Special **Feature**

JAMIA

Presentation of the Morris F. Collen Award to Donald A. B. Lindberg, MD

DANIEL R. MASYS, MD

The American College of Medical Informatics is an honorary society established to recognize those who have made sustained contributions to the field. Since its founding in 1984, 170 fellows have been elected to the College. Its highest award, for lifetime achievement and contributions to the discipline of medical informatics, is the Morris F. Collen, MD, award. Dr. Collen's own efforts as a pioneer in the field stand as the embodiment of creativity, intellectual rigor, perseverence, and personal integrity. And so it is that the College gives its highest recognition to those whose attainments have, throughout their careers, substantially advanced the science and art of medical informatics. The College is proud to announce that the 1997 recipient of the Collen award is Dr. Donald A. B. Lindberg.

Born of Swedish–American parents in 1933, Don Lindberg grew up in Brooklyn, New York. An honors graduate of the Polytechnic Prep School in Brooklyn, he attended Amherst College, where he majored in applied mathematics and graduated *magna cum laude* in 1954. He returned to New York to attend the College of Physicians and Surgeons of Columbia University, and received his Doctor of Medicine degree in 1958.

After an internship and residency in pathology at Columbia Presbyterian Medical Center, he joined the pathology department faculty of the University of Missouri School of Medicine in Columbia, Missouri, in 1960. With the support of Dr. Vern Wilson, Dean of the School of Medicine, young Dr. Lindberg was soon engaged in the unprecedented activity of computer-izing the clinical pathology laboratory services for the medical center. He developed applications to improve the speed, quality, and consistency of laboratory results reporting. He developed expert systems to assist in pathologic diagnosis and began publishing articles in the field that would become known as Medical Informatics. By the mid-1960s, he had garnered an international reputation as an expert in the use of computers in medicine.

The establishment of the federal Regional Medical Programs (RMP) initiative in the 1960s provided Dr. Lindberg and the University of Missouri RMP coordinator, Dr. Arthur Rickli, the opportunity and the resources to develop a number of innovative computer applications. Among these were an Automated Patient History Acquisition System that enabled patients to directly enter current symptoms into a computer terminal, employing graphics to reduce language barriers between patients and their physicians.

The RMP center in Columbia provided information services to regional affiliates via "FACTBank," an acronym for Fast Access to Current Text, using electromechanical access to stored microfiche of page images, searchable by Medical Subject Headings. It represented the state-of-the-art in electronic document storage and retrieval, providing access to any of thousands of microfilmed pages within 15 seconds. The Missouri RMP was also one of the first to operationalize the automated interpretation of electrocardiograms acquired via telemetry over phone lines.

Dr. Lindberg's application of expert systems algorithms led to the development of CONSIDER, an early differential diagnostic program, and later the criteria table form of knowledge representation and reasoning upon which AI/Rheum—a diagnostic expert system in Rheumatology—was built. AI/Rheum is particularly notable for its ability to educate its clinician users

to make the proper observations via a rich variety of textual and image-based reference information.

Dr. Lindberg rose through the academic ranks during a 24-year career at the University of Missouri, becoming Professor of Pathology and Director of the Information Science Group. As his international reputation in the field of medical information systems grew, Dr. Lindberg was appointed to review groups and advisory committees of the National Institutes of Health, including the Board of Scientific Counselors of the National Library of Medicine. Thus, in 1984, the NIH in its nationwide search for a scholar and administrator chose Dr. Lindberg to be the Director of the National Library of Medicine.

When Don Lindberg arrived at NLM, the institution had a 148-year history of steady service to health professionals. Medline was primarily a medical librarian's tool, available during regular business hours, Eastern time, five days a week. The new director began his relentless pursuit of increased availability, ease of use, and broader constituencies for NLM's online information services. Within a few months, Medline was available seven days a week, essentially 24 hours a day. To make the searching of NLM databases more user friendly, he introduced Grateful Med, a forms-based searching program for microcomputers, which marked the beginning of an era of new products notable for technical innovation and whimsical names.

He sought best guidance for the future directions of the Library, and convened more than 120 experts in libraries, medical informatics, and health professions education to create a 20-year long-range plan for the NLM as a world resource. From the dozens of recommendations of the long-range planning committees, several emerged as top priorities for the institution.

