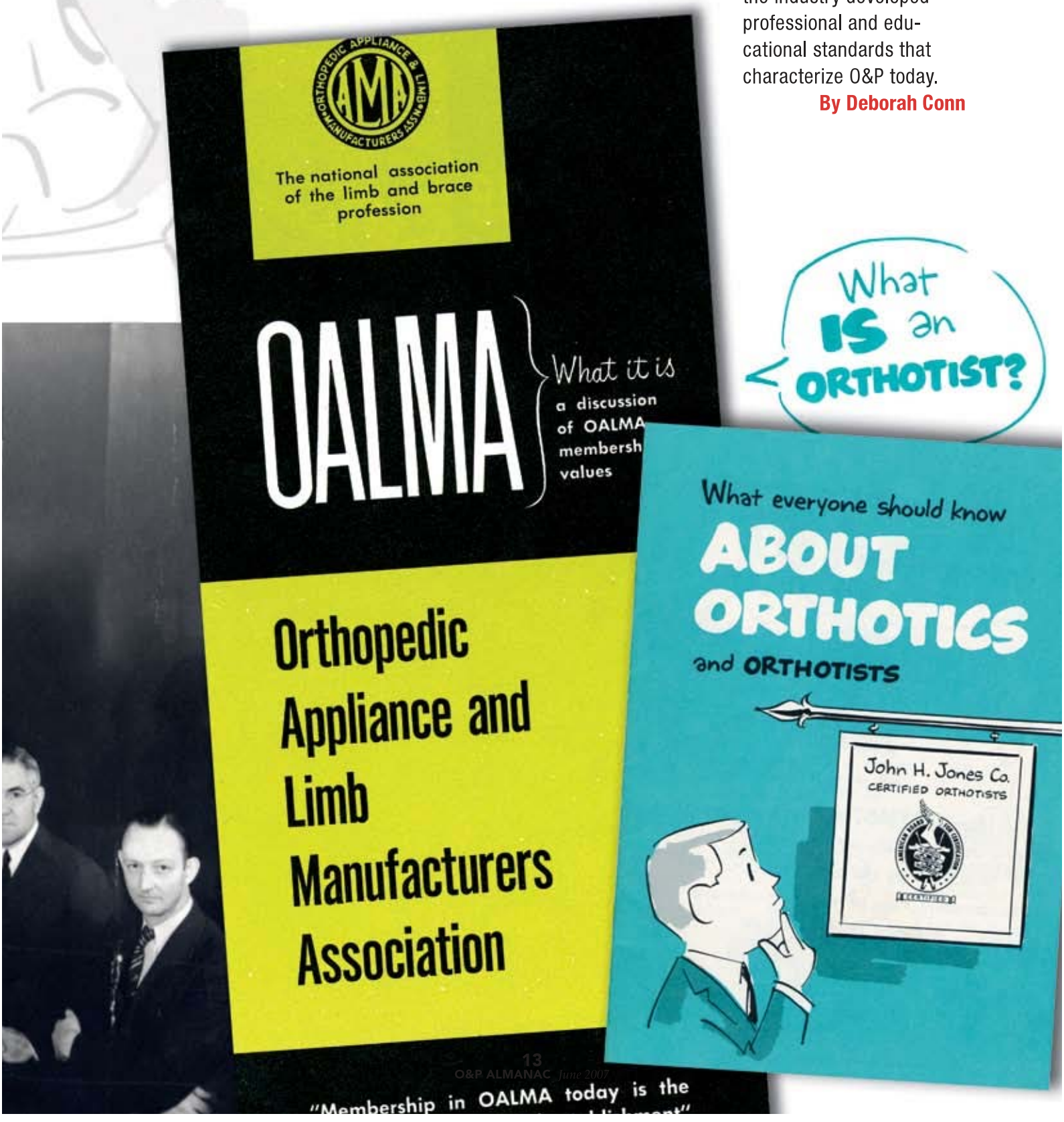
How O&P Began

Part 2

In the May *O&P Almanac*, we began an overview of O&P history in the United States—a history that essentially began with the Civil War. This article begins with another war, one that transformed the industry.

