chemnitz  
Chemnitz, Germany

Dr. Srinidhi Nagaraja  
G.RAU Inc.  
Scotts Valley, CA USA

9:00 a.m.  
(V) Effects of Surface Area on the Corrosion Susceptibility of Nitinol:  
Ms. Grazziela Sena, Dr. Shiril Sivan, Dr. Jason D Weaver and Dr. Matthew Di Prima, Center for Devices and Radiological Health, Office of Science and Engineering Laboratories, Division of Applied Mechanics, U.S. Food and Drug Administration, Silver Spring, MD

9:15 a.m.  
ASTM F2129 Cyclic-Potentiodynamic Polarization Testing of Nitinol Stents Indicated for Use in the GI Tract:  
Mr. Steven Walak¹ and Dr. Noah Budiansky², ¹Endoscopy R&D, Boston Scientific, Marlborough, MA, ²Materials & Corrosion Engineering, Exponent, Inc., Natick, MA

9:30 a.m.  
(V) Accelerated Method to Predict Long-Term Nickel Release from Nitinol:  
Dr. Shiril Sivan¹, Dr. David M. Saylor², Dr. Paul Turner², Mr. Huiyu Shi², Dr. Joshua E. Soneson¹, Dr. Jason D Weaver¹, Dr. Matthew Di Prima¹ and Dr. Eric Sussman², ¹Center for Devices and Radiological Health, Office of Science and Engineering Laboratories, Division of Applied Mechanics, U.S. Food and Drug Administration, Silver Spring, MD, ²Center for Devices and Radiological Health, Office of Science and Engineering Laboratories, Division of Biology, Chemistry, and Material Science, U.S. Food and Drug Administration, Silver Spring, MD

9:45 a.m.  
Effect of ePTFE sintering post processing steps on surface quality and pitting corrosion behavior of NiTi stents:  
Dr. Behnam Amin-Ahmadi, Dr. Navjeet Gill, Dr. Harshad M. Paranjape, Mr. Pahul Singh and Mr. Craig Bonsignore, Confluent Medical Technologies, Inc., Fremont, CA

Morning Refreshment Break  
10:00 a.m.–10:30 a.m.  
Meeting Room: Grand Pacific Ballroom
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Advanced Manufacturing II
10:30 a.m.–12:00 p.m.
Meeting Room: Sunset Ballroom

Co-Chairs:
Prof. Eckhard Quandt
Kiel University
Kiel, Germany

Prof. Aaron Stebner
Georgia Institute of Technology
Atlanta, GA USA

10:30 a.m.
A novel approach to the electromechanical integration of NiTi-SMA actuator wires: Dr. Burkhard Maass1, Mr. Marvin Schuleit2, Dr. Christian Grossmann3, Mr. Fabian Franke3, Dr. André Kortmann2 and Prof. Cemal Esen2, 1Ingpuls GmbH, Bochum, Germany, 2Chair of Applied Laser Technologies, Ruhr University Bochum, Bochum, Germany

10:45 a.m.
Additive manufacturing of high-temperature shape memory alloys: effect of laser parameters and aging: Mr. Mohammadreza Nematollahi1, Mr. Keyvan Safaei4, Ms. Fatemeh Kordizadeh1, Dr. Othmane Benafan2 and Prof. Mohammad Elahinia1, 1Department of Mechanical Engineering, University of Toledo, Toledo, OH, 2Materials and Structures Division, NASA Glenn Research Center, Cleveland, OH

11:00 a.m.
Actuation Response of Ti-rich Nitinol Produced by Laser Powder Bed Fusion: Dr. Kyle Fezi1, Ms. Beth Stehulak2, Mr. Drew J Forbes2, Mr. Jack Davis2 and Kerri Horvay1, 1Fort Wayne Metals, Columbia City, IN, 2Fort Wayne Metals, Fort Wayne, IN, 3Hoeganaes Corporation, Cinnaminson, NJ

11:15 a.m.
Influence of stress on the transition behaviour of NiTi shape memory alloys for actuator applications: Mr. Philipp Eyer, Dr. Anna Trauth and Prof. Kay André Weidenmann, Institute of Materials Resource Management, Augsburg University, Augsburg, Germany

11:30 p.m.
Microstructure and torsional behavior of selective laser melted NiTi shape memory alloy: Mr. Keyvan Safaei Baghbanderani1, Mr. Mohammadreza Nematollahi1, Ms. Parisa Bayati1, Ms. Fatemeh Kordizadeh1, Mohsen Taheri Andani2, Mr. Hossein Abedi1, Nasrin Taheri Andani2, Dr. Othmane Benafan4, Dr. Behrang Pooganjii5 and Prof. Mohammad Elahinia1, 1Department of Mechanical Engineering, University of Toledo, Toledo, OH, 2University of Michigan, Ann Arbor, MI, 3Hoeganaes Corporation, Cinnaminson, NJ, 4University of Michigan, Ann Arbor, MI, 5University of Michigan, Ann Arbor, MI

11:45 a.m.
Advanced Additive Manufacturing Solutions for the Medical Device Industry – 3D printing with Nitinol and PowderLife cycle management
Dr. Gaurav Lalwani1, Dr. Hongtao Wang1, Alina Kirillova1, Cambre Kelly1, Alaa Elwany1, Dr. Ibrahim Karaman1 and Dr. Kenneth Gall1, Carpenter Technology Corporation, Philadelphia, PA, 1Department of Mechanical Engineering and Materials Science, Duke University, Durham, NC, 2Restor3D, Durham, NC, 4Wm Michael Barnes ’64 Department of Industrial & Systems Engineering, Texas A&M University, College Station, TX, 5Materials Science and Engineering, Texas A&M University, College Station, TX

Surface Engineering, Corrosion and Biocompatibility II
10:30 a.m.–11:30 a.m.
Meeting Room: Carlsbad A&B

Co-Chairs:
Dr. Srinidhi Nagaraja
G.RAU Inc.
Scotts Valley, CA USA

Prof. Andreas Undisz
Technische Universität Chemnitz
Chemnitz, Germany

10:30 a.m.
Surface Characterization and Corrosion Resistance of Generation I–III Nitinol with Various Surface Finishes: Dr. Robert M. Pipes1, Dr. Srinidhi Nagaraja1, Dr. Alan R. Pelton1, Dr. Philipp Hempel2, Adna Yazici2 and Dr. Danyal Siddiqui3, 1G.RAU Inc., Scotts Valley, CA, 2Admedes GmbH, Pforzheim, Germany, 3UT Dallas, Richardson, TX