The information systems support for modern molecular biology and the nascent Human Genome Project were recognized by Dr. Lindberg as essential tools for the coming era of molecular medicine, and he led the Library in creating a National Center for Biotechnology Information. NCBI is now home to GenBank, the national DNA sequence databank, and has developed a spectacularly successful set of search tools and algorithms in use worldwide.

Recognizing the potential provided by modern computing and communications technologies for representation of biologic structure, Dr. Lindberg endorsed the idea of a national reference dataset of three-dimensional anatomic data, the Visible Human project, which has become the focal point for development of interactive tools for education, research, and health
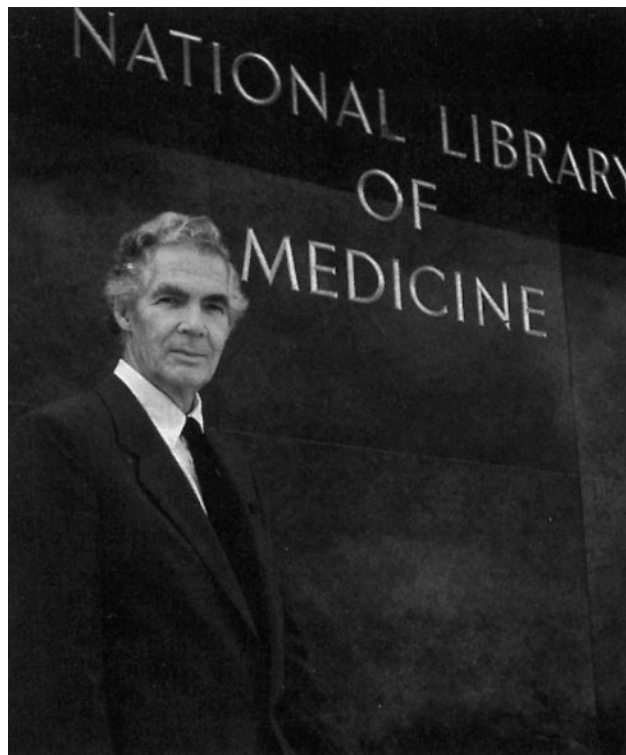
care delivery. The project has captured the eye and imagination of public media and presages an increasing number of services for the lay public as well as for health professionals.

These visible advances of modern information systems are built on an invisible but essential infrastructure, and infrastructure figures prominently in the Lindberg-directed National Library of Medicine. There is infrastructure support for academic medical centers to weave their information resources into a seamless fabric, via IAIMS, the Integrated Advanced Information and Management Systems grant program. Dr. Lindberg's personal vision for improving the infrastructure for representing medical meaning and coding is the goal of a decade-long investment in the Unified Medical Language System (UMLS). The UMLS provides an electronic rosetta stone in the form of a Metathesaurus linking a growing array of computerized naming and coding systems, and a variety of tools to build systems that recognize the common medical meanings behind hundreds of thousands of words, terms, and codes.

In 1991 the White House selected Dr. Lindberg to be the first director of the national High Performance Computing and Communications program—a federal research and development initiative to build the next generation of computing devices, high speed digital networks to connect them, new software technologies

to take advantage of their capabilities, and education and training in their use. Under Lindberg's direction, the program grew to more than a billion dollars and involved nearly a dozen different federal agencies. Importantly, this new initiative provided expanded funding for investigator-initiated medical informatics research in areas such as telemedicine and electronic patient records. Dr. Lindberg made sure that the national investment in advanced technologies for defense, aerospace, and the physical sciences was complemented by an investment in technologies for improving the nation's health.

To garner the resources for the expanded national agenda of medical informatics research and development, Dr. Lindberg has been a persuasive proponent for health informatics in the U.S. Congress. The success of his efforts is reflected in a National Library of Medicine budget that has nearly quadrupled in size, from 43 million in 1983 to 160 million dollars annually.

For many years Dr. Lindberg was the U.S. national representative to IMIA, the International Medical Informatics Association. He was a central figure in the creation of the American Medical Informatics Association and was named its first President in 1991.

Emerson wrote: "The scholar is that man who must take up into himself all the ability of the time, all the contributions of the past, all the hopes of the future." But scholarship alone does not explain the outstanding achievements of a professional career spanning nearly 40 years. For sustained success, scholarship must be guided by other qualities. Those who know Don Lindberg best reflect on the qualities which have made his career so rich with accomplishment.

