ASIP Opens PathologyEducation.org for Online Learning

The American Society for Investigative Pathology began development in mid-2008 of an online learning management system (LMS) in cooperation with Conference Archives, Inc., a Philadelphia firm specializing in electronic event capture in the biomedical sciences. The initiative stemmed from ASIP's 2008 Long Range Plan, which emphasized the need for the society to develop more educational products to serve members and to create instructional resources on pathobiology. In January 2009, ASIP released the first of its online learning products at www.pathologyeducation.org.

The first products in the LMS are an online version of ASIP's journal-based Continuing Medical Education (CME) program, whereby credits are earned from reading and answering questions about selected articles from The Journal of Molecular Diagnostics and The American Journal of Pathology. The journal 'print' CME program has been available for 3 years with increasing popularity; particularly The Journal of Molecular Diagnostics - a joint publication of ASIP and the Association for Molecular Pathology (AMP). Participants can now locate the CME articles from convenient links in the LMS and refer back to questions, save and submit partial results, receive automatic feedback about answers, complete all tests at once or make continuous progress online throughout the year.

Introducing the system, Executive Officer, Mark E. Sobel, MD, PhD, said, "The LMS is a new learning experience with interactive materials and tools. Our goal is to offer the latest instruction in experimental pathology and related disciplines, including investigation into the pathogenesis, classification, diagnosis, and manifestations of disease. To that end, we offer educational activities that include journal articles, conference recordings, and member faculty lectures, online quizzes, and CME certification."

ASIP also plans to use the system to serve the educational needs of its divisions (the International Society for Biological and Environmental Repositories (ISBER) and the Pulmonary Pathology Society (PPS)) and its managed societies (AMP, the Association of Pathology Chairs (APC), and the Intersociety Council for Pathology Information (ICPI)). Next in development: AMP is adapting its successful Molecular Genetic Pathology Review Course to the LMS; designing an extensive pre-test, recording the live sessions, and making them available for future resale or review in the online system.

(continued on page 10)
Support ASIP Career and Educational Initiatives for Young Investigators...

- **ASIP General Education Fund**
  ASIP provides our young experimental pathologists with challenging educational and professional career development initiatives focused on new discoveries in pathogenesis and its ultimate influence on disease prevention and health care. Your gifts go a long way toward providing opportunities for our youngest ASIP members!
  [www.asip.org/donations/GenEdFund.htm](http://www.asip.org/donations/GenEdFund.htm)

- **Pathology Leadership Fund (PLF)**
  The PLF supports symposia and workshops at the ASIP annual meetings, trainee travel awards, educational initiatives, and merit awards. The PLF fund was established in 2004 by the leadership of ASIP. Join with your distinguished colleagues today by making a contribution to the PLF today.
  [www.asip.org/PLF.htm](http://www.asip.org/PLF.htm)

- **Abraham David Sobel - ASIP Education Fund**
  Mark Sobel, ASIP’s Executive Officer, established the Abraham David Sobel - ASIP Education Fund to perpetuate his late father’s lifelong interest in supporting education and training for young scientists. Funds are used to support education and mentorship of trainee members of the ASIP. The fund sponsors A.D. Sobel - ASIP Education Fund Scholar Awards for trainees to attend the ASIP Annual Meeting at Experimental Biology and the ASIP 2009 Summer Academy.
  [www.asip.org/awds/sobel.htm](http://www.asip.org/awds/sobel.htm)

To make a donation online, please go to [www.asip.org](http://www.asip.org), login to the Members-Only area, and click on “Make a Donation”

ASIP is a non-profit education 501(c)(3) organization. Your contributions to the ASIP General Education Fund, the Pathology Leadership Fund, and the Abraham David Sobel - ASIP Education Fund are tax-deductible under current IRS regulations. Please consult your tax accountant for deductibility.
2009 Gold-Headed Cane Awarded to Nicholas K. Gonatas, M.D.

Dr. Nicholas Gonatas, Professor of Pathology and Laboratory Medicine at the University of Pennsylvania School of Medicine, will receive this year’s ASIP Gold-Headed Cane Award. This is the ultimate honor granted to an ASIP member in recognition of long-term contributions to pathology, including outstanding research and teaching and overall excellence in the field.

Dr. Gonatas’ major research contributions have been on the structure and function of the Golgi apparatus, first defining its structure during mitosis and its interdependence with microtubules. He then defined the role of the trans-Golgi network in the retrograde transport of ligands from the plasma membrane to the organelle. These studies also first demonstrated the value of lectin-peroxidase conjugates in studies of neuroanatomical pathways, now a widely used technique. Dr. Gonatas is now utilizing modern biochemical and molecular tools in his research and has demonstrated a novel protein associated with the Golgi, as well as fragmentation of the Golgi, perhaps linked to the pathogenesis of amyotrophic lateral sclerosis (ALS).

Among his accomplishments, he has made numerous other fundamental observations to human neurological disease. Dr. Leonard Jarett writes that his “work has always revolved around the Golgi apparatus and he has made significant contributions to our understanding of the trafficking to and from that area of the cell and its role in ALS as well as Alzheimer’s disease.” He was the first to relate congenital myopathies to mitochondrial lesions. His studies of experimental allergic encephalomyelitis, which may be relevant to multiple sclerosis and other human neuropathies, first demonstrated the pathogenic role of T lymphocytes as well as the genetic control of susceptibility. All told, his findings have marked a career of major and continuing contributions to the structure and function of neural cells and the mechanisms underlying their diseases.