10:45 a.m.
Characteristics of NiTi in the Vicinity of Laser-Induced Periodic Surface Structures: Mr. Robert Wonneberger1, Dr. Stephan Gräf1, Mrs. Katharina Freiberg1, Prof. Frank A. Müller2, Prof. Markus Rettenmayr1 and Prof. Andreas Undisz2, 1Friedrich-Schiller-Universität, Jena, Germany, 2Technische Universität Chemnitz, Chemnitz, Germany

11:00 a.m.
Influence of Annealing Temperature and Time on Surface Oxide Layers with a Thickness of ~60nm on NiTi: Mrs. Katharina Freiberg1, Mr. Robert Wonneberger2, Prof. Markus Rettenmayr1 and Prof. Andreas Undisz2, 1Friedrich-Schiller-Universität, Jena, Germany, 2Technische Universität Chemnitz, Chemnitz, Germany

Lunch
12:15 p.m.–1:15 p.m.
Meeting Room: Ocean Blue Terrace

Free Time!
1:15 p.m.–6:00 p.m.

Social Event & Awards Ceremony
6:00 p.m.–9:00 p.m.
Meeting Room: Grand View Atrium
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Plenary Session: Ichiro Takeuchi
8:00 a.m.–9:00 a.m.

Development of compression-based elastocaloric cooling systems based on superelastic shape memory alloys: Prof. Ichiro Takeuchi, Maryland Quantum Materials Center, University of Maryland, College Park, MD

Beyond Alloys: Shape Memory Polymers and Ceramics I
9:00 a.m.–9:45 a.m.
Meeting Room: Sunset Ballroom

Co-Chairs:
Prof. Christopher A. Schuh
Massachusetts Institute of Technology
Cambridge, MA USA

Mr. Chung H. Yeh
Shape Memory Medical
Santa Clara, CA USA

9:00 a.m.
Tuning Thermo-Mechanical Properties of Shape Memory Polymer Foams for Biomedical Applications: Dr. Sayyeda Marziya Hasan, Ph.D, R&D, Shape Memory Medical, Inc., Santa Clara, CA

9:15 a.m.
Pre-Clinical and Clinical Experience with Biodegradable Shape Memory Polyurethane Foam Occlusion Devices: Dr. Landon D Nash, PhD, R&D, Shape Memory Medical, Santa Clara, CA

Phase Transformations I
9:00 a.m.–10:00 a.m.
Meeting Room: Carlsbad A&B

Co-Chairs:
Prof. Jan Frenzel
Ruhr University Bochum
Bochum, Germany

Prof. Yunzhi Wang
The Ohio State University
Columbus, OH USA

9:00 a.m.
Tuning the Martensitic Transformation Mode in Shape Memory Materials via Mesostructure and Microstructure Design: Prof. Hang Z. Yu, Virginia Tech, Blacksburg, VA

9:30 a.m.
Effect of off-stoichiometric compositions on microstructures and martensitic phase transformations in Ni-Cu-Pd-Ti-Zr-Hf high entropy shape memory alloys: Mr. Oluwaseyi Sheriff Oluwabi, Mr. David Piorunek, Prof. Jan Frenzel, Dr. Aleksander Kostka, Dr. Christoph Somsen and Prof. Gunther Eggeler, Chair for Materials Science and Engineering, Ruhr University Bochum, Bochum, Germany, Institute for Materials, Ruhr University Bochum, Bochum, Germany, ZGH, Ruhr University Bochum, Bochum, Germany

Morning Refreshment Break
10:00 a.m.–10:30 a.m.
Meeting Room: Sunset Foyer

Beyond Alloys: Shape Memory Polymers and Ceramics II
10:30 a.m.–12:00 p.m.
Meeting Room: Sunset Ballroom

Co-Chairs:
Mr. Chung H. Yeh
Shape Memory Medical
Santa Clara, CA USA

Prof. Christopher A. Schuh
Massachusetts Institute of Technology
Cambridge, MA USA

10:30 a.m.
Shape Memory Zirconia: Shape Memory, Superalasticity, and Electric Field-Activated Shape Memory at Small Scales: Dr. Alan Lai and Prof. Christopher A. Schuh, Massachusetts Institute of Technology, Cambridge, MA, Department of Materials Science and Engineering, Massachusetts Institute of Technology, Cambridge, MA

11:00 a.m.
Ferroelastic domain nucleation in polycrystalline ceramics: A multiscale perspective: Prof. Jessica A Krogstad and Dr. Charles S. Smith, Materials Science and Engineering, University of Illinois, Urbana-Champaign, Urbana, IL

11:15 a.m.
Intrinsic and extrinsic size effects in shape memory zirconia: Ms. Isabel Crystal and Prof. Christopher A. Schuh, Department of Materials Science and Engineering, Massachusetts Institute of Technology, Cambridge, MA

11:30 a.m.
Characteristics of Martensitic Transformation in Shape Memory Ceramic-Based Granular Packings and Composites: Prof. Hang Z. Yu, Virginia Tech, Blacksburg, VA

11:45 a.m.
Understanding trends in thermal hysteresis during the martensitic transformation in ZrO2-CeO2 shape-
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memory ceramics: Mr. Edward L. Pang, Prof. Gregory B. Olson and Prof. Christopher A. Schuh, Department of Materials Science and Engineering, Massachusetts Institute of Technology, Cambridge, MA

**Phase Transformations II**
10:30 a.m.–11:45 a.m.
Meeting Room: Carlsbad A&B

Co-Chairs:
Prof. Yunzhi Wang
*The Ohio State University*  
*Columbus, OH USA*

Prof. Jan Frenzel  
*Ruhr University Bochum*  
*Bochum, Germany*

10:30 a.m.
Phase transformation and viscoplasticity coupling in polycrystalline NiTiHf high-temperature shape memory alloys: Mr. Pawan S. Chaugule, Graduate Student¹, Dr. Othmane Benafan² and Dr. Jean-Briac le Graverend³, ¹Aerospace Engineering, Texas A&M University, College Station, TX, ²Materials and Structures Division, NASA Glenn Research Center, Cleveland, OH