Joyce Mitchell, Associate Dean, University of Missouri School of Medicine: "At Missouri he's considered to be 30 years ahead of his time, and people who knew him when he was at Missouri still say that. What he was envisioning 30 years ago is just now taking place in terms of the use of computers in clinical care. One thing that he did while he was there that was just remarkable was to build the first clinical laboratory system in the whole world. And he did that because he saw there was a need to take care of patients better and to distribute data to the folks who needed the data to take care of patients. If you look now, it is a common part of our lives: everybody in the entire world has a lab system. He could envision that and create it, make it a reality as the first person in the world.

"He can do that with other things as well. When he first started talking about the UMLS, he could see how that was a rate-limiting step in how you handle clinical information, and get started on the first steps, and pull the people around him to make that a reality, even though he knew that it was going to be at least a 20-year quest."

Mary Lindberg: "Perhaps his childhood, his upbringing, and his Swedish heritage have had something to do with that. He's very tolerant. He accepts people as they are, for the qualities they have, and has managed to surround himself with people of various talents and persuasions. I think it's been part of the secret of what he's done. And he never forgets, whether he is in a department of pathology or in an administrative position, or now as Director of the National Library, that the patient is important. That struck me about him when I met him as a medical student; his concern was for the patient. He did go into an academic field and has not been clinically involved in the sense of being a hands-on physician, but he is first and foremost a physician and his concern is for the patient. And when he collects the medical literature of the world, he's doing it with the idea of helping the physicians who are directly aiding and helping the patient.

G. Octo Barnett, 1996 Morris F. Collen Award winner: "Since the early 1960s it has been my pleasure to work with Don in a variety of organizational activities—in AMIA, in the NIH, and in the National Library of Medicine, particularly in the development of electronic medical record systems and the UMLS. I've always been impressed by the imagination and ingenuity he has demonstrated in identifying exciting technologic initiatives, by the graciousness with which he led committee activities, by his willingness to change his position after such discussions, and by the candor he demonstrates in identifying certain positions as nonsense. In the last decade Don has played a very important part, demonstrating political savvy and very strong leadership in guiding a very important and enormously influential National Library of Medicine.

"Don is a very warm and generous friend whose support and collaboration have been very important to me over these past 30 years. I am delighted that ACMI has chosen to honor him with this award."

Burton J. Hendrick wrote that: "The great glory of modern medicine is that it regards nothing as essential but the truth." In pursuit of that truth, and the means to make it ever more widely available to others, the contributions of Donald Lindberg to the field of medical informatics and to all humanity make him a fitting recipient of the 1997 Collen Award for lifetime achievement.

American College of Medical Informatics

FELLOWS, 1997

R. Scott Evans, MS, PhD
R. Scott Evans is in the Department of Medical Informatics at Intermountain Health Care and is the Director of Research for the Department of Clinical Epidemiology, LDS Hospital, and a Research Associate Professor in the Department of Medicine, University of Utah. Dr. Evans received his BS degree in Biology and MS degree in Microbiology/Parasitology from Brigham Young University. He received his PhD in Medical Biophysics and Computing from the University of Utah.

His major experience and interests have been in the design, development, and evaluation of computerized tools for the selection and management of anti-infective agents, computer methods to identify and reduce adverse drug events, computerized methods to identify patients needing isolation, and computerized methods to identify and reduce hospital-acquired infections. A number of these computerized tools are clinically operational at several hospitals at Intermountain Health Care.

He was a finalist and third place winner in the Student Paper Competition, 1984, Eighth Annual SCAMC. In 1992, he won the Best Paper on an Application, Sixteenth Annual SCAMC, and in 1993 he received the Priscilla M. Mayden Award for outstanding contribution to the field of Medical Informatics. In 1997, he received the Oslers Cloak Excellence in Caring and Curing Award from Intermountain Health Care. Dr. Evans was on the Fall AMIA Program Committees in 1995 and 1997 and the AMIA Awards Committee.

Stanley M. Huff, MD
Stanley M. Huff is a Senior Medical Informaticist at Intermountain Health Care and an Associate Professor (Clinical) in Medical Informatics at the University of Utah School of Medicine in Salt Lake City, Utah. Dr. Huff received his BS degree in Chemistry from Brigham Young University and his MD degree from the University of Utah.