World War II triggered massive amounts of research and development in O&P. For the first time, the government initiated and funded O&P research, resulting in a steady pace of technological innovation that continued well into the second half of the 20th century and beyond. And as that technology advanced, the industry developed professional and educational standards that characterize O&P today.

By Deborah Conn



World War II

Returning World War II veterans, protesting the poor quality of their prostheses, prompted the surgeon general of the army, Norman T. Kirk, to ask the National Academy of Sciences for assistance. The NAS formed the Committee on Prosthetic Research and Development, or CPRD, which coordinated federal efforts and developed research programs at universities and industrial laboratories to create improved upper- and lower-limb prostheses.

Carlton Fillauer, returned from serving in the Army's orthopedic units, was the first staff prosthetist on this pioneering committee, which many mark as the beginning of the modern era. Fillauer helped import techniques he had learned from the German O&P technicians his father, George, employed before the war.

Later, the Department of Veterans' Affairs (VA) assumed the management of O&P research contracts from CPRD and in 1947 established a testing and development lab in New York City. According to Sam Hamontree, CP, chairman of OrPro Inc. in Irvine, Calif., the VA Prosthetics Center was well funded and conducted significant research and development.

For example, the Center encouraged manufacturers to use plastic laminates instead of wood. With United States Manufacturing Co., the Center developed the HydraCadence knee-shin-ankle-foot system, which was the standard for many years. By 1949, the VA had created 30 multi-disciplinary amputee clinics throughout the country, along with a program to educate staff members about amputation.

Around the same time, says Hamontree, the VA launched the Prosthetic and Sensory Aids Service in Washington, DC. "The PSAS was the VA's administrative arm in providing prostheses and other aids to veterans," he says.

Post-war research

This heightened focus on O&P resulted in exciting technological advances in the period just after the war. For example, VA-funded upper-limb research at Northrop Aircraft Corporation (later taken over by the University of California at Los Angeles) applied the same cable system used to control aircraft to power split hooks in upper-limb prostheses. The Bowden cable system is still used today.

Another major breakthrough was the PTB, the patella tendon-bearing below-knee prosthesis, which, says Hamontree, has become the basis of all BK prostheses today.

"The Navy had quite an R&D program at Oak Knoll Hospital in Oakland and at the University of California at Berkeley," says Hamontree. "Under Professor Charles Radcliffe, they published more on basic gait research than anyone else."

Private companies were engaging in their own research efforts. At Ohio Willow Wood, in Mt. Sterling, Ohio, William Arbogast and his sons, Edwin and John, developed the first semi-finished, above-knee prostheses.

"They were the first in the United States to manufacture and use interchangeable parts," says Lisa Arbogast, William's great-granddaughter and a graphic designer and human resources associate at the company. "Repairs could now be completed without returning the entire prosthesis to the factory for a simple custom part replacement. Also, practitioners could update prostheses with new components as they became available."


BRACES Today

EXHIBIT SHOWS NEW STAPLING TECHNIC

Pope Foundation Devises New Fixture To Help Brace Makers Shape Bands Quickly And Easily

In 1948, Jim Snell, who owned Snell's Orthotics-Prosthetics in Shreveport, La., developed an innovative process for making lightweight leg braces, using aluminum that was heat treated after shaping, with steel bushings at the knee and ankle joints. It was a revolutionary idea, so much so that it was years before it gained widespread acceptance in the industry.

New companies

Two major O&P companies got their start just after the war. As in so many cases, their founders became interested in the business after losing limbs.

Anthony Filippis had lost both his legs in a train accident when he was 12 years old. Shunned from most workplaces because of his disability, he began in 1934 as an apprentice to his prosthetist, Carl Wright, at a firm in Detroit. Ten years later, Wright and Filippis started their own patient care facility.

