



2019  
RAMACO RESEARCH  
RODEO v2.0

**JULY 9-11**  
SHERIDAN, WY



## WELCOME TO R3 v2.0



They're starting to pay some attention.

Roughly 45 days ago, many in this room helped deliver a report that I chaired from the National Coal Council to U.S. Secretary of Energy Rick Perry, on alternative new uses for coal. It was the result of a lot of thought and effort, and a cause for reflection. This unique area of opportunity, once overlooked, is now a focus at both the highest levels of government and the coal industry. There is a realization of how far research in this area has come, and that an abundant natural resource could be used for higher-value, more environmental purposes with widespread socio-economic advantages.

We are proud to welcome you to the second year of our own Rodeo — R3 v2.0 — a forum dedicated to expanding the uses of coal's carbon material and manufacturing possibilities. Those at this conference are leaders in an extremely important intersection of commercial and constructive innovation, and we thank you for joining us.

We look forward to learning more about all these opportunities with you over the next few days, networking, having some fun, and working together to transform how advanced products of the future are made.

RANDALL ATKINS  
CEO, RAMACO CARBON

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MANUFACTURING PROCESSES  
Novel Processes and scalable, distributed modular facilities for specialty carbons

CARS, CARBON FIBER & 12-13  
COMPOSITES  
Lightweighting through carbon fiber, moldable composites, and more

ENERGY STORAGE & 14-15  
POWERING  
Utility-scale storage, lithium ion battery materials and REEs

PANEL: CHALLENGES & 16-17  
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## DAY 02

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Products, purity, and processing

ADVANCED 24-25  
MANUFACTURING PRODUCTS  
3D printing, foams, composites, and more

CARBON HOUSE 08-11  
& BUILDING PRODUCTS  
New approaches to how we design and build structures with carbon

## CLOSING

ABOUT RAMACO CARBON 26-27  
Learn more about our efforts in Wyoming to create an ecosystem of innovation

## OPENING RECEPTION

BRINTON MUSEUM - JULY 9, 2019



### Featured Speaker: Joseph Giove

Joe Giove is the Director of Coal Business Operations for the U.S. Department of Energy's Office of Fossil Energy. He was previously the Director of the Division of CCS Demonstrations, responsible for the management of the \$3.4 billion dollar program to build carbon capture and storage (CCS) power and industrial facilities.

# SCHEDULE: DAY 01

## BREAKFAST

7:15 - 8:00AM

## OPENING

8:15 - 8:45AM

RANDALL ATKINS — RAMACO CARBON  
Coal in a New Carbon Age

CHARLIE ATKINS — RAMACO CARBON  
The Coal to Carbon Products Continuum

## SESSION ONE: ADVANCED MANUFACTURING - NEW PROCESSES

9:00- 10:40AM

PAUL YELVINGTON — RAPID MANUFACTURING INSTITUTE  
The Importance of Scalable, Distributed Facilities

JIM DIETZ — TWO POINT SOLUTIONS  
Role of Needle Coke, Mesophase Microspheres, Pitch and Availability

VIJAY SETHI — THERMOSOLV  
Thief Carbon & Other Novel Processes

GEORGE SKOPTSOV — H QUEST  
Microwave Systems in Coal & Natural Gas Processing

## SESSION TWO: CARS - LIGHTWEIGHTING - CARBON FIBER, COMPOSITES

11:00 - 12:10PM

JERAMIE ADAMS — WESTERN RESEARCH INSTITUTE  
Consortium for the Production of Affordable Carbon Fibers

CLIFF EBERLE — INSTITUTE FOR ADVANCED COMPOSITES MANUFACTURING  
The Market Mandate: Large-Scale Molding of Carbon Composite Parts

SUJIT DAS — OAK RIDGE NATIONAL LABORATORY  
Cost Disruptors, Embodied Energy Opportunities

## LUNCH

12:10- 1:15PM

CHRISTOPHER MATRANGA — NATIONAL ENERGY TECHNOLOGY LABORATORY  
News on the NETL Program and Partnering

## SESSION THREE: ENERGY STORAGE — POWERING

1:15- 2:55PM

ANDREW PONEC — ANTORA ENERGY  
Role of Carbon-based Products in High Temp Thermal Energy Storage

EDGAR LARA-CURZIO — OAK RIDGE NATIONAL LABORATORY  
Low-cost Battery Graphite from Coal

RICHARD WOLFE — CARBON TECHNOLOGY COMPANY  
Carbonite Char Processing

EVAN GRANITE — NATIONAL ENERGY TECHNOLOGY LABORATORY  
Rare Earth Elements from Coal-Derived Sources