10:45 a.m.
Epitaxial NiTi thin films: a 3D puzzle: Ms. Klara Lünser¹,²,³, Stefan Schwabe¹,², Kornelius Nielsch¹,² and Sebastian Fähler³, ¹Leibniz IFW Dresden, Dresden, Germany, ²Institute of Materials Science, TU Dresden, Dresden, Germany, ³Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany

11:00 a.m.
Tensile deformation of B19' monoclinic martensite in nanocrystalline NiTi wires: Dr. Petr Sittner¹, Dr. Orsolya Molnarova¹, X Bian¹, Dr. Ludek Heller¹ and Prof. Hansus Seiner¹, ¹Institute of Physics of Czech Academy of Science, Prague, Czech Republic, ²Institute of Physics of the CAS, Prague, Czech Republic, ³Institute of Thermomechanics of the Czech Academy of Sciences, Prague, Czech Republic

11:30 a.m.
Towards Accurate Predictions of Martensitic Transition Temperatures for Shape Memory Alloys from Ab Initio Simulations: Dr. Zhigang Wu¹, Dr. Hessam Malmir¹, Dr. Justin Haskins¹ and Dr. John Lawson¹, ¹KBR Inc, Ames Research Center, NASA, Moffett Field, CA, ²NASA Ames Research Center, Moffett Field, CA, ³Thermal Protection Materials Branch, NASA Ames Research Center, Moffett Field, CA, ⁴Intelligent Systems Division, NASA Ames Research Center, Moffett Field, CA

**Panel Discussion: Aerospace**
1:15 p.m.–1:55 p.m.
Meeting Room: Sunset Ballroom

Moderators:
Dr. Frederick Calkins  
*The Boeing Company*  
*Seattle, WA USA*

Dr. Shankar Buravalla  
*General Electric*  
*Bengaluru, Karnataka, India*

Panelists:
Ciera Balkenbusch  
*Fort Wayne Metals*

Saverio Dagostino  
*NASA JPL*

Doug Nicholson  
*Boeing*

**Elastocaloric Potential in SMAs I**
2:00 p.m.–2:45 p.m.
Meeting Room: Sunset Ballroom

Co-Chairs:
Prof. Jun Cui  
*Iowa State University*

Dr. Paul Motzki  
*Saarland University*  
*Saarbrücken, Germany*

2:00 p.m.
Effects of alloy compositions and microstructures of Ni-Ti-based shape memory alloys on ferroic cooling performance: Prof. Jan Frenzel¹, Dr. André Wieczorek² and Prof. Gunther Eggeler¹, ¹Institute for Materials, Ruhr University Bochum, Bochum, Germany, ²Institute of Materials, Ruhr University Bochum, Bochum, Germany

2:15 p.m.
Mechanical properties and latent heats of low hysteresis NiTi shape memory alloy components for elastocaloric cooling applications: Dr. Christian Grossmann¹, Dr. Burkhard Maass¹, Dr. André Kortmann¹, Dr. Alexander Paulsen¹, Mr. Fabian Franke¹, Mr. Nicolas Michaelis², Mr. Felix Welsch³, Ms. Susanne-Marie Kirsch³, Ms. Franziska Louia³, Mr. Lukas Längler³, Prof. Stefan Seelecke⁴ and Dr. Paul Motzki⁵, ¹Ingpuls GmbH, Bochum, Germany, ²Lab for Measurement, Department of Systems Engineering, Saarland University, Saarbrücken, Germany, ³Department of Systems Engineering, Saarland University, Intelligent Material Systems Lab, Saarbrücken, Germany, ⁴Center for Mechatronics and Automation Technologies (ZeMA) gGmbH, Saarland University, Saarbrücken, Germany

Lunch
12:15 p.m.–1:15 p.m.  | Meeting Room: Sunset Terrace
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- INTERVENTIONAL PULMONOLOGY

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2:30 p.m.  
Elastocaloric potential in copper-based SMAs through a combinatorial approach: Dr. Gaoyuan Ouyang¹ and Prof. Jun Cui²,¹. Division of Materials Sciences and Engineering, Ames Laboratory, AMES, IA, ¹Department of Materials Science and Engineering, Iowa State University, Ames, IA

Microstructure Characterizations and Standards I  
2:00 p.m.–3:15 p.m.  
Meeting Room: Carlsbad A&B

Co-Chairs:  
Dr. Harshad M. Paranjape  
Confluent Medical Technologies, Inc.  
Fremont, CA USA

Dr. Behnam Amin-Ahmadi  
Confluent Medical Technologies, Inc.  
Fremont, CA USA

2:00 p.m.  
Shape Memory Materials Database (SMMD): Finding Data Anomalies & Trends: Dr. Othmane Benafan¹, Dr. Peter E. Caltagirone¹ and Mr. John S. Bostic³, ¹Materials and Structures Division, NASA Glenn Research Center, Cleveland, OH, ²Oak Ridge Associated Universities, Oak Ridge, TN, ³Peerless Technologies Corporation, Beavercreek, OH

2:15 p.m.  
SMAnlytics – An Automated Software for the Analysis of Shape Memory Alloy Test Data: Mr. Glen S. Bigelow¹, Mr. Zachary Toom² and Dr. Othmane Benafan¹, ¹Materials and Structures Division, NASA Glenn Research Center, Cleveland, OH, ²HX5, LLC, Cleveland, OH

2:30 p.m.  
3D Grain Maps of Intragranular Misorientation During Load-Biased Thermal Cycling: Mr. Wenxi Li, Prof. Darren Pagan, Ph.D.³, Dr. Lee Casalena³, Prof. Michael J Mills³, Prof. Aaron Stebner³ and Prof. Ashley N. Bucsek¹, ¹University of Michigan, Ann Arbor, MI, ²The Pennsylvania State University, State College, PA, ³Thermo Fisher Scientific, Hillsboro, OR, ⁴Department of Materials Science and Engineering, The Ohio State University, Columbus, OH, ⁵Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA

