Industrial education

Anything made of metal, no matter how big or small, can be welded. Examples are everywhere, from vehicles like cars, trucks and motorcycles to rail cars, ships, aircraft, rockets and space stations. Construction is a huge market, and skyscrapers, bridges and highways would be impossible to build without welding, as would oil and natural-gas pipelines, offshore oil platforms, giant wind turbines and solar panels. Welders help install and maintain boilers, antipollution systems and other large structures, as well as piping for industrial, commercial and residential facilities. Welding is even used by artists to create sculptures and decorative items. There is almost no limit to what welding can do, especially since developments in the technology continually improve its accuracy, quality and versatility. Welding is, in fact, an increasingly high-tech skill. Welders are being trained to operate robots and other automated systems that use powerful lasers, electron beams and sometimes explosives to bond metals. The ability to work with computers and program software is consequently vital to the successful operation of these systems. Don Howard, a welding specialist at Concurrent Technologies Corp., an engineering firm in Johns town, Pa., estimates that 20%-25% of U. S. welding is automated and predicts this trend will grow by about 20% in the next few years. “ A lot of very intelligent people are coming into the welding community, " says Howard. There is money to be made, he notes, but the industry also offers career paths. “ Welding is not just about working on a manufacturing line anymore. Once in the industry, people know they can find a niche. " “ These are good times to be in welding, " says Patricio Mendez, director of the Canadian Center for Welding and Joining at the University of Edmonton in Alberta, Canada. Mendez notes that students who like designing and building with metal and

are interested in fields such as materials engineering, robotics, lasers, computer programming and systems integration will find plenty of career opportunities in welding. Many students are introduced to the process by virtual welding. This simulation program is being developed by the Edison Welding Institute of Columbus, Ohio, to teach the basics of welding in classrooms. “ The objective is to give students a virtual experience that is very much like the real thing, " says John Coffey, engineering manager at. The system uses sensors that duplicate the look and feel of welding. There are more than 80 welding processes. Most involve a skilled worker using a high-heat torch (2, 800-plus degrees Fahrenheit), filler material that is usually in wire or stick form (though some welds don’t use fillers) and pressure to permanently bond metal pieces. Welding can also be used to cut and dismantle objects of all sizes as well as for repairs. The most common process is Gas Metal Arc Welding, or GMAW. In GMAW, an electrode, which is also the filler, is continuously fed through the nozzle of an arc torch. When the welder activates the torch, several operations take place: The electrode begins feeding through the nozzle, a direct current is generated that creates an arc when it comes in contact with the electrode and shielding gases are released around the nozzle to protect the weld from atmospheric gases that could degrade its quality. The arc, whose movement the welder controls, consumes the electrode, fills in the weld joint and creates the weld. Other widely used techniques like Gas Tungsten Arc Welding (GTAW) and Shielded Metal Arc Welding are variations of the process. GTAW, for example, is a relatively low-heat method that uses a non-consumable tungsten electrode. Its low-heat characteristic reduces distortion in thin metals, such as those used in aerospace, also called “ stick welding, " uses a flux-coated

consumable electrode (" flux" is a chemical cleaning agent that removes oxidation from the metals to be joined) and is primarily used for repair and steel welding. As the electrode burns, the flux disintegrates, which releases a shielding gas that protects the weld from degradation. In more advanced welding technologies, lasers are combined with in a hybrid process to make what one expert calls “ scalpel-like cuts" that are up to ½-inch deep, narrow and extremely precise. The part of the process then deposits the filler and melts it with a secondary heat source. The influence of welding is so broad that many of the product designs and building techniques people take for granted would not be possible without it. With demand for skilled welders rising and the technology of welding becoming more advanced, especially where automation is concerned, students have a unique opportunity to learn a career that can be shaped around their interests.