Debra A. Schwinn, M.D., has been selected to receive the American Society of Anesthesiologists 2007 Excellence in Research Award. This purpose of this award is to recognize an individual’s work that represents a body of original, mature, and sustained contribution to the advancement of the science of anesthesiology. Dr. Schwinn not only embodies these attributes but also provides an example to us all of how a physician–scientist uniquely contributes to the overall mission of advancing patient care.

Dr. Schwinn, a native of Ohio, completed her undergraduate studies in chemistry at the College of Wooster, Wooster, Ohio, in 1979. In 1983, she was awarded her M.D. degree from Stanford University, Stanford, California. Her internship and residency were performed at the University of Pennsylvania (Philadelphia), followed by a clinical cardiac anesthesiology fellowship completed in 1987 at Duke University, Durham, North Carolina. This extraordinary medical training would have met most people’s definition of a long road. However, for Dr. Schwinn there was still 5 yr to go. She recognized excellence in the laboratory of Robert J. Lefkowitz, M.D., a Professor of Medicine and Biochemistry at Duke whose work has pioneered elucidation of the molecular properties and regulatory mechanisms controlling the function of G protein–coupled receptors. G protein–coupled receptors provide the signal transduction mechanism for a plethora of ligands well known to anesthesiologists, including adenosine, γ-amino butyric acid, vasopressin, histamine, dopamine, norepinephrine, epinephrine, acetylcholine, serotonin, and others. Dr. Schwinn, while continuing her work as a cardiac anesthesiologist, immersed herself in the Lefkowitz laboratory from 1987 to 1992, learning the molecular biologic techniques that would support the balance of her investigative career. During this time, Dr. Schwinn made fundamental discoveries in the field of α1-adrenergic receptors (α1-ARs) that would allow her to bring translational molecular biology into the cardiac operating room, as well as extension to studies of benign prostatic hyper trophy,1 neurologic disease,2 and ophthalmology.3 After 5 yr of research training, Dr. Schwinn established the Molecular Pharmacology Laboratory within the Department of Anesthesiology at Duke. She rapidly rose through the academic ranks to be promoted to Professor in 1998 within the Departments of Anesthesiology, Surgery, and Pharmacology/Cancer Biology.

Dr. Schwinn’s scholarly achievements are extraordinary. She has published well over 100 peer-reviewed articles, many of which have been in Anesthesiology, Circulation Research, Circulation, Journal of Biological Chemistry (of which she is an editorial board member), Nature, Proceedings of the National Academy of Sciences, and so on. The National Institutes of Health has funded Dr. Schwinn’s work since 1990, most of that time with multiple simultaneous awards. She served as a full-term member of two successive National Institutes of Health study sections from 1993 to 2000. Her performance was outstanding. Therefore, she was selected to serve as a member of the National Institute of General Medical Sciences Advisory Council from 2000 to 2004. In addition, she has served a full term as a grant reviewer and member of scientific advisory committee for the Foundation for Anesthesia Education and Research, sits on the International Anesthesia Research Society Board of Trustees and the Scientific Board of the Sarnoff Cardiovascular Research Foundation, and provides leadership roles in multiple philanthropic funding agencies. Her excellence has been recognized by her induction into the Institute of Medicine of the National Academies, Alpha Omega Alpha, and the Association of American Physicians. She has broad international recognition as both a research scientist and an individual who can translate research discoveries into clinical practice. Of
note, Duke recently opened an Institute for Genome Sciences and Policy. Among many prominent cardiovascular scientists at Duke, most being in the departments of Medicine and Surgery, Deb was selected as the Program Director for Cardiovascular Genomics. These sorts of activities have had enormous impact in making the field of anesthesiology not only a player, but even more so a leader in cutting edge genomic science.

Dr. Schwinn has not overlooked the importance of science education. Duke has a peculiar system in the medical school in which third-year students spend a full year doing research. Deb has served as the director of this program and has helped to formalize the process for students who wish to spend a second year in the laboratory to earn a master's degree in addition to the M.D. In her own laboratory, she has provided hands-on training of a plethora of individuals, spanning the range of teaching high school students to serving as the primary mentor of basic science doctoral candidates. Most of her many trainees have remained in research careers, with numerous individuals having achieved investigator status. Duke recently opened a new medical school in Singapore, and Dr. Schwinn led the development of research training of medical students, mirroring the system in place in Durham. Dr. Schwinn has also authored peer-reviewed articles pertaining to research training, the most recent of which was a seminal article in Anesthesiology proposing a solution to the very real problem of the declining number of formally trained physician-scientists in our specialty.

