What is SME's Role in Higher Education?

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In March 2008, then SME President Neil Duffie, PhD, FSME, CMfgE, tasked a group of SME members to provide strategies for the Society's role in higher education, the results of which will be released later this year. One of the most thought-provoking issues that arose from this task force and its discussions was: "Where should SME focus its efforts?" Should it direct its attention (1) toward advancing degrees in engineering and technology that have "manufacturing" in their title, and hence reflect graduates that have knowledge that allows immediate use in manufacturing, or (2) toward increasing manufacturing topics within traditional mechanical, industrial, or electrical/electronics engineering and technology programs, through options and courses, or across the curricula for all students?

Some participants may take the position that most engineers actually work in manufacturing industries, and are likely to have mechanical-related degrees. Manufacturing engineers in the electronics industries would appear to rely on electrical engineering graduates, and they can therefore argue that there is no need for specialized programs in manufacturing, which is obviously a bone of contention for many of us.

Because of the costs associated with manufacturing-related degree programs, it is hard to envision many US engineering schools being willing to invest in manufacturing facilities and faculty. Engineering faculty are often rated on how many research dollars they bring into the school. Most research funding is currently slated for more up-and-coming areas, such as bioengineering, nanoengineering, "green" engineering, wind energy, and so on. In addition, not many industry representatives beat on the engineering dean's door and demand real manufacturing specialists to make their company competitive—instead, they complain to SME's educational leaders that they cannot find the manufacturing engineers and technologists they need to compete. Some of these same industry leaders did not know that there are current manufacturing engineering and technology programs that deliver exactly what they want, which is graduates who were closely advised by their industrial partners, and now have enough hands-on experience that they can immediately hit the ground running.

Is there a good answer to the questions raised by the task force and in this editorial? Yes, and it is a simple one. None of the approaches outlined above are adequate. I have degrees in both mechanical engineering and in manufacturing engineering. There was no commonality in the graduate programs of either, but a bachelor's in mechanical and a master's degree in manufacturing gave me the combination that I needed. Understanding thermodynamics and heat transfer and stresses because of my training in mechanical engineering was a big asset in metal-cutting. Full manufacturing courses in practical economics, design for manufacturing, and other topics gave me much-needed, on-the-job knowledge. Understanding both and fitting into both worlds made it easy for me to shift into management positions, and to converse with engineers and directors in almost any field. Unfortunately, there is just no way to gain all the knowledge anyone needs in four years. Whatever degree one starts with, it is just that—a start. Careers in engineering and technology require a lifelong pursuit of knowledge, and regardless of the approach used, both individuals and companies, along with SME, must contribute to and influence the future of manufacturing engineering and technology programs.

Looking to the Future of Manufacturing Education

The Manufacturing Education & Research Community has been actively examining the state of manufacturing education with an eye to the future. The strategic vision for manufacturing education has not been updated since the landmark Curricula 2000 and Curriculum 2002 documents written in the early/mid-1990s. Since then, there has been a massive shift in the reality of manufacturing. Academic programs have addressed

the changes to varying extents, but not as part of a concerted effort to match education initiatives to industry needs. Issues of concern include the public image of manufacturing, globalization, new manufacturing technologies, new manufacturing sectors, the expanding role of manufacturing professionals, a new business focus on efficiency (e.g., lean manufacturing), environmental issues, energy, and an increased use of technology/automation.

The MER Community has embraced an open approach to forming the vision for manufacturing education. Along the way, two forums were held at Robert Morris University (June 2008) and Farmingdale State College (Nov. 2008). These forums will be followed by the Manufacturing Education Transformation Summit 2009, June 18–19, at the University of Texas at Austin. The ongoing results of this work are available at *www.merconline.net/wiki* so that others from outside the community may contribute to the process without the need to be fully engaged. The current target for the MER Community is to produce a new document, Curriculum 2015, which provides strategic recommendations and suggestions for manufacturing education. Those looking to become involved may do so through the wiki, or you can contact Hugh Jack, PhD, at *jackh@gvsu.edu* to volunteer for more extensive participation.

2009 Innovation: Buckypaper

Buckypaper is a new material composed of carbon nanotubes that promises to revolutionize composite materials. Stacking sheets of buckypaper together nets a material that's 500 times stronger than steel, yet 10 times lighter. Unlike conventional composite materials, though, it conducts electricity like copper or silicon, and disperses heat like steel or brass.

Buckyballs were discovered in 1985 after British scientist Harry Kroto joined researchers at Rice University for an experiment to create the same conditions that exist in a star. They wanted to find out how stars, the source of all carbon in the universe, make the element that is a main building block of life. During the experiment, there was an extra character that turned up totally unexpected. The surprise guest was a molecule with 60 carbon atoms shaped like a soccer ball. To Kroto, it also looked like the geodesic domes promoted by Buckminster Fuller, an architect, inventor, and futurist. That inspired Kroto to name the new molecule buckminsterfullerene, or "buckyballs" for short.