"In those days, you had to have

Carlton Fillauer working with patients.

permission from the O&P community to open an office," says A.J. Filippis, CPO, Anthony's son and president of Wright & Filippis in Detroit. "My father drove down to Ohio Willow Wood to get product so he could open the facility. He went in to see John Arbogast, who said it would be a problem to sell to him. My father said, 'I'm staying here until I get product.' Eventually John took him home, and after a few drinks, he agreed to sell to Wright & Filippis." Today, Wright & Filippis has more than 30 facilities throughout Michigan and Ohio.

Another company that emerged after the war was Leimkuehler Limb Co., in Cleveland. Paul E. Leimkuehler had lost his leg in the Battle of the Bulge in World War II. As a patient at McGuire General Hospital in Richmond, Va., he was able to use his expertise as a mechanical engineer to assist in the hospital's limb and brace shop. He continued working there until his prosthesis was completed, under the direction of Blair Hanger.

Paul's son, Jon Leimkuehler, CPO, FAAOP, says that when his father returned to his hometown of Cleveland, "he found antiquated designs at the local prosthetics companies. So he traveled to nearby Youngstown to have a prosthesis made with a knee that had friction control."

In 1948, Leimkuehler purchased an existing limb company in Cleveland, renamed it the Leimkuehler Limb Company, and began his career in prosthetics. He also started PEL Supply Co. (named for his initials) in 1959, one of the first firms to provide prefabricated parts to other O&P facilities.

Leimkuehler's three sons, Jon, Bob, and Bill, all ABC-certified practitioners, purchased Leimkuehler Limb Company in 1978, and they each now have their own separate patient care businesses. His daughter, Paulette Vaughn, started working at PEL Supply Co. in 1976 in marketing and advertising and is today executive vice president.

ABC and the first education programs

Meanwhile, postwar growth and technical advances increased the pressures for organizational change and greater professionalism and standards. The Artificial Limb Manufacturers and Brace Association, or ALMBA, was actively involved in the new focus on research and development. In 1946 the group changed its name to the Orthopedic Appliance and Limb Manufacturers Association (OALMA) and opened an office in Washington, D.C. to work closely with the federal government.

OALMA recognized the need for a national certifying body, and in 1948, the American Board for Certification in Orthotics and Prosthetics, or ABC, was incorporated. At the first ABC board meeting, under President Chester C. Hadden, the terms "certified orthotist" and "certified prosthetist" were adopted for those who met certification requirements. The first certifying exam was held in New York City in 1951.

caption to come

Instituting standards meant that prospective practitioners needed a standardized educational program that delivered the required skills and knowledge. UCLA established its Prosthetic Education Program in 1952, and the first of 12 six-week courses in upper-limb prosthetics was offered in January 1953. New York University followed suit in 1956, followed by Chicago's Northwestern University in 1959. Many prominent practitioners donated their time as invited speakers and instructors.

"At the time, these were all short-term programs," recalls Sam Hamontree. "I attended three- to six-week intensive courses on particular phases of O&P--below knee, above knee, upper limb—at all three institutions."

1960s and '70s

O&P technology continued its rapid advance in the following two decades. In 1961, Ohio Willow Wood introduced the first solid-ankle cushion-heel (SACH) foot manufac-

tured in the United States—a foot that, says Lisa Arbogast, "we still sell today, improved, of course." The Massachusetts Institute of Technology was working with the bionic "Boston Arm" in the 1960s.

In 1963, Durr-Fillauer introduced a new industry standard: nonporous, thermomoldable foam, called PeLite. "It was said to have made the prosthetist's job 'too easy,'" says Gerry Stark, CP, FAAOP, vice president of product development and education at the Fillauer Companies.

Around the same time at Becker Orthopedics, Lucille Becker was developing designs for a double action joint and a modified drop-lock knee joint. She had assumed control of the company after her husband, Otto, died in 1960.