Despite all of this, Dr. Schwinn’s greatest achievements have been in her laboratory and in how she has translated those discoveries into anesthesiology and the broader field of clinical medicine. Her laboratory combines molecular pharmacology approaches with translational human functional genomics to study mechanisms underlying regulation of adrenergic receptors in health and disease. She focuses primarily on regulation of the G protein-coupled \( \alpha_1 \)ARs, which she discovered as a research fellow in Dr. Lefkowitz’s laboratory. Because these receptors are important in smooth muscle and the heart, diseases such as hypertension and myocardial hypertrophy are the main foci. However, it is of note that her discoveries have also had major impact in the field of urology because of the relevance of her signal transduction work to understanding the pathogenesis of benign prostatic hypertrophy.

Three \( \alpha_1 \)AR subtypes exist \( (\alpha_1a, \alpha_1b, \text{ and } \alpha_1d) \). Over the years, Dr. Schwinn was involved in cloning complementary DNAs encoding each of these subtypes from both animal and human sources and demonstrated that \( \alpha_1d \)ARs are present and functional in human vasculature (particularly resistance vessels and coronary arteries) and modified by age. To understand mechanisms underlying these changes, her laboratory examines regulation of the human \( \alpha_1d \)AR at transcriptional and protein levels in the presence and absence of hypoxia. Within this context, she is pursuing an emerging line of investigation that may play a key role in the uniqueness of the \( \alpha_1d \)AR in continued signaling in the presence of agonist in situations where other G protein-coupled adrenergic receptors, such as \( \alpha_1b \) and \( \alpha_1d \), concurrently desensitize and/or down-regulate signaling. Her laboratory has demonstrated that the \( \alpha_1d \)AR, but not the \( \alpha_1b \)AR, undergoes constitutive internalization in the absence of agonist, suggesting that internalized \( \alpha_1d \)ARs may use alternative trafficking pathways. Recent data suggest that this may be due to compartmentalization of the \( \alpha_1d \)AR to lipid-enriched regions of the plasma membrane termed lipid rafts, thereby restricting coupling of the receptor to distinct subsets of intracellular signaling molecules. Dr. Schwinn is using the power of chromatin immunoprecipitation and microarray analysis to extend these studies to elucidate dynamic transcriptional mechanisms that reprogram in cellular gene expression. Because of these studies, her laboratory was asked to write the definitive \( \alpha_1d \)AR UCSD–Nature molecule page (Nature, 2006; doi: 10.1038/mp.a000007.01).

Despite her already extraordinary training, Dr. Schwinn recognized an emerging field that could have dramatic implications for anesthetized and/or critically ill patients. In 2000, she received extramural funding to conduct a sabbatical at the National Human Genome Research Institute (Bethesda, Maryland) to be trained to perform functional genomics research. She transferred this knowledge to her laboratory, with recent emphasis on study of the role of genetic variability on human cardiovascular disease. Specifically, the role of naturally occurring single nucleotide polymorphisms and insertions/deletions of \( \alpha_1 \)AR signaling is being investigated. These studies use classic genetic approaches; large-scale genomic sequencing, single nucleotide polymorphism identification, and analysis for association with disease in highly phenotyped populations. It also includes investigating the biology of each single nucleotide polymorphism in terms of \( \alpha_1 \)AR signal transduction pathways by using microarray and proteomics approaches.

This work has positioned Dr. Schwinn to postulate that reproducible perioperative stress represents a unique paradigm for understanding the effects of acute and chronic stress. Of particular relevance to anesthesiology, her group is studying how genetic variability can be used to predict (and intervene to prevent) adverse outcomes in the perioperative period. An explosion of articles resulted from this work, including the role of functional genomics in perioperative sepsis, stroke and cognitive decline, renal failure, and myocardial responses to cardiopulmonary bypass. This work ushered in a new era of the operating room as a laboratory for study of human responses to physiologic stress, the implications of which will likely transform our approach to patient care for decades.

Anesthesiology, V 107, No 3, Sep 2007
Dr. Schwinn is a leading scientist in cardiovascular medicine bringing into anesthesiology the science of genomics, but at the same time making the specialty of anesthesiology a leader in this field. She does all of this while being a physician, mentor, mother of two daughters, a friend of most if not all scientists in our specialty, a communicator to clinicians, and a role model to which virtually all of us aspire. Deb's vision for the role of science in anesthesiology is prescient. She is a giant in our specialty, and we are thrilled she has received the 2007 Excellence in Research Award.

However, her journey does not end here. To be sure, Dr. Schwinn had incredible collaborators who allowed her vision to become reality. I am certain that they all take pleasure in her receipt of this award because it reflects their work as well. At the same time, Dr. Schwinn has recently accepted a new challenge, that of being Professor and Chair of the Department of Anesthesiology at the University of Washington (Seattle). We hope her new colleagues also take pride in Dr. Schwinn’s receipt of the American Society of Anesthesiologists 2007 Excellence in Research Award. In her, they will find a tireless soul dedicated to breakthrough medicine based on rigorous scientific inquiry and discovery. They will also find in her an individual who has walked the walk, making the personal sacrifices necessary to be equipped to make these discoveries, and one who realizes that anesthesiologists have not only a mandate to provide patient care, but also a responsibility to advance it.

References