For their discovery of the buckyball—the third form of pure carbon to be discovered after graphite and diamonds—Kroto and his Rice colleagues, Robert Curl, Jr. and Richard E. Smalley, were awarded the Nobel Prize for chemistry in 1996.
Combining carbon nanotubes with other materials can create nano-based composite materials that are stronger, lighter, and capable of better thermal management than any known material. These new materials could have a myriad of applications. Attempts to integrate carbon nanotubes into composite materials proved disappointing, however, because nanotubes tend to stick together and are not easily dispersed, causing a dramatic increase in system viscosity. An inadvertent discovery in the 1990s resolved many of these problems. When researchers from Smalley's laboratory managed to disperse nanotubes into a liquid suspension and then filtered that suspension through a fine mesh, the nanotubes would stick to one another and collect on the filter, forming a thin film disk of pure nanotubes, later dubbed buckypaper.

The secret of its strength is the huge surface area of each nanotube, said Ben Wang, PhD, FIIE, FSME, FWIF, director of Florida State's High-Performance Materials Institute (HPMI), who was introduced to buckypaper in 2000. "If you take a gram of nanotubes, just one gram, and if you unfold every tube into a graphite sheet, you can cover about two-thirds of a football field," Wang said.

Currently, buckypapers are produced one sheet at a time, basically using an assembly line process. To make this assembly line commercially feasible, researchers must be able to scale up production. Therefore, HPMI researchers have developed a prototype for continuous production, and are planning to build a larger prototype in the near future. They also have a concept plan for a process capable of continuous production of magnetically aligned buckypapers.

Near-term uses for the buckypaper would be as electrodes for fuel cells, super capacitors, and batteries, Wang said. Next in line, buckypaper could be a more efficient and lighter replacement for graphite sheets used in laptop computers to dissipate heat, which is harmful to electronics. The long-range goal is to build planes, automobiles, and other products with buckypaper composites. The military is also looking at it for use in armor plating and stealth technology.

"Our plan is that perhaps in the next 12 months we'll begin, maybe, to have some commercial products," Wang said. "Nanotubes obviously are no longer just lab wonders. They have real-world potential. It's real."

To learn more about this Innovation, contact Ben Wang, PhD, FIIE, FSME, FWIF, at *benwang@eng.fsu.edu*.

Tech Group to Host Interactive Roundtable

Members of the Composites Manufacturing Tech Group, part of SME's Plastics, Composites & Coatings Community, will host an interactive roundtable at Composites Manufacturing 2009 and Tooling for Composites, April 29–May 1, in San Diego. "Interactive Roundtable: Working through Your Composite Show Stoppers," will focus on the methods and best practices for dealing with your composite manufacturing problems. Participants will learn some of the methods used by industry experts that work for top manufacturers of composite structures and products made from composites. They will also discover how to work through composite problems, and the resources they can use to determine the problem and get back on track. This roundtable allows individuals to bring their real-world manufacturing issues to experts, and receive suggestions/solutions from a diverse group of manufacturing leaders, not consultants, but other practitioners. It is a true "give back" to others—competitors, partners, unknowns—and all are welcome. To learn more, visit *www.sme.org/composites*.

Marsh Named 2008 Business Leader of the Year

Sheldon "Skip" Marsh was recently honored as the "2008 Business Leader of the Year" by the Rindge Chamber of Commerce, Rindge, NH, for his commitment and active volunteerism to his local community, as well as his passion for manufacturing. Marsh is the president/CEO of V & A Cleaning Systems Inc., which he has operated in Rindge for more than 25 years. The company is a manufacturer's representative for industrial capital equipment.

Marsh has been an active SME member since 1990, and is a member of SME Chapter Monadnock No. 124, where he has served as chair and as a member of the program committee and education committee. In 2007, Marsh was a member of SME's Member Council. Currently, he's an SME Membership Consultant for three SME Chapters: Contoocook Valley No. 177, Monadnock No. 124, and Southern New Hampshire No. 327.

Through his involvement with SME, he has assisted in organizing an Education Forum at Keene State College (Keene, NH). This event brought together educators and business leaders to discuss what students need to be successful in the workplace. Marsh is a strong advocate of improving education and showing students how hands-on education can improve their skills. He was recently a judge in the Robotics First competition in Springfield, MO.

SME congratulates Sheldon "Skip" Marsh on being named "2008 Business Leader of the Year," and thanks him for his tireless dedication to the Society.

Discounted Rate Offered for Displaced Workers

SME's Board of Directors, which consists of industry leaders and premier educators, recently approved a specially discounted membership rate for those displaced workers in particular need of SME's products, services, and networking. Unemployed manufacturing professionals can apply for membership with full benefits by contacting SME for a special $30 rate for a six-month membership. If the displaced worker is still unemployed after that time, a subsequent request may be made. The SME Board members want to encourage manufacturing professionals to take advantage of all the Society has to offer. To apply for the displaced worker membership rate, contact SME at 800-733-4763 or *service@sme.org*. This rate is available to new and renewing memberships only.

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