Dr. Gonatas led the Neuropathology section of the Department of Pathology and Laboratory Medicine at the University of Pennsylvania from 1964 to 2000, providing outstanding diagnostic service and working effectively with neurologists and neurosurgeons in the care of patients with neurological disease. The Neuropathology Training Program he established and directed at the University of Pennsylvania has attracted the most promising individuals in this discipline for well over 25 years, including such well known neuroscientists as Gambetti, Trojanowski, Messing, Oberholzer, Levy, and Hickey. He has organized and led the teaching of fundamental neuropathology and related neurobiology to medical students throughout his time, and has trained numerous pathology residents and fellows who have gone on to leadership roles in academic medicine and other institutions.

In describing Dr. Gonatas, Dr. William F. Hickey, M.D. of Dartmouth Medical School, a former mentee, says he is "most complex". Explaining, "He is charming, witty, gregarious and animated. He loves to joke and tease, and can balance joviality with seriousness and compassion. He cares deeply about people and takes a personal interest in the success and well-being of those who work with and for him. Yet, at the most fundamental level his most penetrating traits are an insatiable curiosity and an inquisitive mind." He goes on to say, "These have permeated every aspect of his career. His quest to understand the function of the neuronal Golgi apparatus and its role in neurological disease is an effort spanning decades. He has gained successes in persistent enigmas, rather than applying the technology du jour to random or trivial questions. He is a superb scientist and a critical intellect."

Dr. Gonatas earned his B.A. from Anatolia College, Thessaloniki, Greece and his M.D. from Thessaloniki University Medical School. He completed an internship in Internal Medicine at the Jersey City Medical Center and completed his residency in Pathology at the Montefiore Hospital in New York. Among his many honors, he was awarded the ASIP Rous-Whipple Award in 1994.

Dr. Gonatas will receive the Gold-Headed Cane, a mahogany cane topped with a 14-karat gold head and engraved band, at the ASIP Annual Meeting in New Orleans on April 20, 2009.

ASIP to Honor George Michalopoulos, M.D., Ph.D. with the Rous-Whipple Award

The Rous-Whipple Award is presented to a senior scientist with a distinguished career in research who has advanced the understanding of disease and has continued productivity at the time of the award. Dr. George Michalopoulos is the 2009 recipient of this honor.

Dr. Michalopoulos has made several significant contributions to the field of hepatocyte biology and is known for at least 2 pioneering contributions: first for his work on the importance of matrix (collagen gels) in maintaining epithelial integrity and functions and second for the foundations he laid that resulted in the discovery of hepatocyte growth factor (HGF), a multifunctional cytokine with mitogenic, motogenic and morphogenic manifestations.

His pioneering work paved the way for the novel concept of the dependence of epithelial cells on extracellular matrix. He began the use of type 1 collagen for hepatocyte culture and his very first paper describing this work became an ISCI Citation classic.

(Continued on page 4)
Several aspects of the role of HGF in liver growth have been determined by his group: 1) HGF protein is consumed from stores in the extracellular matrix until new HGF becomes available from synthesis of new protein; 2) administration of HGF to livers of normal rodents causes massive proliferation of hepatocytes; 3) HGF receptor, c-Met is activated within 30-60 minutes after partial hepatectomy, thus documenting the active involvement of HGF at the early stages of the regenerative process; and 4) RNA interference with c-Met abolishes the proliferative activities of hepatocytes seen in the rat 24 hours after partial hepatectomy. His most recent work utilizes liver conditional nulls and RNA interference to study the role of β-catenin and HGF, respectively.

"George truly lives and breathes research, has done so for his entire career, and will continue to do so for many years to come." an apt comment made by Harriet C. Isom, Ph.D., Assistant Director of Penn State Cancer Institute, after citing Dr. Michalopoulos's active involvement in FASEB's summer research conferences. He has organized and co-directed these conferences held every other year since 1988, and has led workshops and discussion groups on liver research. Dr. Isom adds that Dr. Michalopoulos' research continues to break ground in the area of stem cell biology of the liver. He began publishing studies in 2005 showing hepatocytes and biliary epithelial cells can act as facultative stem cells for each other. These new stem cell studies "actually recapitulate and expand, using current methodology and terminology (stem cell), basic findings from more than twenty years ago."

Dr. Michalopoulos earned his M.D. at Athens University Medical School, Athens, Greece and his Ph.D. from the University of Wisconsin, Madison. He completed a residency in pathology at the University of Wisconsin.

Dr. Michalopoulos will present his award lecture on "Liver Regeneration" on Sunday, April 19, 2009 at the annual meeting of the American Society for Investigative Pathology. Wisconsin, Madison. He completed a residency in pathology at the University of Wisconsin.

Dr. Feany will present her award lecture on "New Approaches to Neurodegeneration." She has developed and characterized fly models that remarkably summarize human counterparts. These models have been used to define the principal mediators of α-synuclein, tau and amyloid neurotoxicity and to define and isolate suppressor and enhancer mutations associated with neuronal degeneration.

In addition to being an outstanding research pathologist, Feany spends 25% of her time performing clinical work as a neuropathologist. She is well funded with several grants from NIH and currently holds a Senior Scholar Award from the Ellison Medical Foundation. She is active in both graduate student and medical student education at Harvard. In listing Dr. Feany's many research achievements, Dr. Peter M. Howley, M.D., Chairman of the Department of Pathology at Harvard Medical School, describes her as "a star" and goes on to say, "I anticipate that she will become one of the leaders in American Pathology in the future."