Immediately after completing his residency training, he worked for two years with AT&T Bell Laboratories in Columbus, Ohio. He is currently working on the design and implementation of vocabulary services and the database architecture for a lifetime patient data repository. His academic interests center on medical vocabularies, clinical information models, and medical database architectures. He was one of the participants in the early UMLS (Unified Medical Language System) contracts and is a contributing member to the HL7 (Health Level Seven) and IEEE Medix standards groups, and he is currently one of the co-chairs of HL7's Vocabulary Special Interest Group. He was also a founding member of the LOINC (Logical Observation Identifier Names and Codes) committee.

Dr. Huff is a fellow of the American Board of Pathologists and of the College of American Pathologists. He is also a member of the American Medical Informatics Association (AMIA) Standards Committee, a member of the Board of Directors of HL7, and an advisor to the SNOMED (Systematized Nomenclature of Human and Veterinary Medicine) Editorial Board.
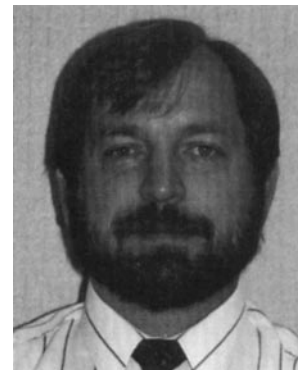
Suzanne Bakken Henry, RN, DNSc
Suzanne Bakken Henry is Associate Professor, Nursing and Medical Information Science, at the University of California, San Francisco. She serves on the Executive Committee of the MIS Program and heads the focal area in Knowledge Management. Dr. Henry received her BSN from Arizona State University. Following her

doctoral degree in nursing science from the University of California, San Francisco, she completed a NLM-funded Postdoctoral Fellowship in Medical Informatics at the Section on Medical Informatics, Stanford University School of Medicine.

Dr. Henry's research has focused on the intersection of informatics and quality management. Early studies described the clinical decision-making process using computer simulations. More recent efforts have focused on concept representation for computer-based systems in order to provide the infrastructure to link patient problems, interventions, and outcomes across settings and over time. She is currently conducting comparative evaluations of selected coding and classification systems using clinical data extracted from patient records. The findings of her research have targeted areas for the development and refinement of coding and classification systems.

Dr. Henry was selected as a Fellow, American Academy of Nursing in 1995. She serves as a member of the American Nurses Association Steering Committee on Databases to Support Clinical Nursing Practice and as a consultant to the SNOMED Editorial Board. She is a member of the AMIA Awards Committee, Standards Committee, and Nursing Working Group, as well as the editorial board of the Journal of the American Medical Informatics Association.

Cornelius Rosse, MD, DSc

Cornelius Rosse is a Professor of Biological Structure at the University of Washington School of Medicine. He received his BSc degree in anatomy with honors, and his medical degree (MB, ChB) from the University of Bristol, England. The same university also granted him both the MD and DSc degrees in recognition of his research on hematopoietic cell differentiation and lymphocyte biology.
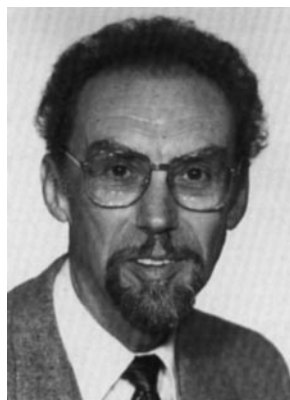
Dr. Rosse has combined his biological research with medical education and administration. Until recently, he was Chairman of the Department of Biological Structure at the University of Washington. He has published three textbooks related to anatomy, taught anatomy at the Royal College of Surgeons of England, and has worked extensively with the National Board of Medical Examiners. More recently, Dr. Rosse has focused his research interests on knowledge representation in anatomy. He established the Digital Anatomist Program at the University of Washington, which has served as an impetus and prototype for the National Library of Medicine's Visible Human Project. In collaboration with investigators from computer science, informatics, and clinical medicine, the laboratory pursues spatial and symbolic modeling of anatomy in parallel. These knowledge sources are integrated and made available on-line for anatomy education as a test bed for an information system.

Dr. Rosse is a member of the Biomedical Library Review Committee of NLM, serves on the Executive Board of the National Board of Medical Examiners and has been elected a Fellow of AAAS. Dr. Rosse's contributions to education have been recognized by numerous teaching awards at the University of Washington, and he has also received the national Distinguished Basic Science Teacher Award from the Alpha Omega Alpha Honor Medical Society sponsored by the Association of American Medical Colleges.

