TECHNOLOGY TRANSFER

From Benchtop to Marketplace

For more than four decades many of the technologies developed at ORNL have been transformed into practical goods and services that serve as the basis for the creation of new companies. Now institutionalized as a part of the Laboratory, ORNL's technology transfer program and the economic growth it generates are "downstream" by-products of basic scientific research. Indeed, since April 2000 30 new companies, including many in the Oak Ridge region, have been created with technologies licensed at ORNL.

A representative example of ORNL's technology transfer is found in the area of detectors, sensors, and scanners. In 1960 ORNL's John Neiler, Jack Gibbons, Hal Schmitt, and Phil Miller founded ORTEC. This spin-off firm built and sold detectors of charged particles (alpha particles, fission fragments) based on silicon surface barrier detection technology developed at the Laboratory. ORTEC, now part of AMETEK, has been a world leader in commercial radiation detection instrumentation. The creation of ORTEC and Tennelec—an Oak Ridge company founded in 1960 by Edward Fairstein to make signal amplifiers for ORTEC detectors and now owned by Canberra—marked the first significant examples of technology transfer from ORNL.

In the mid-1970s ORNL researchers developed a technique to analyze noise in reactors. General Electric marketed the technique, which could measure stability in boiling-water reactors.

Position-sensitive detectors that measure the angle and energy at which particles bounce off a target were devised for physics and neutron-scattering experiments. Such detectors, invented by Cas Borkowski and Manfred Kopp, were commercialized.

ORNL physicists and electronics experts have played a major role in developing detectors and electronic components to search for evidence that the beginning of the universe (quark-gluon plasma) has been mimicked at the Department of Energy's Brookhaven National Laboratory. The PHENIX detector development work provided the springboard for ORNL to develop a significant capability in creating low-power, mixed-signal integrated circuits. Several small start-up companies in detection and measurement markets have taken advantage of this capability through licensing agreements and collaborations.

Like bicycle tires, nuclear power plants have check valves, devices that allow gas or liquid to flow in only one direction. In the 1980s Howard Haynes, Don Casada, and Dave Eissenberg devised magnetic technologies that nonintrusively monitor the motion of check-valve internal parts, permitting identification of valves that are degraded or operating in an abnormal way that could lead to premature failure. Framatome ANP licensed the ORNL technology, which is the basis of a system sold to diagnose problems in power plant check valves.

Framatome ANP also licensed Haynes and Eissenberg's innovation for breaking down electrical signals from motors and generators into such fine detail that even small changes in the condition of a machine can be detected. Framatome ANP has sold more than 50 signal analysis systems for improving equipment safety and reliability and predicting equipment lifetime to customers including Boeing, Eli Lilly, General Motors, NASA, and electric utilities.

In the 1990s ORNL engineers led by Randall Wetherington developed the world's most advanced underwater acoustic measurement system. The U.S. Navy is using this technology to determine whether its next-generation submarines will operate at a level of quietness required to escape detection by enemy subs.

Michael Paulus and Shaun Gleason developed the MicroCAT scanner, an X-ray computed tomography system for mapping internal defects and organ changes in experimental mice. Their company, ImTek, has sold 17 scanners to universities and private firms for cancer, genetics, and drug discovery research.

Thomas Thundat showed that microcantilevers—miniature diving boards similar to probes in atomic force microscopes—could be used to detect environmental pollutants, explosives, and chemical signals for disease. This ORNL technology has been licensed to Graviton, for chemical and biochemical sensors soon to be marketed; Sense Technologies, for detecting unexploded ordnance at airports; and Sarcon, for infrared imaging.

The commercial success of these and dozens of other ORNL technologies underscore the belief that scientific discovery can bring a variety of benefits to the public we serve.

When a microcantilever [illegible] that adsorbs a particular [illegible] and its natural rate of vibration will change, altering the angle of deflection of incoming laser light.

Outdoor FACE experiment shows sweetgum trees grow faster in enriched CO_2 atmosphere

ORNL techniques help semiconductor firms find problems causing defects in computer chips

Vice President Gore speaks at Spallation Neutron Source groundbreaking

Alloy studies lead to retrofitted or new boilers in paper industry, making it safer

Multifunctional biochip devised to rapidly detect diseases in humans