Afternoon Refreshment Break  
3:15 p.m.–3:45 p.m.  
Meeting Room: Sunset Foyer

Elastocaloric Potential in SMAs II  
3:45 p.m.–5:00 p.m.  
Meeting Room: Sunset Ballroom

Co-Chairs:  
Dr. Paul Motzki  
Saarland University  
Saarbrücken, Germany

Prof. Jun Cui  
Iowa State University  
Ames, IA USA

3:45 p.m.  
Advances in active regenerative elastocaloric cooling: Dr. Julie Slaughter, Dr. Agata Czernuszewicz, Dr. Lucas Griffith and Dr. Vitalij Pecharsky, Materials Science and Engineering, Ames Laboratory, Ames, IA

4:00 p.m.  
Improving elastocaloric cooling performance by applying novel thermodynamic cycle: Dr. Parham Kabirifar¹, Dr. Jonas Troje, Dr. Miha Brojan¹ and Dr. Jaka Tušek², ¹Faculty of Mechanical Engineering, University of Ljubljana, Ljubljana, Slovenia, ²University of Ljubljana, Slovenia, Denmark

4:15 p.m.  
(V) Additive Manufacturing Enabling Elastocaloric Materials with Fatigue-Resistance and High-performance: Prof. Huilong Hou¹,², Dr. Emrah Simsek³, Dr. Tao Ma³, Dr. Nathan S. Johnson³, Dr. Suxin Qian⁴, Dr. Cheikh Cissé⁴, Mr. Drew Stasak⁵, Ms. Naia H. Al Hasani⁶, Dr. Lin Zhou⁵, Prof. Yunho Hwang⁶, Prof. Reinhard Radermacher⁶, Prof. Valery I. Levitas⁶, Dr. Matthew J. Kramer⁶, Prof. Mohsen Asle Zaeem⁷, Prof. Aaron Stebner⁷, Dr. Ryan T. Ott⁷, Prof. Jun Cui⁸ and Prof. Ichiro Takeuchi⁹, ¹School of Aeronautic Science and Engineering, Beihang University, Beijing, China, ²Department of Materials Science and Engineering, University of Maryland, College Park, Maryland, ³Division of Materials Sciences and Engineering, Ames Laboratory, AMES, IA, ⁴Department of Mechanical Engineering, Colorado School of Mines, Golden, CO, ⁵Department of Refrigeration and Cryogenic Engineering, Xi’an Jiaotong University, Xi’an, China, ⁶Department of Mechanical Engineering, University of Maryland, College Park, MD, ⁷Department of Aerospace Engineering, Iowa State University, Ames, IA, ⁸Department of Materials Science and Engineering, Iowa State University, Ames, IA, ⁹Maryland Quantum Materials Center, University of Maryland, College Park, MD

2:45 p.m.  
ASMAĐA—A tool for automatic analysis of shape memory alloy thermal cycling data under constant stress: Mr. Matthew Kuner, Dr. Anargyros Karakalas and Dr. Dimitris C. Lagoudas, Department of Aerospace Engineering, Texas A&M University, College Station, TX

3:00 p.m.  
Automated Data Extraction Techniques for SMAs: Mr. Dylan Kennedy³, Prof. Aaron Stebner³ and Dr. Branden Kappes⁴, ³Georgia Institute of Technology, Atlanta, GA, ⁴Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA, ⁵Mechanical Engineering, Colorado School of Mines, Golden, CO, ⁶KMM, LLC, Denver, CO
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- SEM and optical microscopy
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**Microstructure Characterizations and Standards II**

**3:45 p.m.–5:15 p.m.**

**Meeting Room: Carlsbad A&B**

**Co-Chairs:**
- Dr. Behnam Amin-Ahmadi
  Confluent Medical Technologies, Inc.
  Fremont, CA USA
- Dr. Harshad M. Paranjape
  Confluent Medical Technologies, Inc.
  Fremont, CA USA

**3:45 p.m.**
**Comparison of various preparation methods of binary NiTi-shape memory alloys:** Mr. Christopher Holm, Ms. Nefeli Klonis, Dr. Romina Krieg, Dr. Ralf Theiß and Dr. Peter Dültgen, FGW Forschungsgemeinschaft Werkzeuge und Werkstoffe e. V., Remscheid, Germany

**4:00 p.m.**
**Vacuum Induction Melting of Low Inclusion Nitinol Ingots:** Dr. Burkhard Maass, Dr. Christian Grossmann, Dr. André Cortmann and Dr. Ulrich Muerlle, Ingpuls GmbH, Bochum, Germany

**4:15 p.m.**
**Microstructure characterizations of NiTi containing non-metallic inclusions and hydrogen: implications to the self-expandable stents:** Dr. Fan Sun¹, Prof. Laurence Jordan², Dr. Virginie Lair³, Prof. Armelle Ringueule⁴, Dr. Frantz Martin⁵ and Prof. Frederic Prima⁶, ¹IRCP, Metallurgie structurale, Chimie-Paristech, ENSCP, PSL Univ., Paris, France, ²Université de Paris, Paris, France, ³IRCP, Chimie-Paristech, ENSCP, PSL Univ., Paris, France, ⁴Service de la Corrosion et du Comportement des Matériaux dans leur Environnement, Université Paris-Saclay, CEA, Gif-sur-Yvette, France

**4:30 p.m.**
**Determination of the Mechanical Properties of NiTi + Ni4Ti3 and Ni3Ti in Hardened 60NiTi Using Nanoindentation:** Mr. Charles Richey Miller¹, Dr. Christopher Dellacorte² and Dr. Min Zou¹, ¹University of Arkansas, Fayetteville, AR, ²NASA Glenn Research Center, Cleveland, OH

**4:45 p.m.**
**An Overview of ASTM Standard Test Methods for Shape Memory Alloy Actuation Materials:** Dr. Douglas E Nicholson², Mr. James H. Mabe¹, Dr. Othmane Benafane², Mr. Glen S Bigelow³, Mr. Frank Sczerzenie³, Mr. Drew J Forbes⁴, Mr. Brian Van Doren⁵, Mr. Alexander Demblon⁶ and Dr. Ibrahim Karaman³, ¹The Boeing Company, Berkeley, MO, ²Materials and Structures Division, NASA Glenn Research Center, Cleveland, OH, ³SAES Smart Materials, New Hartford, NY, ⁴Fort Wayne Metals, Fort Wayne, IN, ⁵ATI Specialty Alloys and Components, Albany, OR, ⁶Materials Science and Engineering, Texas A&M University, College Station, TX