Dr. Feany earned her Ph.D. for Harvard University and her M.D. from Albert Einstein College of Medicine. She completed residency training and a neuropathology fellowship at Brigham & Women's Hospital.

Dr. Feany will present her award lecture on "New Approaches to the Pathology and Genetics of Neurodegeneration" and will receive the Outstanding Investigator Award on Monday, April 20, 2009.

Vinay Kumar, M.B.B.S., M.D., FRCPath to Receive the 2009 ASIP Robbins Distinguished Educator Award

Dr. Feany's major research contributions center on her development of Drosophila models of neurodegenerative disease, reflecting the hypothesis that toxic gain of function is related to abnormal expression of normal and mutant forms of proteins linked to these disorders, i.e., α-synuclein (Parkinson's disease), tau and beta-amyloid (Alzheimer's disease) and superoxide dismutase (ALS). She has developed and characterized fly models that remarkably summarize human counterparts. These models have been used to define the principal mediators of α-synuclein, tau and amyloid neurotoxicity and to define and isolate suppressor and enhancer mutations associated with neuronal degeneration.

Vinay Kumar, M.B.B.S., M.D., FRCPath to Receive the 2009 ASIP Robbins Distinguished Educator Award

One of three newly established meritorious awards this year, the Robbins Distinguished Educator Award is named for Dr. Stanley Robbins, who was a pioneer of pathology education and a member of ASIP for over 50 years at the time of his death in 2003. This award, partially supported by an unrestricted grant from Elsevier, an ASIP Corporate Partner, recognizes individuals whose contributions to education in pathology have had a manifest impact at a regional, national, or international level. Dr. Vinay Kumar, Chair of the Department of Pathology at the University of Chicago, is the first recipient of this award.

As a scientist, Dr. Kumar was at the forefront of the research that led to the identification of Natural Killer (NK) cells. He not only was a pioneer in the field, but also has continued, through the years, to be a major contributor of studies that characterized and better defined the identity of NK cells and their role in transplantation and infections.

Dr. Kumar's most visible contribution to the teaching of Pathology is as a co-author and now lead author, of Robbins and Cotran Pathologic Basis of Disease and Robbins' Basic Pathology, as well as other books in this series. His involvement in these books spans more than twenty years and much of their success...
can be attributed to him. Dr. Abul K. Abbas, M.D., Professor and Chair of the Pathology Department at the University of California San Francisco, who has also worked on this project, remarks, "His ability to balance fundamental principles and new advances has made him a remarkably successful "torch-bearer" for the Robbins and Cotran legacy."

In addition to his tireless efforts to these leading textbooks, Dr. Kumar has been an outstanding hands-on teacher of Pathology. He served as the Ashworth Professor of Pathology at the University of Texas Southwestern Medical School from 1986 to 1994, and later as the Vernie A. Stembridge Chair in Pathology from 1994 to 2000. Here, Dr. Kumar developed an innovative Pathology course that became a model for interactive teaching. He received numerous teaching awards while in Dallas, and because of his leadership role, he was appointed Associate Dean for Medical Education, a position he maintained while supervising an active, NIH-funded research group. Since his appointment as Chair of the Department of Pathology at the University of Chicago in 2000, Kumar has re-invigorated the department, strengthened its faculty and residency program and enhanced its educational and research activities. Thanks to Dr. Kumar’s efforts, the Residency Training Program at the University of Chicago is among the best in the country.

Dr. Kumar is past president of ASIP and past member of the APC Council, working with dedication to define the goals of these societies and developing educational opportunities for their members. It is also important to note that, since 2006, Dr. Kumar has been a member of a unique AAMC-HHMI committee charged with ensuring strong basic science in medical curricula. He is the only pathologist on the committee and plays a leadership role in this national initiative.

Dr. Kumar received his B.Sc. from Fergusson College, Poona University, India, his M.B.B.S. (equivalent to MD in the United States) from Punjab University Medical College, Amritsar, India and his M.D. in pathology (equivalent to PhD in the US) at All India Institute of Medical Sciences, New Delhi. After completing his residency training in anatomic pathology and hematology at the All India Institute of Medical Sciences, Dr. Kumar emigrated to the United States and began his academic career at the Boston University School of Medicine in 1972.

Dr. Kumar will receive the Robbins Distinguished Educator Award on Monday, April 20.

Jonathan H. Lin, M.D., Ph.D., 2009 Recipient of ASIP Excellence in Science Award

The ASIP Excellence in Science Award is a new ASIP award that recognizes outstanding achievements at the earliest stages of a career in biomedical research. Accomplishments include, but are not limited to, publications and presentations as well as volunteered service to the ASIP or other professional societies, institutional committees, and the pathology community. This award is funded through the generous support of the A.D. Sobel-ASIP Education Fund. Dr. Jonathan H. Lin is the first recipient of this year’s award.

Dr. Lin received his undergraduate degree from Harvard University. He then went on to earn his Ph.D. in Neuroscience (1999) and his M.D. (2001); both from Columbia University. He completed a pathology residency at Brigham & Women’s Hospital and the University of California, San Francisco. He also completed an ophthalmic pathology fellowship at UCSF. He is currently an Assistant Professor of Pathology at University of California San Diego.

