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Pulsating Heat Pipes for Future Space Flight..... 26  
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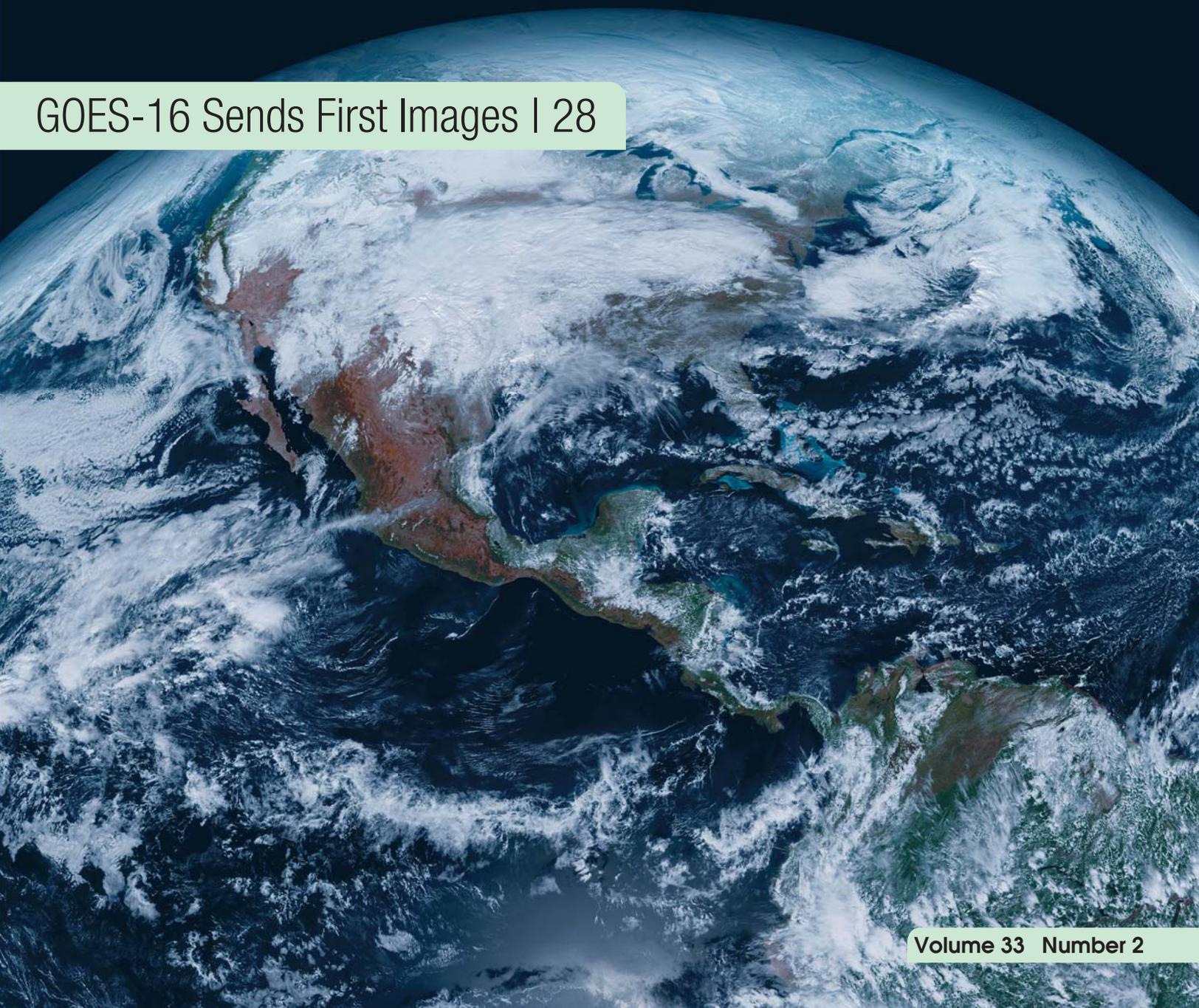
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# Cold Facts

The Magazine of the Cryogenic Society of America, Inc.