**5:00 p.m.**
**Effects of texture and grain size on fatigue crack growth in NiTi:** Prof. William LePage¹,², Prof. John A. Shaw³ and Prof. Samantha Daly⁴, ¹Mechanical Engineering, University of Tulsa, Tulsa, OK, ²Mechanical Engineering, University of Michigan, Ann Arbor, MI, ³Aerospace Engineering, University of Michigan, Ann Arbor, MI, ⁴Department of Mechanical Engineering, UCSB, Santa Barbara, CA

**CASMART Student Design Competition**

**5:30 p.m.–7:00 p.m.**

**Meeting Room: Grand Pacific Ballroom**
Plenary Session: Koichi Tsuchiya  
8:10 a.m.–9:00 a.m.  
Meeting Room: Sunset Ballroom

(V) Research and Activities on Shape Memory Alloys in Japan: Dr. Koichi Tsuchiya, National Institute for Materials Science, Tsukuba, Japan

Actuation and Novel Applications I  
9:00 a.m.–9:45 a.m.  
Meeting Room: Sunset Ballroom

Co-Chairs:  
Mr. Andreas Keck  
G.RAU GmbH & Co. KG  
Pforzheim, Germany

Mr. Jeff Brown  
DYNALLOY, Inc.  
Irvine, CA USA

9:00 a.m.  
Production of NiTiHf High Temperature Shape Memory Alloy actuator components via hot-rolling and additive manufacturing: Dr. Burkhard Maass1, Mrs. Emel Choroomi1, Mr. Leo Ornot2, Dr. Philipp krooss3, Mr. Felix Ewald3, Dr. André Kortmann3, Dr. Rainer Kaulbarsch3 and Prof. Thomas Niendorf3, 1Ingpuls GmbH, Bochum, Germany, 2Engineering and Innovations, Nuclear Power Plant Goesgen-Daeniken, Däniken, Switzerland, 3Institute of Materials Engineering, Universität Kassel, Kassel, Germany

9:15 a.m.  
Bistable Actuators Based on Shape Memory Alloy/Polymer Composites: Ms. Sabrina M. Curtis1,2, Mr. Marian Sielenkämper3, Mr. Gowment Arivanandhan4, Ms. Duygu Dengiz5, Mr. Lars Bumke5, Mr. Zixiong Li5, Mr. Prasanth Velvaluri5, Prof. Eckhard Quandt5, Prof. Stephan Wulfinghoff6 and Prof. Manfred Kohl6, 1Chair for Inorganic Functional Materials, Institute for Materials Science, Kiel University, Kiel, Germany, 2Dept. of Materials Science and Engineering, University of Maryland, College Park, MD, 3Chair for Computational Materials Science, Institute for Materials Science, Kiel University, Kiel, Germany, 4Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen, Germany

9:30 a.m.  
Next steps for an insight on the link between geometrical inclusion characteristics and damage in a shape memory alloy during fatigue loading: Mr. Kevin Koschella and Dr. Philipp Hempel, Admedes GmbH, Pforzheim, Germany

Modeling of Shape Memory Alloys I  
9:00 a.m.–9:45 a.m.  
Meeting Room: Carlsbad A&B

Co-Chairs:  
Dr. Petr Sittner  
Institute of Physics of the Czech Academy of Sciences  
Prague, Czech Republic

Dr. Kenneth I Aycock  
U.S. Food and Drug Administration  
Silver Spring, MD USA

9:00 a.m.  
Real Fatigue Stains for Nitinol specimens Under cyclic loading: Dr. Sakya Tripathy, Dr. Koray Senol, Mr. Douglas Dominick, Dr. Hengchu Cao and Dr. Ming H. Wu, Edwards Lifesciences, Irvine, CA

9:15 a.m.  
A Probabilistic Approach with Built-in Uncertainty Quantification for the Calibration of a Superelastic Constitutive Model from Full-field Strain Data: Dr. Harshad M. Paranjape1, Dr. Kenneth I Aycock2, Mr. Craig Bonsignore1, Dr. Jason D Weaver2, Dr. Brent A Craven1 and Dr. Tom Duerig4, 1Confluent Medical Technologies, Inc., Fremont, CA, 2Center for Devices and Radiological Health, Office of Science and Engineering Laboratories, U.S. Food and Drug Administration, Silver Spring, MD, 3Center for Devices and Radiological Health, Office of Science and Engineering Laboratories, Division of Applied Mechanics, U.S. Food and Drug Administration, Silver Spring, MD, 4Confluent Medical Technologies, Fremont, CA

9:30 a.m.  
A Probabilistic Approach with Built-in Uncertainty Quantification for the Calibration of a Superelastic Constitutive Model from Full-field Strain Data: Dr. Harshad M. Paranjape1, Dr. Kenneth I Aycock2, Mr. Craig Bonsignore1, Dr. Jason D Weaver2, Dr. Brent A Craven1 and Dr. Tom Duerig4, 1Confluent Medical Technologies, Inc., Fremont, CA, 2Center for Devices and Radiological Health, Office of Science and Engineering Laboratories, U.S. Food and Drug Administration, Silver Spring, MD, 3Center for Devices and Radiological Health, Office of Science and Engineering Laboratories, Division of Applied Mechanics, U.S. Food and Drug Administration, Silver Spring, MD, 4Confluent Medical Technologies, Fremont, CA

Next steps for an insight on the link between geometrical inclusion characteristics and damage in a shape memory alloy during fatigue loading: Mr. Kevin Koschella and Dr. Philipp Hempel, Admedes GmbH, Pforzheim, Germany

Morning Refreshment Break  
10:00 a.m.–10:30 a.m.  
Meeting Room: Sunset Foyer

Actuation and Novel Applications II  
10:30 a.m.–1:15 p.m.  
Meeting Room: Sunset Foyer