Another advance in prosthetics occurred when Dr. Ernest Burgess, chief of the clinic at the Seattle VA Medical Center, led a study that resulted in the practice of fitting prosthetic devices immediately after amputation.

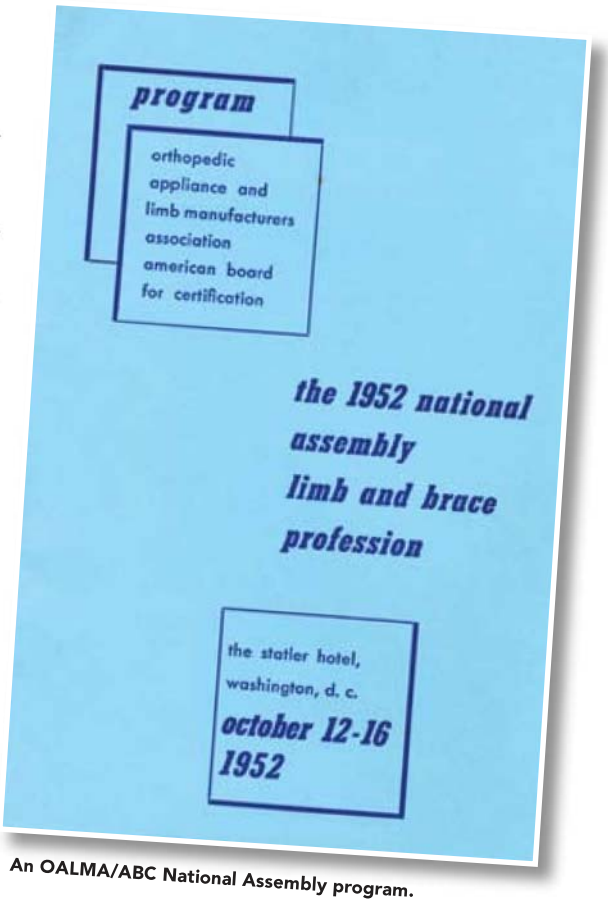
One of the biggest changes during this time was "the way we take care of patients," says Greg Gruman, CP, president of Winkley Orthotics and Prosthetics, now headquartered in Golden Valley, Minn. "The profession shifted from mail-order and remote fittings to personal contact with patients.

"The VA came up with the clinic team approach to help World War II vets in the late '40s and early '50s," says Gruman. "But the idea really didn't catch on until the late '50s and early '60s, [when] the entire care provider team—doctor, prosthetist, counselor, therapist—all worked together to help amputees. This became the patient-centered concept that we use today. And it's meant better fittings and more accurate assessments of patients' needs."

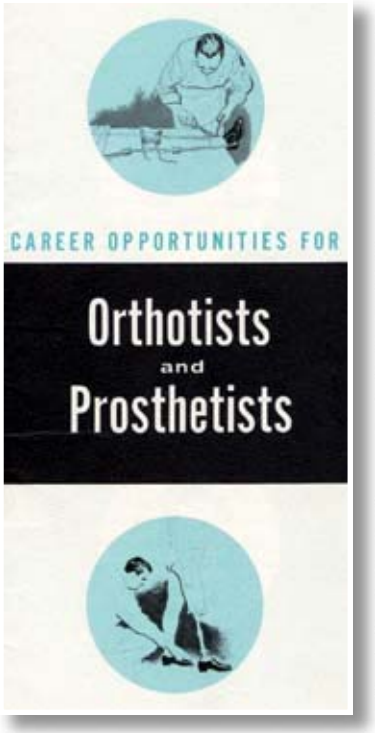
Other technological developments included the reciprocating gait orthosis, or RGO, in 1967. Invented by Wallace M. Motloch, CO, at the Ontario Crippled Children's Center in Toronto, the device harnessed the hip flexion capabilities of children with spina bifida. In 1973, Roy Douglas, in cooperation with Carlton Fillauer, developed the Louisiana State University RGO, a device that refined Motloch's concept to make it more practical for clinical use.