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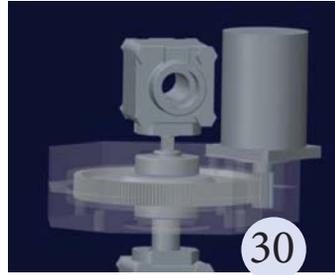




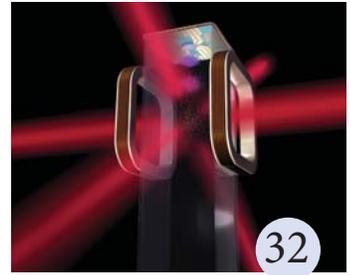
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## ON OUR COVER



This composite color image of the Western Hemisphere was captured from the NOAA GOES-16 satellite on Jan. 15, 2017, using several of the 16 spectral channels available on the satellite's Advanced Baseline Imager. The image, taken from 22,300 miles above the surface, shows North and South America and the surrounding oceans. Read more about GOES-16 on page 28. ■

*In all instances, "CSA CSM" indicates a Corporate Sustaining Member of CSA.*

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## DID YOU KNOW?

Early registration is now available for the 27th Space Cryogenics Workshop—July 5-7, 2017, in Oak Brook IL. It's just \$525 for CSA members through May 5. More information, including details on the new Frederking student scholarships, is available at <http://2csa.us/scw>.

CSA is offering four short courses at CEC-ICMC 2017. Registration information and course descriptions are provided at <http://2csa.us/sc17>

You can stay up to date on all CSA news by subscribing to the CryoChronicle newsletter and CSA Newsflashes at [www.cryogenicsociety.org](http://www.cryogenicsociety.org). ■

# Spaulding's Journey from Leatherboard to Fusion

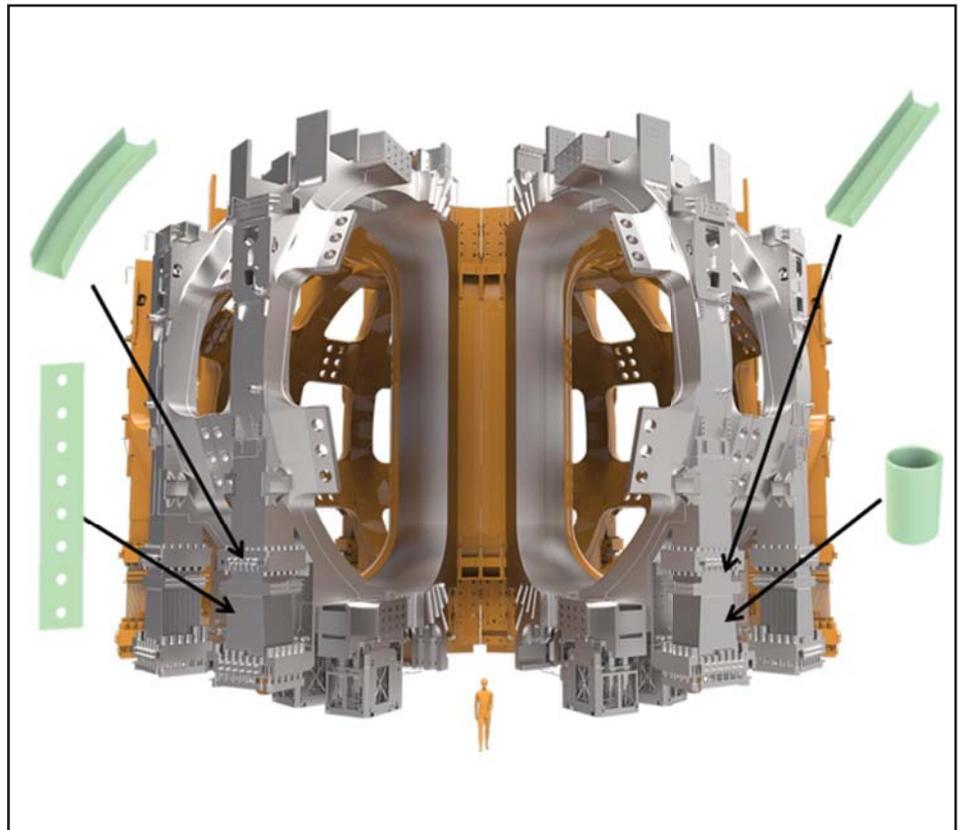
In the late 19th century, the Spaulding family of Townsend MA probably didn't think the business they were starting would become a contributing member of the most ambitious energy project in the world today, but that's just what happened.