Co-Chairs:  
Mr. Jeff Brown  
DYNALLOY, Inc.  
Irvine, CA USA

Mr. Andreas Keck  
G.RAU GmbH & Co. KG  
Pforzheim, Germany
10:30 a.m.
Shape Memory Alloy Actuated Vortex Generators: Alloy Design: Dr. Othmane Benafan1, Mr. Darrell J Gaydosh1, Mr. Glen S Bigelow1, Dr. Ronald D Noebe1, Dr. Frederick Calkins1 and Dr. Douglas E Nicholson4, 1Materials and Structures Division, NASA Glenn Research Center, Cleveland, OH, 1Center for Mechatronics and Automation Technologies (ZeMA) gGmbH, Saarland University, Saarbrücken, Germany, 2Institute of Physics of the Czech Academy of Sciences, Prague, Czech Republic, 3Materials and Structures Division, NASA Glenn Research Center, Cleveland, OH, 4Bay Area Research Center, Cleveland, OH, 2Dept. of Materials Science and Engineering, Institute for Materials Science, Kiel University, Kiel, Germany, 3Boeing Research and Technology, The Boeing Company, Seattle, WA, 4Boeing Research and Technology, The Boeing Company, Berkeley, MO

10:45 a.m.
Shape Memory Alloy Actuated Vortex Generators: Development and Flight Test: Dr. Frederick Calkins1, Dr. Douglas E Nicholson2, Andrew Fassmann3, Paul Vijgen3, Christopher Yeel2, Dr. Othmane Benafan4, Mr. Glen S Bigelow2 and Mr. Darrell J Gaydosh2, 1Boeing Research and Technology, The Boeing Company, Seattle, WA, 2Boeing Research and Technology, The Boeing Company, Berkeley, MO, 3Boeing Commercial Airplanes, Everett, WA, 4Materials and Structures Division, NASA Glenn Research Center, Cleveland, OH, 3Ohio Aerospace Institute, Cleveland, OH

11:00 a.m.
Thermomechanical hysteresis and cyclic testing of resistance controlled heated NiTi SMA wires for low force and high cycle actuator applications: Dr. Christian Grossmann1, Dr. Burkhard Maass1, Dr. André Kortmann1, Mr. Sebastian Wehrenfennig2, Mr. Christoph Kellner3, Dr. Alexander Paulsen3, Prof. Stefan Seelecke1, Dr. Paul Motzki1, Mr. Dominik Scholtes2 and Mr. Yannik Goergen1, 1Ingpuls GmbH, Bochum, Germany, 2Center for Mechatronics and Automation Technologies (ZeMA) gGmbH, Saarland University, Saarbrücken, Germany, 3Center of Mechatronics and Production Engineering, RWTH Aachen University, Aachen, Germany

11:15 a.m.
Design and fabrication of an innovative active bending articulation based on shape memory alloy wires: Mr. Michele Arcangelo Mandolino1, Mr. Yannik Goergen1, Mr. Sören Wedow1, Mr. Tarek Mostafa1, Prof. Stefan Seelecke2, Dr. Paul Motzki1, Mr. Dominik Scholtes2 and Mr. Yannik Goergen1, 1FGW Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V., Remscheid, Germany, 2Material Science, Kiel University, Kiel, Germany, 3IT Concepts, Lahnau, Germany

11:30 a.m.
Method for characterization work output of NiTi accounting for application based transient thermo-mechanical behaviour.: Dr. Vickram Lakhian, PhD, Dr. Saber Mohamed, PhD and Dr. Mohammad Ibraheem Khan, Smarter Alloys, Waterloo, ON, Canada

11:45 a.m.
SMA-Based Multi-Ring Self-Centering Damping Devices for Seismic Retrofit of Structures: Dr. Mohammad Salehi, Ph.D.1, Dr. Darel E. Hodgson, Ph.D.2, Prof. Reginald DesRoches, Ph.D.1 and Dr. T. Kim Parnell, Ph.D., P.E.3, 1Department of Civil and Environmental Engineering, Rice University, Houston, TX, 2Nitinol Technology, Palo Alto, CA, 3Parnell Engineering & Consulting, Sunnyvale, CA

12:00 p.m.
Auxetic Superelastic TiNiCuCo Sputtered Thin-Films For Stretchable Electronics: Ms. Sabrina M. Curtis1,2, Ms. Duygu Dengiz1, Mr. Lars Burnke3 and Prof. Eckhard Quandt1, 1Chair for Inorganic Functional Materials, Institute for Materials Science, Kiel University, Kiel, Germany, 2Dep. of Materials Science and Engineering, University of Maryland, College Park, MD

Modeling of Shape Memory Alloys II
10:30 a.m.–12:30 p.m.
Meeting Room: Carlsbad A&B

Co-Chairs:
Dr. Kenneth I Aycock
U.S. Food and Drug Administration
Silver Spring, MD USA

Dr. Petr Sittner
Institute of Physics of Czech Academy of Science
Prague, Czech Republic

10:30 a.m.
Simulation Of Pseudoelastic NITI Shape Memory Alloys Under Compressive Loading To Assess The Potential Use In Vibration Damping In The Tool Interface: Mr. Yannic Zwinscher1, Mr. Fabian Hoffmann1, Mr. Simon Horn1, Dr. Romina Krieg2, Dr. Ralf Theiß2, Dr. Peter Dültgen3, Mr. Christian Brecher3, Mr. Stephan Neus3 and Mr. Niclas Klumpen4, 1FGW Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V., Remscheid, Germany, 2Laboratory for Machine Tools and Production Engineering, RWTH Aachen University, Aachen, Germany

10:45 a.m.
Thermodynamical model of NiTi SMA including plastic deformation mechanisms: Dr. Petr Sedał1, Dr. Miroslav Frost1, Prof. Hansu Seiner1, Dr. Ludek Heller2 and Dr. Petr Sittner1, 1Institute of Thermomechanics of the Czech Academy of Sciences, Prague, Czech Republic, 2Institute of Physics of the Czech Academy of Sciences, Prague, Czech Republic

11:00 a.m.
Constitutive model for Ni-Ti-Fe shape memory alloys exhibiting pronounced R-phase transformation: Dr. Miroslav Frost1, Mr. Antoine Jury2, Dr. Ludek Heller2 and Dr. Petr Sedał1, 1Institute of Thermomechanics of the Czech Academy of Sciences, Prague, Czech Republic, 2Institute of Physics of the CAS, Prague, Czech Republic