## NATIONAL COAL TO PRODUCTS RESEARCH & COMMERCIALIZATION

3:15- 3:45PM

EDGAR LARA-CURZIO — OAK RIDGE NATIONAL LABORATORY

## SESSION FOUR: PANEL — CHALLENGES & OPPORTUNITIES OF "TOUGH TECH"

4:00- 5:00PM

BEN BRYAN — WEATHERBY

DAVID DENTON — DENTON CONSULTING

CARL FRICK — UNIVERSITY OF WYOMING

JOHN VAN LEEUWEN — UNIVERSAL MATTER

## HORS D'OEUVRES & DEPARTURE TO SHERIDAN COUNTY FAIRGROUNDS

5:00- 6:00PM

# SCHEDULE: DAY 02

## BREAKFAST

7:15 - 8:00AM

## SESSION FIVE & SIX: LIFE SCIENCES PT.1-2

8:00- 10:10AM

VIKAS BERRY — UNIVERSITY OF ILLINOIS AT CHICAGO  
Applications of Graphene: An Overview

SANJAY BEHURA — UNIVERSITY OF ILLINOIS AT CHICAGO  
Graphene's Life Sciences Applications

MICHAEL KAVANAUGH — MCLAUGHLIN RESEARCH INSTITUTE FOR BIOMEDICAL SCIENCES  
Graphene as a Tool in Studying Neurological Disease

STEPHEN PARNELL — KANSAS UNIVERSITY MEDICAL CENTER  
Kidney Disease Biomarkers: In Search of a Diagnostic Platform

TYLER FRANK — IMMUTRIX  
Coal-Derived Liquids in Life Sciences

CHRIS BROWN — IMMUTRIX  
A Real World Example of the Life Science Device Development Process

## SESSION SEVEN: GRAPHENE - PRODUCTS, PURITY, AND PROCESSING

10:25 - 12:00PM

JOHN VAN LEEUWEN — UNIVERSAL MATTER  
Are All Graphenes Created Equal?

GEORGE SKOPSTOV — H QUEST  
Graphene Purity & Trends

CONGJUN WANG — NATIONAL ENERGY TECHNOLOGY LABORATORY  
Graphene Materials from Coal Feedstocks

YUAN GAO — NATIONAL ENERGY TECHNOLOGY LABORATORY  
Graphene in Concrete

## LUNCH

12:00 - 1:00PM

NICOLA FERRALIS — MIT  
Harnessing the Value of Carbon: Novel Applications of Coal to Carbon Products

## SESSION EIGHT: ADVANCED MANUFACTURING - NEW PRODUCTS

1:00- 2:5PM

EDGAR LARA-CURZIO — OAK RIDGE NATIONAL LABORATORY  
3D Printed Carbide Heat Exchangers + Manufacturing Demonstration Facility

CLIFF EBERLE — INSTITUTE FOR ADVANCED COMPOSITES MANUFACTURING INNOVATION  
Advances in Composite Manufacturing

BRIAN JOSEPH — TOUCHSTONE RESEARCH LABORATORY  
Creating Coal Foams

## SESSION EIGHT: CARBON BUILDING PRODUCTS

1:00- 2:5PM

MARK GOULTHORPE — MIT  
Designing & Building the Carbon House

JAMES KLETT — OAK RIDGE NATIONAL LABORATORY  
3D Printed Slurry Extruded Carbon Insulation

JASON TREMBLY — OHIO UNIVERSITY  
Advanced Composite Decking & GHG Accounting

BRIAN JOSEPH — TOUCHSTONE RESEARCH LABORATORY  
Rigid Carbon Foams in Structural, Flame Retardant Panels

## CLOSING REMARKS

4:40- 5:00PM

## HORS D'OEUVRES & DEPARTURE TO SHERIDAN COUNTY FAIRGROUNDS

5:00- 6:00PM

# SESSION 01: ADVANCED MANUFACTURING – NEW PROCESSES



**MODERATOR:**  
**TOM SARKUS** – NATIONAL ENERGY  
TECHNOLOGY LABORATORY

Tom Sarkus is the Division Director of the Major Projects Division at the U.S. Department of Energy's National Energy Technology Laboratory. He has worked on DOE's Clean Coal and Fossil Energy technology demonstration programs since their inception in the mid-1980s. He holds degrees in chemistry, geology, earth science, and law.



**Paul Yelvington**

RAPID MANUFACTURING  
INSTITUTE

## THE IMPORTANCE OF SCALABLE, DISTRIBUTED FACILITIES

Paul Yelvington is the Chief Technology Officer of the RAPID Manufacturing Institute, a public-private partnership between DOE and AIChE that promotes the transformation of the chemical process industry through the adoption of process intensification and modular manufacturing. He received his B.S. from North Carolina State in 1999 and his Ph.D. from MIT in 2004.



**Jim Dietz**

TWO POINT SOLUTIONS

## ROLE OF NEEDLE COKE, MESOPHASE MICRO- SPHERES, PITCH, & AVAILABILITY

Jim Dietz is an executive business leader with technical and operational expertise in the field of coal chemicals. Most recently, he was responsible for the R&D, engineering and purchasing activities of an international industrial chemical company. Dietz earned his bachelor's degree in chemical engineering at the University of Cincinnati, and Masters in Business Administration at University of Pittsburgh.