Over the past two years, Spaulding Composites has been working on ITER, the Tokamak project in France, and after prototype setup and testing, project leaders approved Spaulding to supply magnetic insulating components for the gravity support structures in the heart of ITER's plasma control system.

ITER engineers defined Spaulding's G-10 CR as a key component for this control system due to its electrical and thermal insulating capabilities and the ability to meet the high radiation requirements of the application. The gravity supports for the Toroidal Field Coil Structure use machined flat sheets and blocks. Engineers interposed both flat and curved elements in the Correction Coil supports and designed cylindrical sleeves into the Poloidal Field Coil supports. Spaulding will deliver components to the magnet manufacturer in the summer and fall of 2017.

"We are honored to have involvement in such an exciting program. Beginning in the late 1800s, the company has evolved and become a leader in thermoset composites and laminates," says Jen Green, marketing coordinator at Spaulding. "In digging up some history, this quote surfaced from the words of our founder, 'We are proud of all our industries and the advancements they have made over the years.'"

Spaulding has accomplished much since its humble beginning in 1873 as a manufacturing facility in Rochester NH. By 1900, Jonas Spaulding was looking to construct a second plant in New Hampshire, this time a leatherboard mill on a plot of land he discovered during a buggy ride along the Salmon Falls River.



*ITER Tokamak schematic showing Spaulding product locations. Image: ITER/Spaulding*

The facility, under the name J. Spaulding & Sons, took scrap leather from shoe factories and fibrous materials such as paper waste and wood pulp and compressed the materials. Although times and engineering have evolved, this composite process of materials remains the foundation of the composites business today.

The leatherboard manufacturing plant in 1900 produced seven tons of leatherboard per day. Unfortunately, the 67-year-old Spaulding died before construction was completed, leaving his businesses to his three sons.

The men carried on running the companies, but within a few years converted the leatherboard plant to fiberboard. The brothers developed a patent and, after the purchase of new machinery, they began producing shoe counters. The brothers also acquired several auxiliary businesses in the local area—including manufacturing plants of fiberboard products—and

developed a subsidiary company to act as the nucleus of material handling.

Over the course of the 20th century, Spaulding became a leading participant in the development of industrial composite materials. Research broadened the product base to utilize wood pulp, cotton, fiberglass and Kevlar as base substrates in combination with phenolic, silicone, melamine and epoxy resins to achieve a wide range of properties touching many applications.

Spaulding also participated in developing the standards used today by the National Electrical Manufacturers Association to define the properties of industrial composites. This development work gave Spaulding a leading role in composite markets for electrical insulation and components, bearing and wear, precision bearing retainers, reverse osmosis, cryogenics and air tool vanes.

The company name has changed over the years and it is now known as Spaulding Composites. This company continues to manufacture composite sheets and tubes as it did in the 1900s, as well as many other products to support other industries. It has produced tubes for the cryogenics industry for a few decades. Other cryo-related items include dewar neck tubes, tank supports and vacuum jacketed spacers.

In 1923, as the company celebrated its 50th anniversary, the Spaulding brothers said, "Today, as in our pioneer past, advancement is made by men who refuse to be satisfied with the achievements, however many, of bygone years. And our industries are ever on the move ahead to meet the challenges of a changing world."

Spaulding Composites continues to manufacture its own thermoset composites, such as various grades of glass epoxy and G10 and G11. It is a vertically integrated manufacturer, and as such has had the opportunity to be involved with a couple Tokamak projects over the years, not just ITER.

In 1979, Spaulding Composites worked with the US Department of Energy for a Fusion Research Project in Oak Ridge TN. The project was designed to research the effects of radiation at 5 K on organic insulators for superconducting magnets. The study used three types of Spaulding composites, the G-10 CR, G-10 and G-11 CR. Research results from the study found that Spaulding fiberglass-cloth filled epoxies retain sufficient strength for use. The materials additionally provided an economical approach for not only electrical insulation but also mechanical support desired in coil insulation.

In a more recent study from 2015, Spaulding was asked to partner with a superconducting magnet manufacturer in China. The project, which used Spaulding's G11-CR, was designed to support a particle accelerator from the Thomas Jefferson National Accelerator Facility (CSA CSM). [www.spauldingcomposites.com](http://www.spauldingcomposites.com) ■



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