11:15 a.m.
A New Constitutive Modeling Approach For Shape Memory Alloys: Prof. Chad M. Landis1, Prof. Stelios Kyriakides1 and Dr. Dongjie Jiang2, 1ASE&EM, University of Texas at Austin, Austin, TX, 2School of Aeronautics and Astronautics, Shanghai Jiao Tong University, Shanghai, China
11:30 a.m.
A Constitutive Model of the Zero/Negative Thermal Expansion Response during Phase Transformation and Martensite (Re)Orientation in Shape Memory Alloys: Ms. Mengqian Zhang and Prof. Theocharis Baxevanis, Mechanical Engineering, University of Houston, Houston, TX

11:45 a.m.
Meso-scale interface propagation in NiTi shape memory alloys – understanding experimental results from a thermo-mechanical perspective: Prof. Martin F.-X. Wagner, Technische Universitaet Chemnitz, Institute of Materials Science and Engineering, Chair of Materials Science, Chemnitz, Germany

12:00 p.m.
Crystal-plasticity modeling of the coupling between phase transformation and viscoplasticity in high-temperature shape memory alloys: Mr. Pawan S Chaugule, Graduate Student and Dr. Jean-Briac le Graverend, Aerospace Engineering, Texas A&M University, College Station, TX

12:15 p.m.
Ab Initio Simulations of Martensitic Phase Transformations in NiTi-based High Temperature Ternary Shape Memory Alloys: NiTiHf and NiTiZr: Dr. Hessam Malmir1, Dr. Zhigang Wu1, Dr. Justin Haskins2, Dr. Santosh KC3, Dr. Othmane Benafan4 and Dr. John Lawson5, 1KBR Inc., Intelligent Systems Division, NASA Ames Research Center, Moffett Field, CA, 2Thermal Protection Materials Branch, NASA Ames Research Center, Moffett Field, CA, 3Chemical and Materials Engineering, San Jose State University, San Jose, CA, 4Materials and Structures Division, NASA Glenn Research Center, Cleveland, OH, 5Intelligent Systems Division, NASA Ames Research Center, Moffett Field, CA
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**EXHIBIT HOURS**
Tuesday, September 13............................ 9:00 a.m. – 5:30 p.m.
Wednesday, September 14....................... 9:00 a.m. – 5:00 p.m.

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EXHIBIT DATES & TIMES
The Westin Carlsbad Resort | Grand Pacific Ballroom

Monday, May 16
Welcome Reception..................................................................................................................................................5:30 p.m. – 7:00 p.m.

Tuesday, May 17
Exhibits Open..................................................................................................................................................9:30 a.m. – 7:00 p.m.
Morning Refreshment Break .........................................................................................................................10:00 a.m. – 10:30 a.m.
Lunch...............................................................................................................................................................12:15 p.m. – 1:15 p.m.
Afternoon Refreshment Break .........................................................................................................................3:15 p.m. – 3:45 p.m.
Expo/Poster Reception ..................................................................................................................................5:30 p.m. – 7:00 p.m.

Wednesday, May 18
Exhibits Open..................................................................................................................................................9:30 a.m. – 1:00 p.m.
Morning Refreshment Break .........................................................................................................................10:00 a.m. – 10:30 a.m.
Lunch...............................................................................................................................................................12:15 p.m. – 1:15 p.m.

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*Exhibitor List as of 4.25.22
**Bold indicates sponsor or supporter
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confluentmedical.com – Booth 105

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Established over 75 years ago, Norman Noble remains committed to leading the development of advanced manufacturing processes required for our medical OEM customers. Norman Noble’s exclusive STEALTH athermal laser technology enables the manufacturing of next-gen medical implants made from thin and thick wall Nitinol without producing any heat affected zone (HAZ). Please contact us to learn more about our new Rapid Prototyping services.

nnoble.com – Booth 204

Vascotube, a Cirtec Company, focuses on custom manufacturing tubing exclusively for medical devices. Simply: we do not do anything else. We are dedicated to quality medical implantable tubing and the specific requirements of working and forming Nitinol and other demanding materials. Our tubing is used in medical devices including replacement heart valves and stents. We specialize in large outer diameters, high surface smoothness, tight wall tolerances, and tight concentricity.

vascotube.com – Booth 106

Nitinol for Medical Devices
October 24-26, 2022 | 2.0 CEUs | ASM Headquarters & Virtual Classroom

The unique properties of the shape memory alloy Nitinol have led to many transformational medical device innovations including self-expanding stents, percutaneously delivered heart valves, kink-resistant guidewires, and self-locking orthopedic devices. Its superelastic qualities allow the alloy to withstand large amounts of recoverable strain, and its potential for excellent biocompatibility and fatigue resistance make it the material of choice for some of the most demanding medical device applications.

Upon completion of this course, students can successfully:
- Identify the reasons for Nitinol’s unique properties
- Describe how Nitinol performs in a variety of conditions
- Understand basic Nitinol device manufacturing principles
- Recognize how to apply the benefits of Nitinol’s properties to real-world applications

Register for this course by visiting bit.ly/EDUNitinol

asminternational.org/exploreeducation
ACQUANDAS GmbH

ACQUANDAS GmbH (Kiel, Germany) is a medical supplier/OEM/technology company that develops, engineers and supplies precision micro components for medtech industry. Based on state-of-the-art additive micro system technology (MST) and precision processes, we fabricate the next generation of metallic or hybrid components (e.g. from ASTM Nitinol, Titanium in pure or in combinations with oxides and polymers) in single or multiple layers for applications in short and long-term medical devices.

www.acquandas.com

ADMEDES GmbH

SPONSOR

As the leading global provider of nitinol and other metallic components to the medical device industry for 25+ years, our diverse product applications include heart valve frames, vascular and gastroenterology stents, orthopedic and ophthalmologic devices, and more. From rapid response prototyping to laser technology, micromachining, wire technology, microassembly, and test lab services, we are dedicated to the highest quality standards. In Germany, California and Costa Rica—we’re here to help you.

ATI Specialty Alloys & Components

ATI is one of the largest and most diversified specialty materials and components producers in the world and uses innovative technologies to offer global markets a wide range of specialty materials solutions. We serve multiple markets with a range of low-carbon, shape memory and super-elastic, nickel-titanium alloys.