J. Marc Overhage, MD, PhD

J. Marc Overhage is an Associate Professor of Medicine at Indiana University School of Medicine and an Investigator at the Regenstrief Institute for Health Care. Dr. Overhage is also a staff physician at Wishard and Indiana University Hospitals. Dr. Overhage received his MD and PhD from the Indiana University School of Medicine.

After completing fellowship training in medical informatics with Dr. Clement J. McDonald and in clinical pharmacology, Dr. Overhage served as an Information Advisor for Eli Lilly & Company, a major pharmaceutical and information company. Dr. Overhage has more than 15 years of computing experience, including developing one of the earliest commercial object-oriented database systems and real-time data acquisition and control systems. He has applied this experience to the evolution of the Regenstrief Medical Record System, which has been used for more than 25 years and is evolving toward a city-wide electronic patient record. While he has broad interests in the use of informational interventions to modify physician behavior, development of rule-based systems to implement guidelines and protocols has been a major focus

of Dr. Overhage's research for the last seven years. Using these tools he is completing two large-scale studies of implementing guidelines in the outpatient and inpatient settings, which examine the impact of process measures, costs, and patient outcomes.

Dr. Overhage is a member of the American Medical Informatics Association Meetings Committee.

Isaac S. Kohane, MD, PhD

Dr. Kohane is an Assistant Professor in Pediatrics, Harvard Medical School, and an Associate in Medicine in the Division of Pediatric Endocrinology at Children's Hospital in Boston. He is also a Research Affiliate at the MIT Laboratory for Computer Science and a founding member of the Dana Farber Cancer Institute Center for Outcomes and Policy Research. He received a ScB with Honors in Biology at Brown University. He pursued research in knowledge-based systems at the Clinical Decision-Making Group, MIT Laboratory for Computer Science, under the auspices of the Boston University MD, PhD program, and he received both degrees.

He completed a residency in Pediatrics at Children's Hospital in Boston followed by a fellowship in Pediatric Endocrinology. He became director of the Children's Hospital Informatics Program (CHIP) in 1995. In 1991, Dr. Kohane completed implementation of the Clinician's Workstation (CWS) at Children's Hospital, which has been in operation since then in several specialty clinics. The CWS has been successfully used for several clinical research projects in addition to its primary role as a pediatric record system. Dr. Kohane was chief architect of the World Wide Web Electronic Medical Record System (W3-EMRS), which has been the foundation of several multi-institutional implementations and collaborations. He was instrumental in organizing a collaboration among several Boston teaching hospitals, the Boston EMR Collaborative, which has led to the identification of several significant problems in multi-institutional data sharing as well as the articulation of a model confidentiality policy. Other contributions in medical informatics include research into temporal reasoning and trend detection.

Dr. Kohane has chaired the two most recent spring symposia on Artificial Intelligence in Medicine at Stanford University, sponsored by the American Association for Artificial Intelligence.

INTERNATIONAL ASSOCIATES, 1997

Ove B. Wigertz, DSc, DMedSc

Ove Wigertz is Professor and Chairman of the Department of Medical Informatics and a member of both the Health Science Faculty and the Engineering School Faculty at Linköping University, Linköping, Sweden. He received a Master of Electrical Engineering degree and a Doctor of Science degree in Automatic Control from the Royal Institute of Technology, Stockholm. He also received a Doctor of Medical Science degree in Physiology from Karolinska Institute, Stockholm.

Dr. Wigertz has held positions as teacher, research associate, and associate professor at the Royal Institute of Technology, Stockholm, and at Karolinska Institute, Stockholm, until his move to Linköping University in January 1973 to set up one of the first Departments of Medical Informatics in Europe. Other commissions have been as Chairman of the Swedish Association of Academic Professors (1991–94), Chairman of the Department of Biomedical Engineering, Linköping University (1993–96), Chairman of the Swedish Society of Biomedical Physics and Engineering (1975–77), and Chairman of the Swedish Society of Medical Informatics (1978–81).
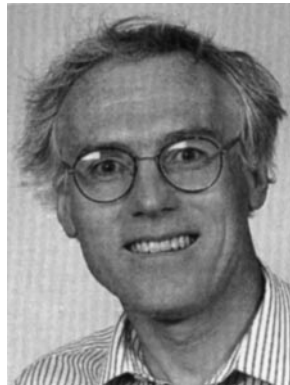
Dr. Wigertz has done considerable basic and applied research in biomedical engineering and instrumentation, cardiovascular and work physiology, and several

medical informatics fields, including knowledge-based representation, knowledge-based systems, and controlled vocabularies.