**Vijay Sethi**

THERMOSOLV

## THIEF CARBON & OTHER NOVEL PROCESSES

Vijay Sethi is the Senior Vice President for Energy Production and Generation business unit at Western Research Institute in Laramie, WY. He is also the Chief Executive Officer of Thermosolv LLC, a for profit spin-off from Western Research Institute. He has over 40 years of R&D experience in energy systems, received his Ph.D. and MS from Case Western Reserve University, and an MS in Physics from Indian Institute of Technology, Delhi.



**George Skoptsov**

H QUEST

## MICROWAVE SYSTEMS IN COAL & NATURAL GAS PROCESSING

George Skoptsov is the President and CEO of H Quest Vanguard, Inc., a hard tech start-up. H Quest is developing and commercializing technologies to cleanly and cost-effectively derive high-performance materials such as graphene, graphite, and carbon fiber from coal and natural gas resources. George has BS and MS degrees from Carnegie Mellon University and is an inventor on multiple granted patents and pending applications.



## SESSION 02: CARS, CARBON FIBER & COMPOSITES



**MODERATOR:**  
**DAVID DENTON** — DENTON CONSULTING

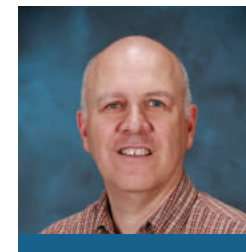
David Denton is the President of Denton Consulting, providing consultation and experience in the fields of chemical, coal, and energy technology. He previously served in senior roles in business development and R&D at RTI International and Eastman Chemical Company, including launching Eastman Gasification Services Company. He received a B.S. in Chemical Engineering from Virginia Tech, with graduate study at the University of Tennessee.



**Jeramie Adams**  
WESTERN RESEARCH  
INSTITUTE

### CONSORTIUM FOR THE PRODUCTION OF AFFORDABLE CARBON FIBERS

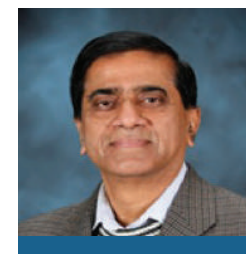
Jeramie Adams joined WRI in 2012 and had managed a variety of industry lead initiatives and projects including the Heavy Oil Research Consortium, Processing Improvement of Problematic Crudes Research Consortium, Asphalt Industry Research Consortium and most recently the Consortium for Affordable Carbon Fibers in the US. Adams obtained his PhD in Chemistry from the University of Wyoming (UW) in 2008 and continued there for four years as a postdoctoral researcher.



**Cliff Eberle**  
INSTITUTE FOR ADVANCED COM-  
POSITES MANUFACTURING

### THE MARKET MANDATE: LARGE-SCALE MOLDING OF CARBON COMPOSITE PARTS

Cliff Eberle is a composites manufacturing and business development consultant for IACMI – The Composites Institute. He was Chief Engineer for Oak Ridge National Laboratory's Carbon Fiber Technology Facility, leading research programs on carbon fiber, bio-derived materials and e-beam curing. He developed the business case for ORNL's pitch carbon fiber program and held leadership roles on program development teams winning \$300M+ in R&D funding.



**Sujit Das**  
OAK RIDGE NATIONAL  
LABORATORY

### COAL DISRUPTORS, EMBODIED ENERGY OPPORTUNITIES

Sujit Das is part of the Senior Research & Development Staff at Oak Ridge National Laboratory, where he's worked for more than 30 years, and led several projects in the areas of resource modeling, energy/economic and policy analysis of numerous resource markets including petroleum, coal, and alternative fuels. He earned a MS and MBA from the University of Tennessee, and a Bachelor of Technology from the Indian Institute of Technology in Kharagpur.

# SESSION 03: ENERGY STORAGE & POWERING



**MODERATOR:**  
**MORGAN SUMMERS** – NATIONAL ENERGY  
TECHNOLOGY LABORATORY

Morgan Summers has been a part of the Department of Energy's (DOE) National Energy Technology Laboratory's (NETL) systems analysis team for the last 10 years. During this time Morgan has led the development of systems studies related to power production, CO<sub>2</sub> capture and storage, gasification, coal-to-liquids, and life cycle analysis (LCA). Morgan has a bachelor's degree in chemical engineering and an MBA both from West Virginia University.



**Andrew Ponec**  
ANTORA ENERGY

## ROLE OF CARBON PRODUCTS IN HIGH TEMP THERMAL ENERGY STORAGE

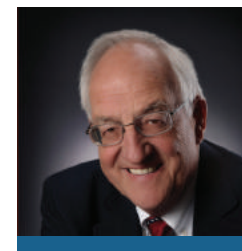
Andrew Ponec is a cofounder and CEO of Antora Energy, which is developing inexpensive electricity storage (based on carbon materials) to improve grid resiliency and support the deployment of low-cost renewables. The company is supported by ARPA-E, Shell, Cyclotron Road, and private investors. Andrew is a graduate of Stanford University, and previously founded Dragonfly Systems, which developed power electronics products for the solar industry and was acquired by SunPower in 2014.



