



Distinguished Alumnus

James H. Philip, ME(E), MD '73

James Philip, ME(E), MD '73, is an anesthesiologist at Brigham and Women's Hospital and professor of anaesthesia at Harvard Medical School. He holds bachelor's and master's degrees in electrical engineering from Cornell University and for seven years was a research and development engineer at Hewlett Packard Medical, which later became Philips Medical.

It was as an engineer that Dr. Philip became interested in product development to solve the needs of physicians. He decided to go to medical school to try to identify those needs and create products to make a positive impact in healthcare.

At Upstate, Philip was drawn to the field of anesthesia due to its technical nature and electrical engineering orientation. He completed residency in anesthesia at Peter Bent Brigham Hospital at Boston, which later became Brigham and Women's Hospital, and then joined the faculty, where he remains today.

Philip's career has focused on engineering the medical environment to make it safer, more effective, and less costly. His areas of clinical expertise and innovation are inhalation agent kinetics, intravenous fluid and circulatory system dynamics, and clinical monitoring and his work in each

area has generated advances in clinical care and produced medical products used around the world.

Inhaled anesthetic agents are the mainstay of anesthesia practice, but understanding and effectively using these drugs is a challenge to many. To address that, Philip created Gas Man®, a computer simulation, textbook, and learning environment that teaches students, clinicians, and researchers the kinetics, clinical use, and economics of inhaled anesthetics. He has continued to refine Gas Man software to keep pace with technology and understanding of these drugs and

their delivery and has taught anesthesiologists worldwide using Gas Man for more than 20 years.

Gas Man simulations led Philip to originate the anesthetic technique called Volatile Induction and Maintenance of Anesthesia (VIMA), a practical application of anesthetic kinetics by which anesthesia can be administered with a single inhaled drug. This technique is now used worldwide.

His second area of innovation lies in the understanding of intravenous fluid infusion dynamics. Philip developed the science of high-flow fluid infusion using a device he created that produces constant pressure to drive liquid infusion into veins. Equipment using this constant pressure infusion principle has become the standard of care for fluid resuscitation worldwide.

Another major innovation was the measurement technique called hydraulic resistance, which assesses the quality of intravenous infusion by varying flow rate and measuring the resulting pressure change. Importantly, this technology detects when infusions infiltrate from veins into tissues, saving patients discomfort and harm. The culmination of that work is the IVAC-Alaris-Carefusion Signature



Beverly and James in front of a display case containing his inventions—the Signature Pump and InfusOR—at top right



Dr. Philip with his wife, Beverly Philip, MD '73, and their sons, Noah (left) and Benjamin (right)

Edition™ Infusion Pump. In another application, he collaborated with researchers in the Harvard Department of Orthopedic Surgery to investigate the causative mechanism of avascular necrosis of the hip, for which they were presented the Hip Society's Stinchfield Award.

In the field of circulatory system dynamics, Philip identified the need for an accurate continuous monitor of cardiac output in the operating room and ICU, resulting in the multi-frequency thermol dilution cardiac output monitoring technique embodied in the Edwards Lifesciences Vigilance® Continuous Cardiac Output Monitor. This monitor is the gold standard for invasive and noninvasive measurement and monitoring of cardiac output for research and is used in clinical care worldwide.

In the area of monitoring and safety, Philip and colleagues developed the first commercially

successful clinical CO₂ monitor, Life-Watch™ by Perkin Elmer. Life Watch added continuous carbon dioxide monitoring to the Perkin Elmer mass spectrometer that previously provided intermittent measurement of gases in some operating rooms. Today continuous carbon dioxide monitoring is considered one of the great safety breakthroughs, having reduced anesthesia mortality by 99%, making anesthesiology the safety benchmark by which other specialties are judged.

Among his many honors, Philip was awarded the Society for Technology in Anesthesia Gravenstein Award for lifetime achievement creating clinical technologic products and safety in anesthesia in 2017 and the ASA-SEA Distinguished Educator in Anesthesiology Award in 2021. He has served as an invited visiting professor more than 250 times.

Philip retired from clinical practice in July 2018 and now focuses on research and mentorship at his own and other hospitals and universities. He also spends one day per week supporting technology efforts in the Mass General Brigham HealthCare System Department of Anesthesiology and the Department of Biomedical Engineering as senior consultant and anesthesiologist.

Throughout his career, Philip has collaborated with his wife and anesthesia colleague, Beverly Philip, MD '73, who he met his first year of medical school. The couple raised two sons, Noah, a psychiatrist at Brown University, and Benjamin, a neuroscientist at Washington University in St. Louis. Avid travelers and adventurers, they are certified in-line skating instructors and current senior members of the National Ski Patrol at Bromley Mountain, Vermont.