

# Welding—Trade or Profession?

By C. E. Albright and Kenneth Smith

Welding has always required a certain level of craftsmanship, but a new educational collaborative program recognizes that it now requires even more technical expertise and professionalism.

High-quality welders have long been vital to American industry, but the public perception of welding is generally of craft-based fabrication. Welders are trained mainly in manual-skills welding processes, although more highly trained or experienced welders may fill welding inspector or welding supervisory roles. This system works best for steel and aluminum construction in which materials considerations are routine.

Many welding and materials-joining applications, however, involve more complex materials and joining techniques. Welding alters the structure of materials, which can be determined through an examination of the metallurgical structure. The structure of

material such as metals, polymers and ceramics affects material strength, hardness, toughness and other mechanical properties that are so important to efficient design. More complex welding and joining must consider and control these structural changes by controlling the welding and joining process.

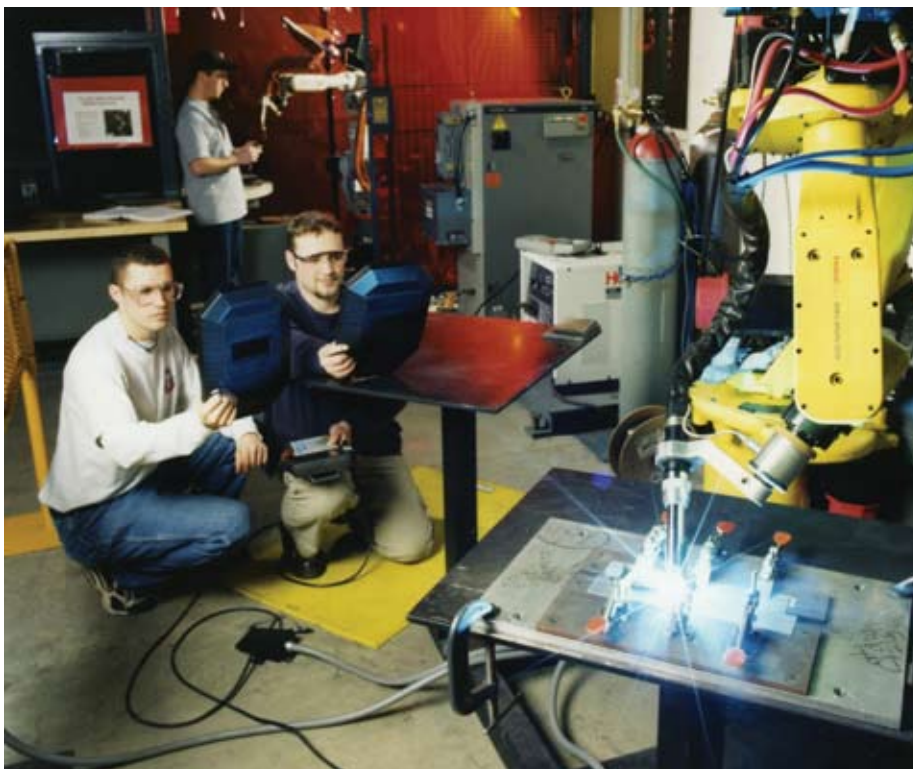
## Complex, Precise and Technical

Modern manufacturing is turning to automation to increase productivity, but it can be a great challenge to program robots and other computer-controlled welding and joining systems. The programmer must understand both robotic motion control and the weld-pool manipulations normally controlled by a manual-skills welder. A knowledge of both programming and manual-skills welding is thus required.