**Edgar Lara-Curzio**  
OAK RIDGE NATIONAL  
LABORATORY

## LOW-COST BATTERY GRAPHITE FROM COAL

Edgar Lara Curzio leads the Mechanical Properties & Mechanics Group in the Materials Science & Technology Division at the Oak Ridge National Laboratory, focused on the development and characterization of functional and structural materials. Lara-Curzio received a degree in Engineering Physics from the Metropolitan University in Mexico City, and a Ph.D. in Materials Engineering from Rensselaer Polytechnic Institute in Troy, NY.



**Richard Wolfe**  
CARBON TECHNOLOGY  
COMPANY

## CARBONITE CHAR PROCESSING

Richard Wolfe has directed clean coal projects for 30 years, including for the U.S. Department of Energy and United Coal Company. He built and operated the first commercial demonstration plant in Virginia to produce carbon char and coke for successful testing in electric arc furnaces and cupola furnaces. He holds a BS in Chemical Engineering from Virginia Tech, an MS and PhD in Nuclear Engineering from University of Cincinnati and an Honorary Doctor of Science from Emory and Henry College.

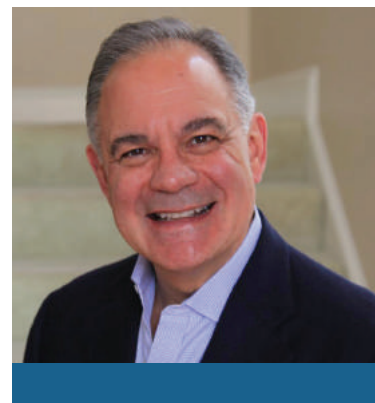


**Evan Granite**  
NATIONAL ENERGY  
TECHNOLOGY LABORATORY

## RARE EARTH ELEMENTS FROM COAL- DERIVED SOURCES

Evan J. Granite initiated, developed and led the Department of Energy's National Energy Technology Laboratory Research and Innovation Center research program on Rare Earth Detection and Recovery; is a Research Chemical Engineer and Task/Group Leader at NETL; and an Adjunct Professor of Chemical and Petroleum Engineering at the University of Pittsburgh.

# SESSION 04: PANEL ON CHALLENGES & OPPORTUNITIES



## MODERATOR:

**CHARLIE ATKINS — RAMACO CARBON**

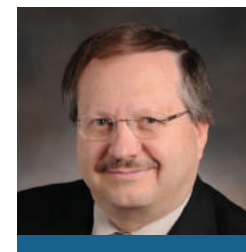
Charlie Atkins is the Director of Research & Development for Ramaco Carbon, and Director of Development for Wyoming iPark. He was formerly a senior partner of Eratosthenes, Talisman and Cherokee Investment Partners, which specialized in the quantification of environmental risks and liabilities and/or sustainable development. Charlie was a Morehead Scholar, Marshall Scholar and Visiting Fellow at the Brookings Institution.



**Ben Bryan**

WEATHERBY

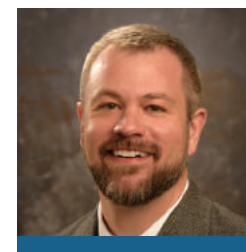
Ben Bryan is the Director of Engineering at Weatherby, one of the most respected names in outdoor sports and Sheridan's newest major corporate recruits. Prior to joining Weatherby, Ben was the Operation Lead on Lockheed Martin's Mars spacecraft where he had also served as a Systems Integration Engineer and lead for the OSIRIS-REx Assembly Test and Launch Operations and a Composite R&D engineer for spacecraft structures. Ben is a graduate of UW College of Engineering and Applied Science.



**David Denton**

DENTON CONSULTING

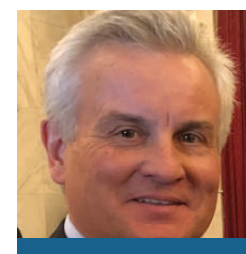
David Denton is the President of Denton Consulting, providing consultation and experience in the fields of chemical, coal, and energy technology. He previously served in senior roles in business development and R&D at RTI International and Eastman Chemical Company, including launching Eastman Gasification Services Company. He received a B.S. in Chemical Engineering from Virginia Tech, with graduate study at the University of Tennessee.



**Carl Frick**

UNIVERSITY OF WYOMING

Carl Frick is a faculty member at the University of Wyoming since 2008, with research focused on the development and characterization of novel materials. He received his B.S., M.S., and PhD in Mechanical Engineering from the University of Colorado Boulder, and then went on to a Visiting Scientist position at the Max Planck Institute for Metals Research in Stuttgart, Germany), investigating size dependent deformation behavior for multiple materials.



**John van Leeuwen**

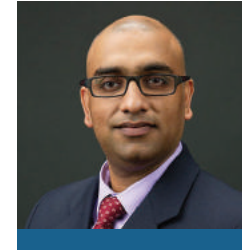
UNIVERSAL MATTER

John van Leeuwen is the CEO of Universal Matter Inc., a company that is commercializing a new method for making graphene. All companies producing graphene powder today use graphite as their starting raw material. Universal Matter uses other carbon sources, such as coal, and converts it into a very pure form of 1-4 layer graphene powder. He previously served as CEO of EcoSynthetix, a biobased polymers company, and earned a BS in Chemistry from the University of Waterloo.