In 1967, Dr. Wigertz received the annual Erna Ebeling Fund Prize from the Swedish Society of Medical Sciences for achievement in the design and development of instruments and systems for physiologic research. Together with research associates and students, he won the Gold Medal (the prize for one of the three best papers) at MEDINFO 80 in Tokyo, Japan, as well as the Gold Medal (the prize for the best paper) at MEDINFO 95 in Vancouver, Canada.

Jeremy Wyatt, MD, MRCP, DM

Dr. Jeremy C. Wyatt is Senior Fellow in Health and Public Policy, University College, London, and Director of the Health Knowledge Management Programme, School of Public Policy, UCL. He is also Senior Fellow, Centre for Statistics in Medicine, Institute of Health Sciences, Oxford University. He holds a bachelor's degree in psychology and physiology and a doctorate of medicine from Oxford University, and a bachelor's degree in medicine and surgery from London University, and he is a member by examination of the Royal College of Physicians of Glasgow.

He was previously Consultant in Medical Informatics to the Imperial Cancer Research Fund, 1992–97, and Medical Research Council Visiting Fellow, Section for Medical Informatics, Stanford University, 1991–92. A practicing physician, his main interest is developing and evaluating decision-support systems and other methods for disseminating and implementing clinical knowledge. He has conducted three randomized-controlled trials of knowledge dissemination techniques and founded a Cochrane Collaboration review group in this area. He is also keen for greater clinical involvement in the development and procurement of clinical information systems. He collaborates closely with clinical epidemiologists, medical statisticians, psychologists, and computer scientists, other interests include computer tools to assist in the design and management of clinical trials and factors limiting the clinical uptake of prognostic models.

Dr. Wyatt is an editorial adviser to the British Medical Journal; an adviser to the National Audit Office and Audit Commission; team leader, Technology Fore-Sight exercise; vice chair, British Medical Informatics Society; member, U.K. Health Technology Assessment Commissioning Board; and former member of the Royal College of Physicians Medical Informatics Committee. He serves as an adviser to the Council of Europe and European Union on evidence-based medicine and oncology telematics. Dr. Wyatt is President of the European Society for Artificial Intelligence in Medicine. He was keynote lecturer at the NSF/NLM workshop on evaluation of clinical knowledge systems in 1995 and was Deseret Foundation scholar, LDS Hospital, in 1992. He is a member of the Programme Committee of the 9th World Conference on Medical Informatics.

Jean-Raoul Scherrer, MD, PhD

Professor Scherrer is a certified internist who received his MD from Geneva University Medical School in 1959. He became laureate of the Geneva Medical School for his doctorate thesis in 1965.

From 1967 to 1969, he collaborated in research in physics at Brookhaven National Laboratory in New York. He became a lecturer on medical informatics at the Geneva University Medical School in 1971 and a full professor at the same medical school in 1979. He is Director of Medical Informatics at the Geneva University Hospital. He has participated in the development of the DIOGENE system since the design stage in the 1970s. Dr. Scherrer is also interested in mathematical modeling and automatic encoding of clinical narratives.

Dr. Scherrer was Executive Vice President of IMIA (International Medical Informatics Association) in charge of Working Groups and Special Interest Groups from 1993 to 1996: In January 1996, he became President of the EFMI (European Federation of Medical Informatics).

AMIA President's Awards

The AMIA President's Award recognizes individuals who have devoted unusual personal effort to the development of the association and the field of medical informatics.

The recipients for 1997 are:

W. Edward Hammond, Head of the Section of Medical Informatics at Duke University, in recognition of his dedicated work in the development of and promotion of medical informatics standards and his work as the champion of AMIA members and Working Groups.

Clement J. McDonald, Director of the Regenstrief Institute and Distinguished Professor of Medicine at Indiana University School of Medicine, in recognition of his seminal work in development of medical informatics standards. His pioneering work in developing and promoting HL-7 and organizing the LOINC standards group have been key to the sharing of electronic medical information.

William W. Stead, Associate Vice Chancellor for Health Affairs and Director of the Informatics Center at Vanderbilt University, in recognition of exceptional dedication and service to AMIA as the founding and continuing editor of JAMIA, the Journal of the American Medical Informatics Association. Under his leadership, JAMIA has become "the" reference journal for medical informatics.