Building on his studies of unfolded protein response (UPR) with Dr. Peter Walter at the Howard Hughes Institute, Lin saw that the molecular behavior of the UPR that he observed in his cell culture studies could be extended to genuine protein misfolding disease in vivo. With this in mind, Lin began working with Matthew LaVail in the departments of Ophthalmology and Anatomy at UCSF to examine the role of the UPR in photoreceptor cell death due to misfolded rhodopsin expression, using animal models of retinitis pigmentosa (RP) developed in the LaVail lab. He demonstrated that these same signaling processes that controlled cell survival after protein misfolding in his tissue culture studies were also activated in multiple animal models of retinal degeneration due to misfolded rhodopsin expression in photoreceptors. This is a very important finding because, despite the extensive body of data that shows some RP-associated rhodopsins are misfolded it has been a mystery how these mutant rhodopsins lead to retinal photoreceptor cell death and ultimately blindness.

Lin’s findings provide an exciting molecular link between rhodopsin misfolding and photoreceptor cell death. He has begun a series of genetic experiments in which he is transferring the chemical and genetic tools he devised to control the UPR in cell culture into mice, with the intention of exploring how artificial manipulation of the UPR in animals affects retinal degeneration. His research was published in a full-length article in the journal Science. Lin is also a recipient of a prestigious K08 grant from the National Eye Institute.

Lin has started his own research group at UCSD where he will continue his studies into the role of the UPR signaling pathways in the pathogenesis of human diseases as well as develop a new molecular eye pathology service as part of the clinical enterprise. Dr. Marilyn G. Farquhar, Ph.D., Professor and Chair of the
Department of Cellular and Molecular Medicine at UCSD, has this to say of Dr. Lin: "As a colleague, Jonathan has been a real treat with whom to work. He brings tremendous enthusiasm, insights and new ideas that he wants to share with others. As evident by the multiple collaborators on his Science paper, Jonathan easily interacts with other researchers at all levels, whether by simply sharing data and reagents, or by coordinating joint experiments. Given the association of protein misfolding and UPR signaling in many diseases, Jonathan's professional endeavors will be a tremendous asset for the larger biomedical community."

In addition to his outstanding research accomplishments, Dr. Lin has contributed to the pathology discipline by his service as a reviewer for many journals, as a grant reviewer, as a participant in his residency program's interview process, and as the medical student editor of the Journal of the American Medical Association.

Dr. Lin will present his award lecture, "Endoplasmic reticulum stress in disease pathogenesis," on Saturday afternoon, April 18, 2009 and will receive his award on Monday, April 20.

Dr. Carlos S. Moreno, Ph.D.
Awarded the 2009 Cotran Established Investigator Award

The Cotran Established Investigator Award is a new ASIP Award that recognizes early career investigators with demonstrated excellence as an investigator with recently established or emerging independence and with a research focus leading to an improved understanding of the conceptual basis of disease. This award is named in honor of Ramzi S. Cotran, (1933-2000) a leader of pathology, formerly of Harvard Medical School and Brigham and Women's Hospital, and past president of ASIP. This award is provided through the partial support of Elsevier, an ASP Corporate Partner, through an unrestricted educational grant. This year, Dr. Carlos S. Moreno, Ph.D., Assistant Professor of Pathology and Laboratory Medicine at Emory University, is the first recipient of the Cotran Award.

Dr. Moreno's research has centered on bioinformatics and cancer biology, particularly as related to the development of novel therapies for cancer patients. Much of his work has focused on prostate cancer and the role of two transcription factors HOXC6 and SOX4, whose expression are strongly correlated with cancer progression. By manipulating expression of HOXC6 and SOX4, he has observed important effects on a number of key proteins that tie into Wnt and Notch signaling. In addition, he has linked SOX4 expression with worsening prostate cancer grade and as a regulator of apoptosis in cell lines. His lab is also focused on the continued identification of ovarian, breast, and brain cancers. Dr. Moreno has been very productive in his studies, having produced 20 publications since 2000 alone in highly respected journals such as Journal of Biological Chemistry, Molecular Biology of the Cell, The American Journal of Pathology, and Biotechniques.

The significance of Dr. Moreno's work is further underscored by his substantial track record of funding from federal and non-federal grant agencies, including the National Cancer Institute, the Susan G. Komen for the Cure Foundation, and Emory's own Winship Cancer Institute. The NIH has also continuously funded him for 15 years since he first received a Pre-doctoral NIH Fellowship in 1993. Since then, he has received a NIH Postdoctoral Fellowship and supplement, a K22 Career Transition Award and an R01 research grant. He has served on NIH Study Sections and has been an active member of ASIP since 2004, serving on the 2007 and 2008 Program Committees and as a session chair and minisymposium speaker.

Dr. Charles A. Parkos, M.D., Ph.D., Professor and Vice Chair of Emory's Epithelial Pathobiology Unit, says of Dr. Moreno, "His unique background makes him an especially valuable candidate for this award. Having trained in Genetics/Molecular Biology and Aeronautics/Astronautics provides a unique perspective in how he approaches the fields of investigative pathology, therapeutic oncology, and bioinformatics."

Dr. Moreno received his B.S. and M.S. from Massachusetts Institute of Technology and his Ph.D. in Genetics and Molecular Biology from Emory University.

He will present his award lecture, "Developmental pathways and transcriptional networks in prostate cancer progression," on Tuesday, April 21 and will receive the Cotran Established Investigator Award on Monday, April 20.