# SESSION 05: LIFE SCIENCES, PT. 1

## APPLICATIONS OF GRAPHENE: AN OVERVIEW



**Vikas Berry**

UNIVERSITY OF ILLINOIS AT  
CHICAGO

Vikas Berry is the Department Head and Associate Professor of Chemical Engineering at University of Illinois at Chicago, and was previously a faculty member at the Kansas State University. He studies the electrical, structural, and chemical properties of innovative nano- and bio- materials. He received his BS from the Indian Institute of Technology-Delhi, and a PhD from Virginia Tech, following an MS from University of Kansas.

## GRAPHENE'S LIFE SCIENCES APPLICATIONS



**Sanjay Behura**

UNIVERSITY OF ILLINOIS AT  
CHICAGO

Sanjay Behura is a Research Assistant Professor and Graduate Faculty at University of Illinois-Chicago. His inter-disciplinary research program is focused on '2D Quantum Materials Science and Opto-Electronic Engineering'. Behura has published over 30 peer-reviewed articles, and he serves as an Editorial Board Member of Scientific Reports.

## GRAPHENE AS A TOOL IN STUDYING NEUROLOGICAL DISEASE



**Michael Kavanaugh**

MCLAUGHLIN RESEARCH  
INSTITUTE

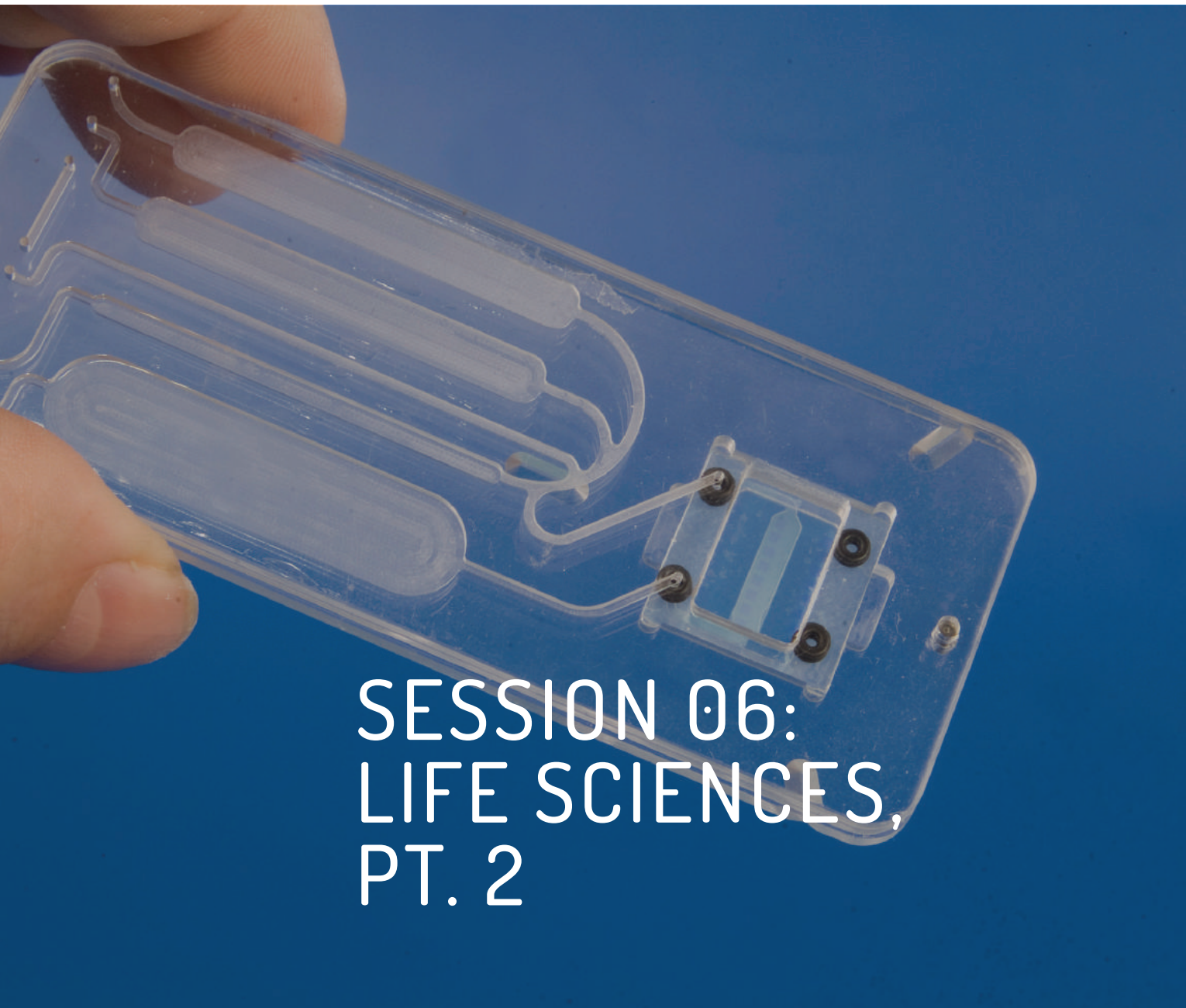
Michael Kavanaugh is a Professor at the University of Montana and Director of the McLaughlin Research Institute in Great Falls, Montana. He completed undergraduate studies in biology at Washington University and graduate and postdoctoral work in Biochemistry and Neuroscience at Oregon Health and Science University. His research is focused on the role of neurotransmitter receptors and transporters in brain health and disease.