Knit-Rite Inc., based in Kansas City, Kan., was applying new technologies to its line of prosthetic socks, and in the 1970s introduced machine-washable wool. Mark Smith, CP, president of the company, says, "We brought in a woman named Martha Field, who had a master's degree in textile technology, and she revolutionized the O&P interface category. She applied more current technology and our prosthetic socks expanded into categories for virtually every O&P application."

Another transforming event came from the federal government, which established Medicare (for the elderly) and Medicaid (for the indigent) in 1965. The impact was huge. "All of a sudden, a whole lot of people had access to orthotics and prosthetics," says Sam Hamontree. "People who were never able to have O&P care could now get it. It made an enormous difference to the growth of the industry."



An OALMA/ABC National Assembly program.



caption to come

Further steps toward professionalism

OALMA changed its name to the American Orthotic and Prosthetic Association in 1966, a move that reflected a growing emphasis on professionalism. As part of that trend, leaders in AOPA and ABC began to discuss the possibility of forming a membership organization for practitioners.

"A group of 10 of us agreed that we wanted to do this," recalls Sam Hamontree, then president of ABC. "We went back to the boards of ABC and AOPA and asked for both financial and human resource support to get it going."

The rehabilitation process as seen in the 70's.

The new American Academy of Orthotists and Prosthetists was founded in November 1970; its first president was Ralph (Ronney) Snell, CPO. The new group, with the mission of furthering "the scientific and educational attainments of professional practitioners in the disciplines of orthotics and prosthetics," held its first annual meeting in 1974, along with two days of scientific presentations on O&P.

Meanwhile, ABC created a new body, the Educational Accreditation Commission (EAC) in 1972. Its purpose was to provide guidance and accreditation to schools as they developed programs for training orthotists and prosthetists. EAC developed basic educational standards and implemented a process of accreditation. EAC operated under the auspices of ABC until 1991, when it became a separate body under the oversight of the National Offfice and was renamed the National Commission on Orthotic and Prosthetic Education (NCOPE). NCOPE incorporated in 1999 and was granted 501(c)3 tax status in 2000.

Beginnings of BOC

Oddly enough, one of the results of ABC's push to increase professionalism in the industry was the formation of a rival certifying organization. The Board for Orthotic Certification (BOC) began in the late 1970's when ABC was increasing educational requirements for certification.

According to Donald O. Fedder, Dr. P.H., former CEO of BOC, "Some of the manufacturers were concerned that if licensing was adopted, they would lose a whole class of their customers," he says. "HEIDA [the Health Industries Distributors Association, a major distribution business for hospitals and large pharmacies] started the National Board for Orthotic Certification in response to this concern."

In the 1980s, the Board for Orthotic Certification became a separate entity from HEIDA and, says Fedder, was immediately sued by ABC and its Canadian counterpart to prevent BOC's use of the term "certified orthotist."

"We ran out of money and settled," says Fedder. "BOC and the other organizations agreed not to disparage each other's programs, and BOC agreed not to use the term certified orthotist." BOC added a prosthetist examination in the mid 1990s.

On to the '80s and '90s

O&P companies and researchers continued to bring new technology to the industry, with a focus on carbon fiber technologies and myoelectrics.

For example, in 1980, Hosmer Dorrance Corp., now a subsidiary of The Fillauer Companies, introduced an externally powered prosthesis called the NY electrically powered elbow. In 1981, a team led by Dr. Steve Jacobson at the University of Utah's Center for Engineering Design invented the Utah Arm, a myoelectric arm for above-elbow amputees.

