

## 3D

— Continued from Page 2

Below are three companies that worked with RCBI on 3D printing projects supported by the Innovate WV early funding program. Funded by the U.S. Economic Development Administration, the initiative allows companies to access technology assistance at RCBI from the initial concept through computer-aided design, reverse engineering, prototyping, fabrication and machining. Learn more about the initiative at [www.rcbi.org/online/InnovateWV](http://www.rcbi.org/online/InnovateWV).

### Aridea Solutions

Established in 2014, Aridea Solutions in Charleston provides clients with real-time environmental monitoring systems. The company's water quality monitoring system, for example, uses sensors to collect information directly from streams. The solar-powered system sends the data in real time to Aridea, which alerts the company when there is a problem with water quality.

By using one of Aridea's monitoring systems, clients avoid having to send an employee to a remote location to test the water, saving both time and money, said BJ Evans, who founded the company with Richard Wilbur III.

The company came to RCBI for assistance on the development of new product that will monitor the levels of chemicals used for water treatment. After receiving a grant from the Innovate WV initiative, the company worked with RCBI Engineer Ron Cabacar on the design of the end-cap that was then printed on the Dimension 1200es 3D Printer at RCBI.

Once installed, the cap will hold the electronics for the system that will monitor the chemicals in a tote. The information is sent to Aridea, which then relays it to the clients. The information lets clients know when the tote must be replenished or if the tote has been damaged.

"It gives them a full picture of their site from an environmental perspective," Evans said.

### Wild Mountain Soap

Phillip and Mary Peelish were looking for a way to distinguish their handmade soaps when they came up with the idea of bars that featured the state of West Virginia.

"My thought was we could put the shape of West Virginia in the middle of our soap, because everyone wants a souvenir to take home with them when they come to visit," said Phillip Peelish, who started Wild Mountain Soap with wife Mary in Fayetteville in 2012.

They needed a reliable way to produce soap in the shape of the state, however. Peelish tried making a die out of Plexiglas, but the piece broke. Then he was referred to RCBI where he found the assistance he needed.

The Peelishes applied for and received assistance through InnovateWV. RCBI worked with the Peelishes to design dies that were then printed on one of RCBI's 3D printers.

The specialty dies are fitted on the extruder through which the soft soap passes. It comes out in a shape – a pumpkin, owl or a moon, for example – that is then sliced into the correct thickness. To date, about 25 different shapes have been created on RCBI's 3D printers.

Peelish believes the bars featuring the state of West Virginia helped his company win a state contract to supply the rooms at all the state parks with soaps, shampoos and lotions.

"When they asked for samples, we had given them one of those," he said. "I know they really liked it, so I think that really helped us land that job."

With the additional business they have received from the state parks, the Peelishes have hired three, part-time employees.

The Peelishes sell their soap and other beauty products at craft shows, through their website ([www.wild-mountainsoap.com](http://www.wild-mountainsoap.com)), and at their store at Dove's Outlet Village Shops near Fayetteville.

### Steel of West Virginia

With assistance from an Innovate WV grant, a Huntington-based steel mill developed prototypes of a product that helped the company win new orders at an international trade show.

Steel of West Virginia Inc. worked with RCBI engineers on the development of prototypes for bulb flats, used as a stiffener by the shipbuilding industry. The prototypes were made through 3D printing out of powdered steel on the EOSINT M280 Direct Metal Laser Sintering system at RCBI's Advanced Manufacturing Technology Center in South Charleston.

Company executives took the prototypes of the bulb flats to the 2015 International Workboat Show in New Orleans to show commercial shipbuilders, U.S. Naval engineers and others. Photographs of the prototypes also were incorporated in advertisements in trade magazines. The company believes these marketing efforts have paid off.

Since the trade show, the company has manufactured and sold more than 620 tons of bulb flats. There are 23 different sizes available, all produced on the company's No. 1 rolling mill, which manufactures special shapes of steel products.

Steel of West Virginia Inc., a wholly owned subsidiary of Steel Dynamics Inc., is the only American company now making bulb flats. Bulb flats are the stiffener of choice in the shipbuilding industry because of their strength-to-weight ratio and because their shape prevents the buildup of corrosive debris.

Steel of West Virginia and its predecessor companies have produced steel continuously at the Huntington location since 1909.