The Road to Becoming a Biomedical Physician Scientist in Pathology and Laboratory Medicine

Avrum I. Gotlieb, MDCM, FRCPC
Published by the American Society for Investigative Pathology (ASIP) and supported by the Intersociety Council for Pathology Information (ICPI)
Topics Include:
What is a Physician Scientist in Pathology and Laboratory Medicine? Why Choose Academic Pathology and Laboratory Medicine? Is a Physician Scientist Career for Me? Choosing a Training Path (PhD followed by MD, MD/PhD, Physician Scientist Training Programs, Post Residency Training) Choosing a Program, Choosing a Supervisor, Searching for Your First Job, Launching your Physician Scientist Career, Tenure, Promotions and the First Ten Years, The Institutional Challenge to Train and Maintain Physician Scientists, and Links and Resources. Order your free copy today by emailing: asip@asip.org, or view the online version at www.asip.org/CareerPath

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Topics Include:
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After adopting another temporary "continuing resolution", the U.S. Senate finally passed the FY 2009 omnibus appropriations bill (HR 1105) the evening of March 10th by a voice vote. Final adoption of the legislation came after more than 20 amendments were defeated, mostly along partisan lines. President Obama quietly signed the bill into law (Public Law 111-008) on March 11th, bringing the FY 2009 appropriations cycle to a close six months into the fiscal year.

Critical increases in funding for federal science programs are as noted in the following table:

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<td>National Institutes of Health</td>
<td>$30.3 billion</td>
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<td>+$937.5 million (+3.19%)</td>
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<td>Dept. of Energy Office of Science</td>
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<td>US Dept. of Agriculture:</td>
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<td>■ Agriculture and Food Research Initiative (AFRI)</td>
<td>$201 million</td>
<td>$192 million</td>
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<td>■ Agriculture Research Service (ARS)</td>
<td>$1.14 billion</td>
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<td>+30 million (+6.25%)</td>
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<td>Veterans Affairs Medical &amp; Prosthetics Research Program</td>
<td>$510 million</td>
<td>$480 million</td>
<td>+30 million (+6.25%)</td>
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Activity around the fiscal year 2010 budget is expected to continue as the House and Senate Budget Committees may mark-up separate versions of the FY 2010 Budget Resolution sometime the week of March 23rd. House Democratic leaders have previously said that they would like to debate the FY 2010 budget resolution on the floor the week of March 30th with votes possible around April 1, 2009. The budget resolution is an agreement between the House and Senate on a budget plan for the upcoming fiscal year and at least the following four fiscal years. Although it is a non-binding piece of legislation that is not signed by the President, it is important because it determines the overall spending levels that provide a framework for subsequent legislative action on the annual appropriations bills.

In other news, NIH's Budget Office has released its annual update of the Biomedical Research and Development Price Index (BRDPI), projecting that research inflation will be 3.8 percent during FY 2009, 3.3 percent each year from FY 2010 - FY 2012 and 3.4 percent during FY 2013 and FY 2014. The future year projections follow the pattern of general inflation projected by the U.S. Office of Management and Budget (OMB) for each year from FY 2009 through FY 2014.

In addition, NIH has created a new website (http://grants.nih.gov/recovery/) that contains information about how the agency will distribute the funds it received in the American Recovery and Reinvestment Act of 2009 (the "stimulus bill"). Separate funding announcements have been posted for:

- Construction/Renovation: Core Facility Renovation, Repair and Improvement - http://grants.nih.gov/grants/guide/rfa-files/RFA-RR-09-007.html (applications are due September 17, 2009)
Milestones...

**In Investigative Pathology**

by Richard G. Lynch, MD, Editor

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### Apoptosis: Programmed Cell Death

(1) Kerr, J.F.R., A.H. Wyllie, and A.R. Currie

*Apoptosis: A Basic Biological phenomenon with Wide-ranging Implications in Tissue Kinetics*

*British Journal of Cancer* 26:239-257, 1972

In their landmark publication, Kerr, Wyllie and Currie proposed that in addition to *necrosis* --cellular death that is a passive consequence of injurious agents such as ischemia, toxins, chemical and physical injury-- a second form of cell death existed with features of an active, inherently controlled process. They termed this other form of cell death *apoptosis*, a Greek word used to describe the "dropping off" or "falling off" of petals from a flower.

It had long been assumed that cells must be lost continuously from many normal tissues to balance cell division and that loss of cells accompanies atrophy and physiological involution of tissues and organs. The terms "necrobiosis" and "shrinkage necrosis" were sometimes used to refer to this "physiological cell death" which was more a concept than a characterized process. Pathologists had recognized a non-inflammatory form of lymphocytic cell death in thymus glands undergoing stress involution and in reactive germinal centers of lymph nodes and spleens. Pyknotic nuclear fragments within germinal center macrophages -so-called "tingible body macrophages"-- were readily detected by light microscopy, but their genesis and significance were unknown. Embryologists were familiar with a non-inflammatory form of cell death that occurred during morphogenesis such as when lumens develop in the solid anlagen of ducts and intestine, and when inter-digital webs are resorbed during embryonic development of fingers and toes. Endocrine pathologists recognized a non-inflammatory form of cell death in adrenal cortical cells following withdrawal of ACTH.

The work that led to the concept of apoptosis came from the Ph.D. studies of the Australian pathologist John Kerr. Working with a rodent model of ischemic-induced hepatic atrophy developed decades before by the American pathologist Peyton Rous, Kerr observed individual, scattered hepatocytes that contained small, round cytoplasmic masses and fragments of pyknotic chromatin. These were located in the non-necrotic liver adjacent to zones of experimentally-induced ischemic necrosis. Much was already known about the morphologic features of necrosis because it typically involves large zones of dead tissue visible to the unaided eye, thus making it easy to obtain samples for analysis. In contrast, the single cell changes present in apoptosis are microscopic lesions that typically occur in one percent or less of the cells. In a series of electron microscopic studies published beginning in 1965 Kerr showed that the small, round, cytoplasmic masses present in individual cells consisted of membrane-bound cellular fragments containing crowded, but structurally well-preserved organelles and remnants of pyknotic chromatin. These findings were distinctly different from the autolytic, degenerative, vacuolar changes seen in electron micrographs of necrotic cells. From a morphologic perspective, necrosis is conspicuous; apoptosis is subtle.