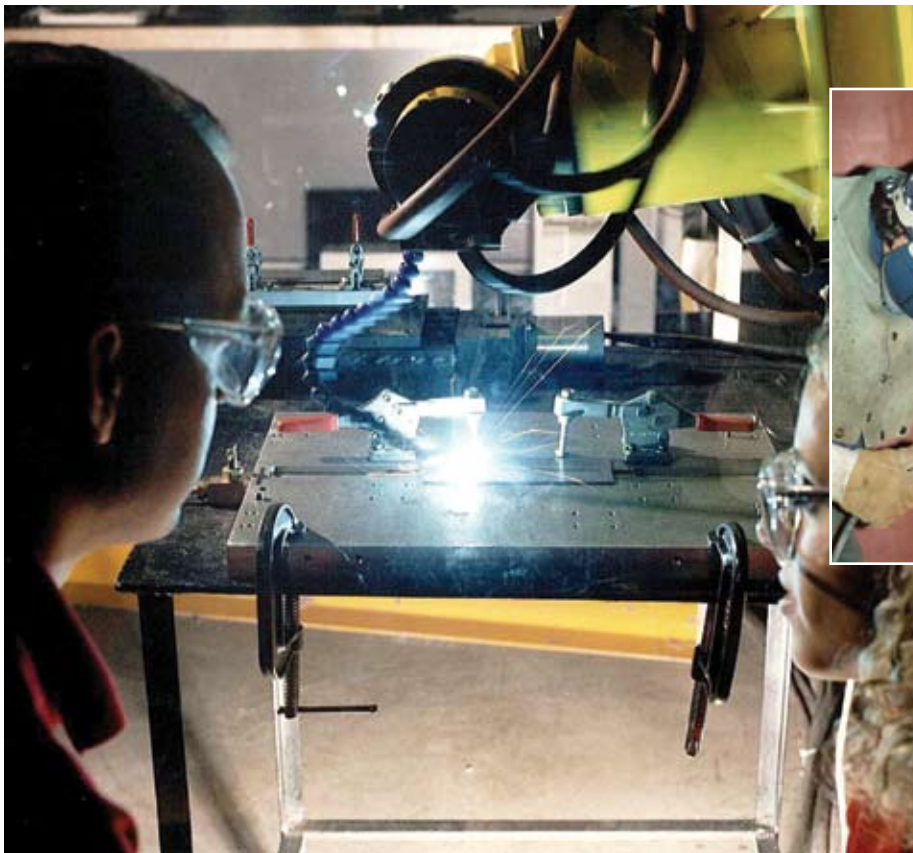
Computer programming and automation is traditionally not taught in welder training programs, though a number of college technical programs are moving in this direction.

There are now many welding and joining processes that do not involve arc welding. For example, laser welding is a high-precision welding process that creates welds that are much smaller than conventional arc welding. While a conventional arc weld may be about one centimeter wide, a laser weld is normally only about one millimeter wide. Thus, high-precision, low-distortion, low-residual-stress welds can be made using the laser.

Laser welding and material processing is taught in only a few colleges and universities, however, it is currently being used throughout the automotive industry, including the assembly of automatic transmissions. A laser beam manipulated with a robotic system may



Students program an arc welding robot.



Students laser weld with a robotic beam manipulator. Right: Welding requires a certain level of skill and craftsmanship.

perform laser welding, and laser welding is also used to make die blanks for precision stamping of automotive body parts. This allows materials of various chemistries, thicknesses and coating types to be joined together prior to forming. Examining cross sections of these welds can reveal that they are made in 0.8-mm-thick steel to 1.6-mm-thick steel, and the welds are very small—less than the width of a dime.

There are hundreds of other advanced welding processes, most of which require delicate control. A high level of process physics knowledge is required to make such processes viable, so personnel with education levels through a Ph.D. in engineering are often employed in advanced manufacturing and fabrication industries.

## Advancing Education in Welding

Modern welding and joining also requires sophisticated inspection techniques. Many welds require non-destructive testing using X-ray, ultrasonic, eddy current

and other advanced methods. Through the years, these techniques have been greatly enhanced by the use of computer image enhancement, computerized C-scanning techniques, and other computer-based enhancements. Such techniques are normally part of more advanced engineering education programs.

It is thus appropriate to train people in both traditional manual-skills welding, as well as in a more engineering-oriented welding technician path. An education collaborative program is therefore proposing a new “Welding and Materials-Joining Technicians” career path. The new path could be designed to be compatible with a pre-engineering curriculum, and the new technician program would become part of a three-pronged approach in welding trade and professional training. This approach would include:

- traditional welder training,
- materials-joining technician training, and
- pre-welding engineering training.

The collaborative program between Lorain County Community College and The Ohio State University is also attempting to form a “Welding and Materials Joining Training” community in the Midwest. Contacts have been made with institutions in Illinois, Indiana,

Michigan, Pennsylvania, Wisconsin, and of course, Ohio.

The National Science Foundation has also awarded a planning grant to develop a proposal for a National Center for Welding Education. For more information about the planned consortium growth and the new center, visit [www.weldingedu.com](http://www.weldingedu.com) or contact Kenneth Smith through that Web site address.

The return on investment to education will include development of methods and materials for welding and material-joining technician training, and a forum for interaction for educators in welding and material joining. Industry will be rewarded with technicians and engineers with a broad training in modern welding and material-joining technology. Thanks to the efforts of career and technical education, with increasingly skilled technicians entering the field, the answer to the question of whether welding is a trade or a profession will no longer have to be asked. The answer will be clearly demonstrated by the professionalism of welding’s new workforce. ■

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