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## WVU

— Continued from Page 2

of advanced technology development in an effort to generate revolutionary solutions to problems of interest to NASA and the nation.

The WVU robot, Cataglyphis – named for a desert ant known for its ability to journey across great distances and reliably return home – did just that when it successfully retrieved the coveted "Red Rock" sample in the 2015 competition. The effort helped WVU notch the only level-two challenge win in the competition's four-year history along with a check for \$100,000.

Team members credit Gu's leadership for guiding their success.

"Gu is a great mentor; he thinks about everything," said team member Scott Harper, a mechanical engineering major from Spencer. "Everything had a plan. He had a checklist for his checklists. He always pointed us in the right direction to allow us to be as successful as possible."

While WVU's robotics efforts have brought national recognition to the Statler College of Engineering and Mineral Resources, it was the efforts of a team of researchers from the Center for Alternative Fuels, Engines and Emissions that captured the world's attention.

The research team from CAFEE, which included Dan Carder, interim director of the center; Greg Thompson, associate professor of mechanical and aerospace engineering; Marc Besch and Arvind Thiruvengadam, research assistants for CAFEE; and Hemanth Kappana, who received his Ph.D. from WVU and now works in private industry, found that nitrogen oxide emissions – one of the top six common air pollutants – from two Volkswagen light-duty diesel engines exceeded EPA emissions standards by a factor of 15 to 35 and a factor of 5 to 20.

"WVU has been the leader in emissions research for 25 years, and we look forward

to continuing work that has an impact on automotive technologies of the future, the companies that develop them and the consumers that buy them," said Carder.

In recognition of their efforts, the team was named the 2016 Roadshow by CNET Disruptors of the Year. Thiruvengadam was named number two on Motor Trend's annual Power List, which recognizes "those who, in terms of their particular area of expertise, have had the most impact on the industry over the past 12 months."

Thiruvengadam was chosen for what Motor Trend says is work that could "very likely change the way governments test vehicle emissions in the future."

Another faculty member who is looking to change the automotive industry is Yaser Fallah. An assistant professor of computer science and electrical engineering, Fallah has earned a prestigious CAREER award from the National Science Foundation for his work to increase the safety and efficiency of automated vehicles by sharing information over a wireless network.

While mainstream use of automated vehicles is still a few years away, connecting them to a wireless network would allow them to share real-time information with each other on traffic conditions, roadway hazards and dangerous conditions that they can't see through other advisories.

"The exchange of information would allow each vehicle to be aware of its surroundings up to a few hundred meters away, well beyond what each vehicle -- or its driver -- could sense," said Fallah. "This awareness can then be used to control and coordinate the action of these vehicles, which can achieve higher levels of efficiency and safety that would not be possible otherwise."

Another CAREER award winner, Cerasela Zoica Dinu, associate professor and associate chair of biomedical engineering, plans to use her award to identify technologies capable of increasing the world's energy portfolio while reducing

environmental impact.

With energy demand rising and the maintenance of supply becoming increasingly problematic, there is a need to build and implement the next generation of materials that can both ensure power generation and guarantee energy sustainability. Dinu's project will focus on the development of the next generation of catalytic nanomaterials for energy efficient systems generation.

Her work will be of interest to WVU's most recent hire.

John Hu, an experienced scientist and engineer with a proven track record of inventing, developing and commercializing innovative chemical processes associated with the oil and gas industries, has been named the inaugural Statler Endowed Faculty Chair in Engineering for Natural Gas Utilization.

Hu will lead the creation of an interdisciplinary research center related to natural gas utilization, which is a key strategic area of investment for WVU. The center will operate within the WVU Energy Institute.

"This position appealed to me because of WVU's commitment to fostering leading-edge education and research that spans all aspects of the energy cycle, from production to distribution, to utilization and conservation and management," said Hu. "At WVU, I plan to focus not only on academic research and education but also on leading industrial-university partnerships, and developing intellectual properties that benefit the University and the state's economy."

Hu comes to WVU from Koch Industries, where he was charged with identifying future technological growth areas related to petrochemicals and catalytic and biological processing, and developing research and development strategies for commercialization. He also supervised industrial-funded research at U.S.-based universities, national laboratories and R&D institutes.



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