In 1970 Alistair Currie, an endocrine pathologist and Professor of Pathology at the University of Aberdeen became aware of Kerr’s work and invited him to spend a sabbatical in Scotland investigating the cellular changes that occurred during adrenal cortical atrophy. Kerr joined Currie and along with Andrew Wyllie, a Ph.D. student in Currie’s lab, they found the same ultrastructural changes in adrenal atrophy that Kerr had described in the atrophic liver. Allison Crawford, a developmental biologist and Ph.D. student in the Aberdeen pathology department at that time, drew the group’s attention to the extensive literature on "programmed cell death" that occurs during mammalian embryogenesis. Few outside of the field of developmental biology were aware of that literature and the published electron micrographs showing cellular changes during embryonic organogenesis that were the same as Kerr had observed in his liver model.

The application of electron microscopy by Kerr, Wyllie and Currie provided the resolving power to visualize the cellular changes that distinguished the two forms of cell death. Apoptosis in normal tissues characteristically affects scattered single cells, thus limiting the opportunity for detection and investigation by microscopy. Certain physiological and pathological conditions increase apoptosis and these provided the models studied by Wyllie, Kerr and Currie. In a series of publications they described the evolution of apoptosis in normal neonatal rat adrenal cortex, in embryonic mesenchyme, in both human and animal neoplasms, in the adrenal cortex following ACTH withdrawal, and in various types of liver and adrenal injury. In every case the ultrastructural features were essentially the same. The authors designated the small, roughly spherical or ovoid cytoplasmic fragments as *apoptotic bodies*. The electron microscopy studies showed that the structural changes in apoptosis take place in two distinct stages: the first comprises the formation of apoptotic bodies, the second their phagocytosis and degradation by other cells, sometimes macrophages, sometimes parenchymal cells, sometimes both.

Subsequent studies by Kerr provided a possible explanation for the high mitotic rate, but paradoxically slow growth of certain malignant tumors, such as human basal cell carcinoma. As a surgical pathology fellow I was taught to ignore mitotic figures in assessing malignant tumors because they were unreliable predictors of tumor growth. At the time that was sound advice because trying to predict the growth properties of a tumor knowing its mitotic index but not its *apoptotic index* was like trying...
to predict the overall rate of a chemical reaction knowing only the forward rate, but not the backward rate.

The importance of the publication by Kerr, Wyllie and Currie (1) was that it presented an integrating concept that fundamentally changed thinking about cellular kinetics. The authors proposed—and provided supporting evidence—that cell death by apoptosis was a normal, intrinsically controlled, active process that occurred during physiological and pathological conditions and played a complementary but opposite role to mitosis in the regulation of animal cell populations. It is amazing that their ground-breaking publication was essentially ignored for more than a decade. Then, in the late 1980s publications from numerous laboratories began to describe some of the biochemical and molecular genetic mechanisms involved in apoptosis. During the 1990s the field underwent an explosive rate of growth and it was difficult to pick up a biology journal that did not have at least one article on apoptosis.

Many of the historic details of the research by Kerr, Wyllie and Currie that launched the current era of apoptosis research and led to the molecular genetic studies that followed in laboratories around the world are nicely covered in the article by Cummings, Winterford and Walker (2). The 1972 publication by Kerr, Wyllie and Currie (1) is a prototype of a paradigm-changing article. The history of the discovery of apoptosis and the central role played by trainees working with seasoned mentors should be inspirational for graduate students and beginning investigators.

(2) Cummings, M.C., Winterford, C.M., and Walker, N.I.
Apoptosis

Are you Interested in Serving on a Scientific Interest Group Development Team?

ASIP currently offers 13 Scientific Interest Group (SIG) designations. If you are interested in serving on a team to activate your SIG area of interest (see list below), please email Tara Snethen, ASIP Senior Director of Society Services at tsnethen@asip.org to indicate your interest.

What do Scientific Interest Groups do?
SIGs provide an excellent forum to interact with your colleagues in focused listservs, and to develop scientific programming and companion social events at the ASIP Annual Meeting. For example, the Liver Pathobiology SIG team, under the direction of Paul Monga, MD, University of Pittsburgh, provides guidance in programming liver scientific sessions at the Annual Meeting. The team also initiated Club Hepatomania, which hosts the Highlights in Liver Pathology Session and Reception at the ASIP Annual Meeting.

What are the Current Scientific Interest Group Areas?

- Analytical and Molecular Morphology
- Cell Injury
- Gene Expression
- Inflammation/Immunopathology
- Informatics
- Liver Pathobiology
- Molecular Markers of Disease
- Neoplasia/Growth Regulation
- Neuropathology
- Pulmonary Pathobiology
- Tissue banking
- Vascular Pathobiology
- Veterinary Pathology

Interested in Pathology Informatics?
Participate in the ASIP INFORMATICS Scientific Interest Group
ASIP Annual Meeting at EB, New Orleans, LA
Tuesday, April 21, 2009, 7:30am-8:30am
Room #203, Convention Center

ASIP members with an interest in pathology informatics and the integration of clinical and translational science (e.g. NIH-CTSA Awards) are invited to participate in the ASIP Informatics Scientific Interest Group (SIG) development team beginning in 2009, under the direction of John A. Smith, PhD, Director of Laboratory Medicine at the University of Alabama, Birmingham Medical Center.

