THE HALO® INSIDER

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Jack Kirkland HPLC Pioneer

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When Tim Langlois and Joe DeStefano started AMT, Jack Kirkland was quick to come out of retirement and become AMT's first R&D manager. Jack was a friend and colleague of both Tim and Joe but, more importantly, he was a world-famous pioneer in the field of liquid chromatography. Jack is credited with inventing many of the early HPLC packing materials that started the growth of liquid chromatography into the most popular analytical technique that it is today. Working together Jack, Tim, Joe, and later, Jason Lawhorn, developed the first Fused-Core® particles designed for small molecule separations and named them HALO®. Without the guidance and knowledge provided by Jack, this product line might never have happened and AMT would have been a much different company.

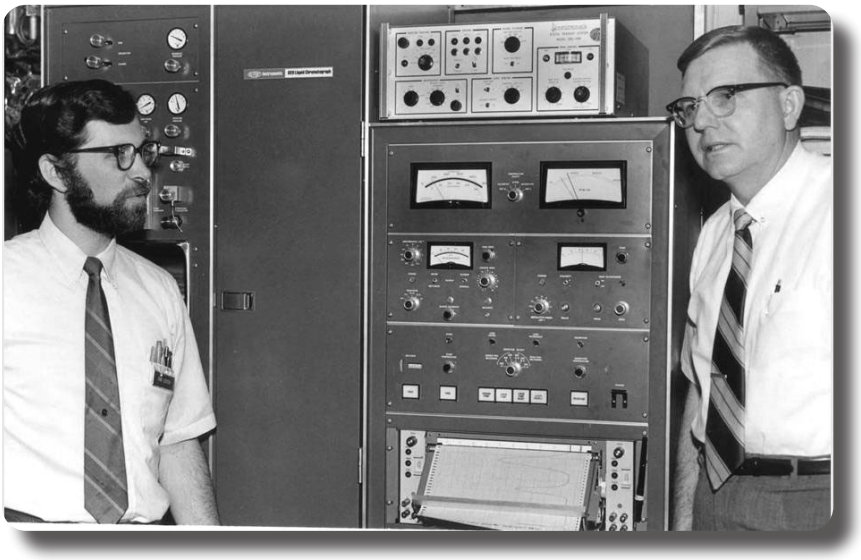
Five years ago, we lost Jack at age 91. His career achievements were many. Below is a summary of some of them. His contributions to the company are numerous and incalculable but his friendship and mentorship outweigh all else. In the mid-1960s Jack built on his earlier work developing core-shell packings for gas chromatography to develop processes to produce spherical particles by performing controlled layer-by-layer depositions of silica sols onto glass beads utilizing electrostatic attractions. The resulting ~ 30 µm, 1000 Å pore size superficially porous particles had 1-micron thick porous layers on flow-impervious cores and were commercialized by the DuPont Company under the trade name Zipax®. These superficially porous packing materials were major improvements to the similarly sized, but irregularly shaped totally porous silica, diatomaceous earth, and alumina particles and ion-exchange resins that were typically used until that time. He followed this particle innovation with the first polysiloxane bonded phases (Permaphase®) which greatly increased the application of HPLC to more sample types and made techniques such as gradient elution and reversed-phase HPLC practical for routine laboratory use.

In the early 1970s, Jack worked with Ralph Iler, a world-famous silica expert and a fellow employee at DuPont, to develop processes for manufacturing spherical small-particle (5-microns), totally porous packings, introducing a major leap forward in the performance of HPLC columns. Later trade-named Zorbax® by DuPont, these small-particle packings greatly increased resolution, decreased separation times of HPLC columns and, for the first time, HPLC rivaled GC as the method of choice for separation applications. Totally porous, small-particle packings then replaced superficially porous packings as the packing of choice until HALO® came along 30 years later.

Jack followed these developments of HPLC packings by collaborating with Lloyd Snyder and a co-worker at DuPont, Joe Glajch to establish HPLC method optimization protocols. He then continued work with Joe Glajch to develop acid and temperature-stable, sterically protected bonded phases (StableBond®) and with a visiting scientist at DuPont, Jurgen Kohler, to develop another major technology breakthrough, the first "Type B" silica support (Zorbax® RX silica), which vastly reduced the acidity of silica surfaces and thereby improved the HPLC of basic compounds. He also worked with another DuPonter, Wallace Yau, to develop the concept of using bimodal pore size packing materials for performing size exclusion chromatography over four orders of magnitude in solute size.

In the 1980s, Jack changed his major research interest from HPLC to Field Flow Fractionation. Jack teamed with Wallace Yau to develop equipment and techniques for applying sedimentation, thermal, and cross-flow FFF to separate

DEDICATION JACK KIRKLAND, FATHER OF SPP



Jack on the right with Bob Leitch (left) in front of one of the first commercial HPLC instruments

large molecules such as proteins and synthetic polymers, and to particles such as viruses and silica sols. The DuPont Company introduced a commercial instrument using sedimentation FFF in the late 1980s but it was not a success. Recently, there has been renewed interest in FFF and new instruments and applications have been reported.

Jack's interest in HPLC returned in the early 1990s when he co-founded Rockland Technologies with Joe DeStefano. During this period, and later with Hewlett-Packard (later became Agilent Technologies), he developed more HPLC column and packing technologies, including densely bonded phases (Zorbax® XDB phases) and bidentate bonded phases designed for high pH operation (Zorbax® Extend) and later the 5 µm Poroshell® 300 SPP for separating high molecular weight molecules such as synthetic organic polymers and natural proteins.

Jack's retirement in 2001 was short-lived as he returned to product development for Advanced Materials Technology in 2005 where he was instrumental in the development in 2006 of the latest major leap in column packing technology, very small (2.7 microns) core-shell particles for UHPLC performance at HPLC pressures. Our very own HALO® particles.

Besides these major product developments, Jack contributed to the scientific community by helping to educate future generations of chromatographers through his books, lectures, scientific publications, and teaching courses. He continually demonstrated an ability to find and collaborate with many technical experts in a variety of fields to integrate technologies to accomplish his goal of finding new and better separations technology. He used his high volume of informative writing and lectures to inform a wide audience of chromatographers of his scientific results to stimulate interest and research into new and improved products and technologies for separations. He was extremely generous of his time, often seeking out students and young scientists to talk to and encourage. He was a mentor to many people in the companies for which he has worked, helping them to solve problems and establish their scientific careers. His philosophy about research was often expressed when he would say to others: *"There is no such thing as a bad experiment. Even if you fail to achieve what was expected, you have learned something by doing it."*

His contributions to science and our family at AMT are missed.
Thank you Jack.