Coherent Inc.

www.coherent.com

Comco Inc.

Comco manufactures micro-abrasive blasting equipment commonly used in the manufacture of nitinol stents. MicroBlasting is an effective method for removing slag, remelt and other imperfections on laser cut stents. It can also be used for edge rounding on stents.

www.comcoinc.com

Confluent Medical Technologies

SPONSOR

Confluent engineers solutions to the most challenging design problems enabling our OEM medical device customers to offer life-saving products.

Element Materials Technology

www.element.com

EUROFLEX GmbH

SPONSOR

EUROFLEX offers high-grade semi-finished products and components from a variety of materials for medical applications. Many years of experience in the metallurgy, the special features of the materials as well as the requirements of medical technology are the basis for continuous expansion of the EUROFLEX product range. Fast sample production, customer support from the sample to serial production as well as extensive analysis and investigation methods are part of the services of the company.

www.euroflex.de

Fort Wayne Metals

CORPORATE SUPPORTER

A melt-to-finish supplier of Nitinol, we create customized material solutions that are helping to advance the performance of the world’s most demanding applications. We accomplish this by building upon our technical expertise and continuously enhancing our Nitinol capabilities, including melting, advanced processing, research and development, and rapid prototyping. It’s led us to manufacture Nitinol in multiple forms, including round wire, flat wire, shaped wire, DFT® composite wire, actuator wire, HHS® tube, bar, and shape-set parts, to support the world’s leading technologies. We will continue to strengthen our knowledge, capabilities, and quality surrounding Nitinol – because our customers are the focus of everything we do.

www.fwmetals.com
Furukawa Techno Material Co., Ltd.  
**CORPORATE SUPPORTER**  
Furukawa Techno Material Co. offers a full range of NiTi(Nitinol) tubes and wires made from its in-house melting furnace and integrated production line. Homogeneous alloy and traceability are guaranteed. The company’s unique techniques and rich experience deliver wires and tubes with superior performance and durability. Its new F-ELI wire offers inclusion less than half of the ASTM F2063-18 requirement for extreme fatigue endurance.

LaserLinc, Inc.  
**CORPORATE SUPPORTER**  
LaserLinc manufactures in-process and off-line non-contact measurement and visualization systems for a multitude of high-value industries. Our products enable accurate and reliable measurement of many dimensions including: inside, outside diameter, ovality, wall thickness, surface flaws & profile. The updated BenchLinc UT is a unique system for wall and diameter measurement from 0.003” [75 μm] wall thickness of metals, such as nitinol stainless steel, cobalt chromium, and other specialty alloys.

Lumenous Device Technologies  
**SPONSOR**  

MeKo MedTech  
**CORPORATE SUPPORTER**  
MeKo is a global ISO-certified contract manufacturer specialized in laser material processing for the medical industry. The company has more than 30 years of experience, particularly in the field of laser cutting of stents, heart valve frames and other medical products made of metal (NiTi, 316L/316LVM, L605) or bioresorbable materials (Mg, polymers). MeKo offers a variety of finishing processes such as electropolishing processes, annealing and mechanic processing.

Memry Corporation  
**CORPORATE SUPPORTER**  
Memry Corporation is a global market and technology leader in Nitinol components. We provide Nitinol melting and materials, a complete range of Nitinol fabrication and finishing, and engineer-to-engineer support in both prototyping and production phases. With melt to market® capabilities under one company roof, medical device customers benefit from precise control, predictability, transparency, a streamlined production process and a platform for collaborative innovation.

Norman Noble, Inc.  
**INDUSTRY PARTNER**  
Norman Noble, Inc. is the largest laser contract manufacturer of Nitinol based implants and devices. We provide fully validated manufacturing, electropolishing, and welding processes in accordance to ISO13485:2016. Our STEALTH laser technology is a HAZ-Free process that enables manufacturing of next-gen implants, including Stents, Heart Valve Frames, and Neurovascular Devices.

Resonetics  
**SPONSOR**  
Founded in 1987, Resonetics is a pioneer in advanced engineering and micro-manufacturing solutions for the life sciences industry. Resonetics is a leader in laser processing, centerless grinding, nitinol processing, thin-wall stainless steel and precious metal tubing, photochemical machining, metal fabrication, and fiber optic sensors. With nine Lightspeed Application Development Labs located strategically to serve medical device companies around the world, Resonetics is built on a foundation of quality, speed, and innovation to deliver best-in-class value with a customer-centric approach. The company is ISO 13485:2016 certified with facilities in the United States, Canada, Costa Rica, Israel, and Switzerland.
Smarter Alloys

Smarter Alloys is the leader in functionally graded shape memory alloys. Our unique ability to program shape memory behavior enables complex machine-like function in simple devices. With Multiple Memory Material technology, we are transforming the design and utility of SMAs in the medical, energy, automotive, aerospace and consumer industries. Founded in 2010 and based in Cambridge, Ontario, Smarter Alloys is a world class facility for design, fabrication, and characterization of SMA devices.

www.smarteralloys.com

Ulbrich Specialty Wire Products

Ulbrich Specialty Wire Products provides the precision you need for any product application. Our proprietary manufacturing process can reach unparalleled precision down to .0003" in a variety of customizable alloys. We custom engineer precision wire products for use in medical, microwave and RF cables, batteries, capacitors, and more. We’re equipped for rolling, drawing, annealing, straightening and precision winding of a variety of round, flat and square wire products.

Vascotube GmbH / Cirtec Medical

Vascotube manufactures implantable, high-quality tubing for the medical device industry. We are dedicated to implantable quality tubing and the specific requirements of working and forming Nitinol and other demanding materials. In addition to our wide range of Nitinol tubing, we also provide customer-specific Nitinol processing. Cirtec Medical Services combines our Nitinol know-how with significant metalworking expertise. Our Capabilities include laser cutting, heat setting and electropolishing.

www.vascotube.com

West-Tech Materials

www.westechmat.com
Advanced Nitinol Processing
Pushing the envelope of medtech and life sciences devices and implants.

Automated Electropolishing
Shape Setting
High Speed Laser Cutting

Learn More at Resonetics.com

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New Laser Technology

Noble Stealth™
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The HAZ-free laser solution for

THIN and THICK wall nitinol!