Do you have an interest in:
- Integrating pathology informatics with medical informatics at your institution?
- Developing informatics resources and expertise at your institution?
- Participating in a focused informatics listserv with other ASIP members?
- Meeting with other ASIP members with an interest in informatics at the ASIP Annual meeting at Experimental Biology?

If you are interested in participating in the Informatics SIG, please email Tara Snethen, ASIP Senior Director of Society Services at tsnethen@asip.org to indicate your interest.

Plan now to attend the first ASIP Informatics Scientific Interest Group Breakfast Meeting at the ASIP Annual Meeting at Experimental Biology on Tuesday, April 21, 2009, 7:30am-8:30pm in Rm # 203 of the Convention Center.
The 2009 ASIP Summer Academy, which will take place June 6-8, 2009 in Arlington, VA will also be adapted to the LMS. This year’s major theme will be Solid Tumors: Transcripts, Tyrosine Kinases, and Therapeutics, and is directed by Drs. William Coleman and Gregory Tsongalis. For more information about this year’s Summer Academy, see page 13. ASIP trainees can apply for Trainee Travel Awards through the A.D. Sobel ASIP Education Fund. In addition, trainees who qualify for under-represented minority status can apply for Minority Trainee Travel Awards, which are supported by the FASEB MARC Program.

Linda McManus, President of ASIP, added, “We are very excited to see the first of our online educational products materialize in the new LMS. Looking to the future, online learning is an important, if not necessary, investment for ASIP and its affiliated societies to reach the widest audience and maintain membership value.”

PathologyEducation.org is designed on the Moodle platform, which provides many options for creative educational applications, including the ability to host a variety of electronic resources and to develop social networking forums. ASIP has long been credited with outstanding contributions to pathobiology education through its annual meeting programs, its scientific publications, and its educational courses. As ASIP continues to develop the full potential of the new LMS, visitors to PathologyEducation.org can expect to see novel approaches and adaptations of traditional programs to the online learning environment.

Although the LMS on PathologyEducation.org has the capability of independently registering individuals for specific education offerings, currently all registrations are functionally linked to the ASIP Office membership database and utilize identical user names and passwords. In addition to investing in the infrastructure of PathologyEducation.org, ASIP has also hired a dedicated Education Services Manager, Ms. Lisa McFadden, to streamline the process and to serve as a facilitator for all educational activities. She can be reached at lmcfadden@asip.org if you have any questions or suggestions for improvements to the online system.
International Society for Biological and Environmental Repositories

ISBER 2009 Annual Meeting & Exhibits

ISBER, Celebrating a Decade of Growth and Development in International Biorepository Excellence
May 12 - 15, 2009 - Portland, Oregon, USA

Plenary Sessions
Workshops
Contributed Papers
Posters
Round Table Lunches
Working Groups
Networking
Exhibits
Corporate Workshops

TUESDAY, MAY 12, 2009
- ISBER’S First Ten Years: A Look Back, A Look Ahead
- Opening Reception, Visit the Exhibits

WEDNESDAY, MAY 13, 2009
- “Getting to Know ISBER” Breakfast
- Preservation of Global Resources for Future Generations
- ISBER’s Working Group Presentations
  - Fundraising Promotion, Automated Repositories, Biospecimen Science, Rights to & Control of Human Tissue Samples, and Informed Consent Procedures for the Collection of Biospecimens
  - Round Table Lunch Discussions
  - Corporate-Sponsored Workshops
  - Poster Discussion
  - Workshop: Quality Control and Quality Assurance (repeated on Friday)
  - Workshop: The Demonstration of an Automated Specimen Culling Tool: A Weighted Approach (repeated on Friday)

THURSDAY, MAY 14, 2009
- Working Group Breakfasts
- Innovations in Biobanking Informatics
- ISBER Awards Presentation & Business Meeting
- Round Table Lunch Discussions
- Contributed Papers Sessions

FRIDAY, MAY 15, 2009
- Working Group Breakfasts
- Emerging Legal & Ethical Issues: Challenges and Practical Solutions
- Friday Afternoon Social Programs

Complete information available online at www.isber.org

Optional Workshop
Designing and Maintaining a Tissue Repository
Tuesday, May 12, 2009
8:00am - 12:00pm
William E. Grizzle and Katherine C. Sexton,
Tissue Collection and Banking Facility
University of Alabama at Birmingham and Southern Division, Cooperative Human Tissue Network, USA

(Requires an additional registration fee)

Who Should Attend?
Anyone thinking about or planning to establish a repository should attend. Those who have recently begun repositories will also find the workshop useful.