**MODERATOR:**

**GARRETT LINDEMANN** — RAMACO CARBON

Garrett Lindemann is Assistant Director of Business Development and Life Science Specialist for Ramaco Carbon. He previously held positions with the Chief Technology Office of Roche Diagnostics, Industrial Farmaceutical Cantabria, and 3DHitech. He earned his undergraduate degrees in Chemistry & Biology from Saint John's University, and a Ph.D. in Molecular Genetics from the University of Kansas.



## SESSION 06: LIFE SCIENCES, PT. 2

### KIDNEY DISEASE BIOMARKERS: IN SEARCH OF A DIAGNOSTIC PLATFORM

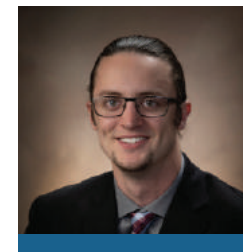


**Stephen Parnell**

KANSAS UNIVERSITY  
MEDICAL CENTER

Stephen Parnell is a research assistant professor at Kansas University Medical Center. His work focuses on autosomal dominant polycystic kidney disease (ADPKD), a common genetic disorder affecting as many as 1 in 400 individuals. He holds a BS in Biology from the University of Iowa, a Ph.D in Biochemistry and Molecular Biology from the University of Kansas Medical Center, and served as a post-doctoral fellow at University of North Carolina, Chapel Hill and KU Medical Center.

### COAL-DERIVED LIQUIDS IN LIFE SCIENCES



**Tyler Frank**

IMMUTRIX

Tyler Frank is the Business Development Manager for Intrinsic Materials and a Financial Analyst for ImmutriX Therapeutics. Intrinsic Materials' primary products are activated carbon beads specifically designed and manufactured for its parent company, ImmutriX Therapeutics, who uses the adsorbent in their blood purification technology. Tyler earned his Master of Professional Accountancy (MPA) from the University of South Dakota in 2018.

### AN EXAMPLE OF THE LIFE SCIENCE DEVICE DEVELOPMENT PROCESS



**Chris Brown**

IMMUTRIX

Christopher Brown works as a hospitalist and Infectious Disease specialist in the VA health care system. In addition, he is Chairman of the medical advisory board and Medical Director for Research and Development for a private post-startup biotechnology firm, ImmutriX, which develops synthetic carbon technologies for the medical and industrial sector. He graduated from Dartmouth College, attended Baylor College of Medicine and completed his Internal Medicine residency at the University of Utah.



**MODERATOR:**  
**GARRETT LINDEMANN** — RAMACO CARBON

Garrett Lindemann is Assistant Director of Business Development and Life Science Specialist for Ramaco Carbon. He previously held positions with the Chief Technology Office of Roche Diagnostics, Industrial Farmaceutical Cantabria, and 3DHitech. He earned his undergraduate degrees in Chemistry & Biology from Saint John's University, and a Ph.D. in Molecular Genetics from the University of Kansas.

# SESSION 07: GRAPHENE



**MODERATOR:**  
**NICOLA FERRALIS** — MASSACHUSETTS INSTITUTE  
OF TECHNOLOGY

Nicola Ferralis is a Research Scientist in the Department of Materials Science and Engineering at MIT. He leads several experimental research projects in the development of novel materials and technologies for energy/water systems. A native of Italy, he holds a Bachelor's and Master's degree in Physics from the University of Padua and a PhD in Experimental Condensed Matter Physics with distinction from Penn State University.



**John van Leeuwen**  
UNIVERSAL MATTER

## ARE ALL GRAPHENES CREATED EQUAL?

John van Leeuwen is the CEO of Universal Matter Inc., a company that is commercializing a new method for making graphene. All companies producing graphene powder today use graphite as their starting raw material. Universal Matter uses other carbon sources, such as coal, and converts it into a very pure form of 1-4 layer graphene powder. He previously served as CEO of EcoSynthetix, a biobased polymers company, and earned a BS in Chemistry from the University of Waterloo.