The decade of the '80s saw big steps—literally and figuratively—in the development of prosthetic feet. The Flex-Foot was introduced in 1983 by inventor Van Phillips, who had become a below-knee amputee in 1976. Frustrated by his prosthesis, Phillips enrolled in prosthetic design at Northwestern University and went to work for the Center for Biomedical Design at the University of Utah in Salt Lake City.

Working with Dale Abildskov, an aerospace engineer, Phillips developed the Flex-Foot using carbon fiber, a material previously used only for military purposes. The lightweight

caption to come

foot allowed users to walk farther and longer, and its introduction at the 1984 Paralympics sealed its success.

In the mid 1980s, Ohio Willow Wood introduced the Carbon Copy II foot. "This was revolutionary because it was the first conventional lightweight energy-storing prosthetic foot that used carbon composites," explains Lisa Arbogast.

The Seattle Foot debuted in 1985. Developed by orthopedist Dr. Ernest Burgess, founder of Prosthetics Research Study in Seattle, the energy-storing foot used a patented spring made of a new plastic developed by DuPont to help the patient push off in taking a step.

Invention onslaught

Greg Gruman of Winkley Orthotics and Prosthetics points to the 1980s as a time when the shift from exoskeletal to endoskeletal prostheses really took hold. "The trend actually started in the 1970s," he says, "but it was considered experimental at first. Companies were really taking a risk, because many people didn't think endoskeletal prostheses were durable or strong enough.

"The old exoskeletals required much more workmanship and craftsmanship and labor. With endoskeletals, modular components could easily be fitted, aligned and realigned, repaired, replaced, and updated."

Advances in fiber technology during the 1980s and '90s showed up in Knit Rite's products, which began to incorporate high-stretch yarns and wicking yarns, as well as silver fiber that kills bacteria and reduces odor.

In 1987 Fillauer began teaching the 3-S, Silicone Sleeve Suspension method in Chattanooga, the precursor to flexible suspension liners. Says Gerry Stark, "The original shuttle lock was a simple metal rod that 'shuttled' side to side through a metal ring attached to the liner. The spring catch shuttle lock mechanism with a serrated distal plunger pin did not come about until 1989. Since then, Fillauer has developed 19 different distal end attachments."

In 1995, Ohio Willow Wood brought out the Alpha Liner. Arbogast says, "This was the first fabric-covered gel interface system in the industry--worldwide. The gel on the inside of the liner gave amputees a sense of freedom they had never experienced before, and since it was introduced, the growth of our company been phenomenal."

The last year of the 20th century saw the introduction of the C-Leg in the United States, a prosthesis developed by Otto Bock Healthcare, headquartered in Duderstadt, Germany. The C-Leg, which uses microprocessors and sensors that mimic the stability and step of a natural leg, ushered in the computer era for O&P.

The new millennium

As in other industries, the increase in the rate of technological change in O&P during the past few years is staggering. The development of new materials w and processes, including computer-aided design and manufacture and laser measurement acquisition systems, seems to be a daily occurrence.

Like others, the O&P industry is becoming increasingly global, with companies that originated in Europe and elsewhere assuming a worldwide presence. Traditional mom-and-pop facilities have given way to large corporations in many cases, but family-owned businesses continue to be passed down to successive generations. The profession is beginning to focus on the importance of research, and educational standards are rising. As AOPA celebrates its 90th birthday this year, it's clear that many more chapters are waiting to be written in the history of O&P.

Deborah Conn is a freelance writer based in Falls Church, Va.

Take a Walk Through Time

If you've enjoyed the stories and photos in this two-part series, come see the "Walk Through Time" exhibit at AOPA's National Assembly in Las Vegas, Nev., Sept. 17-21 at the Venetian Hotel, Resort and Casino.

Two walls of panels, one at each end of the Exhibit Hall, will describe the history you've read in more detail. You'll get to test your knowledge of O&P trivia, try to identify old photographs, and examine a timeline of O&P history. Come see how far O&P has come at the same time you're hearing about its future.

For more information about the Assembly, see the article "Always Something New" on p. XX of this issue.