**George Skoptsov**  
H QUEST

## GRAPHENE PURITY & TRENDS

George Skoptsov is the President and CEO of H Quest Vanguard, Inc., a Pittsburgh-based hard tech start-up. H Quest is developing and commercializing technologies to cleanly and cost-effectively derive high-performance materials such as graphene, graphite, and carbon fiber from coal and natural gas resources. Currently serving as the Principal Investigator on several R&D projects, George has BS and MS degrees from Carnegie Mellon University and is an inventor on multiple granted patents and pending applications.



**Congjun Wang**  
NATIONAL ENERGY  
TECHNOLOGY LABORATORY

## GRAPHENE MATERIALS FROM COAL FEEDSTOCKS

Congjun Wang is a research team leader with Leidos working as an on-site contractor for the National Energy Technology Laboratory. His research interests focus on the synthesis of a wide variety of nanomaterials, such as carbon nanotubes, graphene quantum dots, semiconductor quantum dots, metal and metal oxide nanocrystals. Wang received his PhD in Chemistry from the University of Chicago, and BS from Nanjing University.

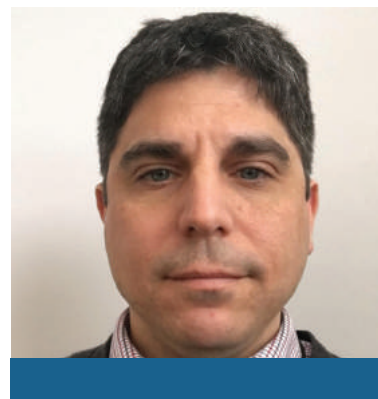


**Yuan Gao**  
NATIONAL ENERGY  
TECHNOLOGY LABORATORY

## GRAPHENE IN CONCRETE

Yuan Gao is a Research Scientist and a contractor at National Energy Technology Laboratory in Pittsburgh, focusing on advanced cement materials with nanomaterials and their characterizations. She received her PhD from Northwestern University in Civil Engineering, and her Bachelor's and Master degrees from Case Western Reserve University in Cleveland.

# SESSION 08: ADVANCED MANUFACTURING – NEW PRODUCTS



**MODERATOR:**  
**CHRISTOPHER MATRANGA** – NATIONAL ENERGY  
TECHNOLOGY LABORATORY

Christopher Matranga is a staff scientist in the Materials Engineering and Manufacturing Division at the National Energy Technology Laboratory, with a focus on nanostructured materials. He earned his M.S. and PhD from the University of Chicago in Physical Chemistry, his B.S. from the University of Houston-Downtown in Industrial Chemistry and Applied Mathematics, and an M.B.A. from the University of Pittsburgh.



**Edgar Lara-Curzio**

OAK RIDGE NATIONAL  
LABORATORY

## **3D PRINTED CARBIDE HEAT EXCHANGERS + MANUFACTURING DEMONSTRATION FACILITY**

Edgar Lara Curzio leads the Mechanical Properties & Mechanics Group in the Materials Science & Technology Division at the Oak Ridge National Laboratory, focused on the development and characterization of functional and structural materials. Lara-Curzio received a degree in Engineering Physics from the Metropolitan University in Mexico City, and a Ph.D. in Materials Engineering from Rensselaer Polytechnic Institute in Troy, NY.

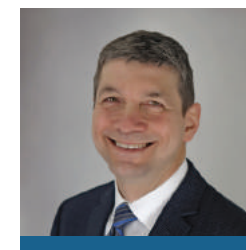


**Cliff Eberle**

INSTITUTE FOR ADVANCED  
COMPOSITES MANUFACTURING

## **ADVANCES IN COMPOSITE MANUFACTURING**

Cliff Eberle is a composites manufacturing and business development consultant for IACMI – The Composites Institute. He was Chief Engineer for ORNL's Carbon Fiber Technology Facility, and led research programs on low cost carbon fiber, ultra-performance carbon fiber, bio-derived materials and e-beam curing. He developed the business case for ORNL's pitch carbon fiber program and held leadership roles on program development teams winning \$300M+ R&D funding.



**Brian Joseph**

TOUCHSTONE RESEARCH  
LABS

## **CREATING COAL FOAMS**

Over the past 37 years, Brian Joseph has built a successful and inventive commercial research and development organization. Under his direction, Touchstone has performed over \$100M in research and development for the private sector and federal government, generating a large volume of intellectual property. After matriculating from what is now West Liberty University, Brian performed graduate work in biophysics at Ohio State University. He was conferred an honorary doctorate from West Liberty University.

# SESSION 09: CARBON HOUSE & BUILDING PRODUCTS



**MODERATOR:**  
**MATTHEW TARGETT** — RAMACO CARBON

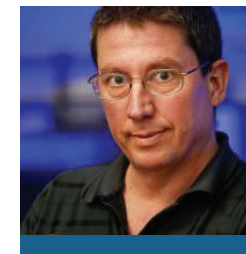
Matthew Targett is the Director of Carbon Research at Ramaco Carbon, and has thirty years leading the development of new innovations, and R&D for some of the world's largest companies in the energy, environmental and material science sectors, including Dupont, Invista, Bayer and LP Amina. He earned his BS in Chemical Engineering from Pennsylvania State University and both an MS and PhD in the subject from University of Pennsylvania.



**Mark Goulthorpe**  
MASSACHUSETTS INSTITUTE OF  
TECHNOLOGY

## DESIGNING AND BUILDING THE CARBON HOUSE

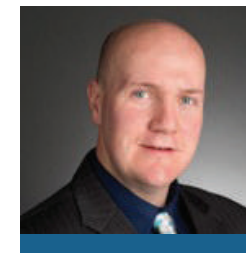
Mark Goulthorpe is an Associate Professor at MIT Dept of Architecture, and undergoing research in digital design and fabrication. Current research centers on automated composite housing production. He has two published books, and is also a practicing architect, creative and technical director of 3 groups of networked interdisciplinary teams, pressing to innovate design, fabrication and material logics to attain new formal sophistication and technical efficiencies.



**James Klett**  
OAK RIDGE NATIONAL  
LABORATORY

## 3D PRINTED SLURRY EXTRUDED CARBON INSULATION

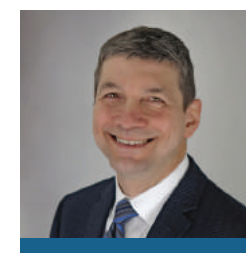
James Klett is a Senior Research Staff Member at Oak Ridge National Laboratory, where he has studied carbon in its various forms and applications, from biomedical implants to aerospace heat shields to nuclear reactor materials. One focus of his research has been the development of a low cost method for the fabrication of carbon/carbon composites, which has been patented and licensed to a major brake manufacturer. He received his BS, MS, and PhD in Chemical Engineering from Clemson University.



**Jason Trembly**  
OHIO UNIVERSITY

## ADVANCED COMPOSITE DECKING & GHG ACCOUNTING

Jason Trembly is Director of the Russ College's Institute for Sustainable Energy and the Environment at Ohio University. His research focuses on process intensification to increase sustainability in the energy and environmental spaces. Research areas of interest include coal utilization, syngas conversion, natural gas/NGLs conversion, nutrient recovery, high temperature electrochemical systems, and techno-economic studies.



**Brian Joseph**  
TOUCHSTONE RESEARCH  
LABS

## RIGID COAL FOAMS IN STRUCTURAL, FLAME RETARDANT PANELS

Over the past 37 years, Brian Joseph has built a successful and inventive commercial research and development organization. Under his direction, Touchstone has performed over \$100M in research and development for the private sector and federal government, generating a large volume of intellectual property. After matriculating from what is now West Liberty University, Brian performed graduate work in biophysics at Ohio State University. He was conferred an honorary doctorate from West Liberty University.

# RAMACO CARBON

## Supporting a New Carbon Age

Construction is underway on the world's first vertically integrated carbon resource, research, development and advanced manufacturing operation here in Wyoming. The component parts are the Brook Mine, the iCAM (or Carbon Advanced Materials Center) and the iPark, a mine-mouth industrial park using coal to make advanced carbon products. Our project will help researchers and commercial interests align and collaborate more efficiently to bring research from the lab to the market.



### INNOVATING COAL

In the early days of computer technology, forward-thinking investors and technical talent collaborated to create a wellspring of innovation in California which came to be called the Silicon Valley. Coal now needs its own Carbon Valley. We are working to support the efforts of researchers to commercialize their work in the realm of “coal-to-products.”

At Ramaco Carbon, we believe researchers, such as those at the R3 conference, are pioneering work that will revolutionize both the world in which we live, as well as how things are built. The iCAM facility is conceived to help their work go further, and to achieve the success that it deserves.

We believe in a future in which coal is too valuable to burn, and is instead used for a wide variety of high-value applications

### THE FACILITY



#### RESEARCH

The iCAM Carbon Advanced Materials Center will house national laboratories, university and private research groups, hosting applied research and development on the commercialization of coal-based carbon products.



#### MANUFACTURING

A 100+ acre “coal to products” iPark industrial park will commercialize research from the iCAM and utilize coal from the Brook Mine in the manufacturing of high-value carbon products.



#### RESOURCES

With 1.1 billion tons of coal resource on a 15,000 acre site, this local Northern Powder River Basin thermal mine will provide low-cost feedstock for coal-focused research, development and manufacturing.

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WITH DEVELOPMENTS IN ADVANCED MATERIALS AND  
MANUFACTURING TECHNOLOGIES, COMBINED WITH NEW  
RESEARCH, COAL'S PROPERTIES WILL ULTIMATELY SERVE  
HIGHER PURPOSES BEYOND ENERGY PRODUCTION.



#### STEERING COMMITTEE

This event would not be possible without the efforts of our steering committee:

- **Nicola Ferralis**, Massachusetts Institute of Technology
- **Edgar Lara-Curzio**, Oak Ridge National Laboratory
- **Garrett Lindemann**, Ramaco Carbon
- **Christopher Matranga**, National Energy Technology Laboratory
- **Matthew Targett**, Ramaco Carbon

#### KEEP IN TOUCH

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