How You Will Benefit from this Workshop
- Gain insight about the various repository models available
- Learn what issues should be considered when designing and operating a repository
- Discuss the various types of services your repository might want to provide (without performing the investigator’s research for them)
- Understand the importance of quality control and safety in the repository
- Learn how to develop an appropriate cost recovery model
- Gain a better understanding about the legal, ethical, and regulatory issues that may affect the repository
- Understand the “nuts and bolts” of operating a repository
- Identify space and resources needed to begin a repository

Appropriate time will be devoted to questions and audience discussion.
Welcome, Donald Guinee

Keynote Address: New insights into the molecular biology of interstitial lung disease, Robert Homer

Update in Pulmonary Neoplasia I
Chairs: Masayuki Noguchi and Joseph Tomashefski
- The new multidisciplinary classification of lung adenocarcinoma, William Travis
- Update on evolving concepts of lymphoproliferative disorders of the lung and pleura, Michael N. Koss
- Pathology/Radiology correlation of neoplastic and non-neoplastic lung diseases, Part II, Teri Franks, Jeff Galvin

Update in Pulmonary Neoplasia II
Chairs: Alberto Marchevsky and Osamu Matsubara
- Classification of neuroendocrine carcinomas, Douglas Flieder
- Debate: Consensus classifications revisited: pros and cons of the WHO classification for neuroendocrine tumors, Pro: William D. Travis; Con: Mary Beth Beasley
- Panel discussion of pulmonary neoplasia, William Travis, Mary Beth Beasley, Douglas Flieder, Michael Koss, Teri Franks, Masayuki Noguchi

Update on Pulmonary Neoplasia III
Chairs: Thomas A. Sporn and Toshiaki Kawai
- Molecular targeted therapy of lung cancer and the role of the pathologist, Elisabeth Brambilla
- Molecular pathologic diagnosis of lung tumors, Sanja Dacic

Update on Non-Neoplastic Lung Diseases I
Chairs: Armando E. Fraire and Junya Fukuoka
- Insights in granulomatous lung disease, Henry Tazelaar
- Pulmonary vasculitis, Eugene Mark
- CT pathology correlation in diffuse lung disease, Kevin Leslie

Brief Case Presentations I
Chair: Andras Khoor

PPS Dinner Presentation: History of Pulmonary Pathology, David H. Dail

Update on Non-Neoplastic Lung Disease II
Chairs: Megan Dishop and Aliya Husain
- Update on idiopathic interstitial pneumonias, Thomas Colby
- Evolving concepts of small airways disease, Jeffrey L. Myers

Update on Non-Neoplastic Lung Disease III
Chairs: Belinda Clarke and Joanne Yi
- Respiratory bronchiolitis, airway centered interstitial fibrosis and fibrotic NSIP, Samuel Yousem
- New and interesting non-neoplastic pediatric lung diseases, Fred Askin

Brief Case Presentations II
Chair: Kelly Butnor

Update on Pleural Neoplasia
Chairs: Philip S. Hasleton and Douglas W. Henderson
- Update on the diagnosis of mesothelioma - the International Mesothelioma Panel Project, Francoise Galateau-Salle
- The separation of benign from malignant mesothelial proliferations: Are we any smarter than we were 10 years ago? Andrew M. Churg
- Pleural neoplasia: entities other than diffuse malignant mesothelioma, Timothy Allen
- Molecular pathology and molecular targets suitable for mesothelioma therapy, Helmut H. Popper

Update on Asbestos, Asbestosis and Associated Malignancies
Chairs: William K. Funkhouser and Keith M. Kerr
- Update on the PPS/CAP Guidelines for the Diagnosis of Asbestosis, Victor L. Roggli
- Environmental exposures, heredity and mesothelioma in Turkey, Handan Zeren
- Debate: Asbestos exposure and lung cancer
  Moderators: Philip T. Cagle and Koichi Honma
  Pros: Richard Attanoos, Allen R. Gibbs
  Cons: Samuel P. Hammar, Victor L. Roggli

Mystery Cases
Chair: Mary Beth Beasley
Case slides provided by APERIO through an unrestricted educational grant.

www.pulmonarypath.org
MOLECULAR MECHANISMS OF HUMAN DISEASE
Solid Tumors: Transcripts, Tyrosine Kinases, and Therapeutics
June 6-8, 2009, Hilton Arlington, Arlington VA

Course Directors
William B. Coleman, PhD, University of North Carolina School of Medicine
UNC Lineberger Comprehensive Cancer Center, Chapel Hill, NC (USA)
Gregory J. Tsongalis, PhD, Dartmouth-Hitchcock Medical Center
Norris Cotton Cancer Center, Lebanon, NH (USA)

Essential Concepts in Cancer Biology
- Introduction to Cancer Pathobiology, William B. Coleman, PhD, University of North Carolina School of Medicine, Chapel Hill, NC
- Molecular Carcinogenesis and Cancer Genes, William B. Coleman, PhD, University of North Carolina School of Medicine, Chapel Hill, NC
- Molecular Genetics of Human Cancer, Gregory J. Tsongalis, PhD, Dartmouth-Hitchcock Medical Center, Dartmouth University, Lebanon NH

Molecular Pathobiology of Human Cancers and Introduction to Targeted Therapy
- Molecular Pathobiology of Liver Cancer, Satdarshan Singh Monga, MD, University of Pittsburgh, Pittsburgh, PA
- Molecular Pathobiology of Lung Cancer, William K. Funkhouser, MD, PhD, University of North Carolina School of Medicine, Chapel Hill, NC
- Molecular Pathobiology of Colon Cancer, Nicholas Papadopoulos, PhD, The Johns Hopkins Institutions, Baltimore, MD
- Molecular Pathobiology of Breast Cancer, Celina G. Kleer, MD, University of Michigan, Ann Arbor, MI
- Current Applications of Targeted Cancer Therapies, Julie Brahmer, MD, The Johns Hopkins Institutions, Baltimore, MD

Personalized Medicine in the Treatment of Cancer
- Cancer Pharmacogenomics, Gregory J. Tsongalis, PhD, Dartmouth-Hitchcock Medical Center, Dartmouth University, Lebanon NH
- Targeting Therapy to Glioblastoma, C. Ryan Miller, MD, PhD, University of North Carolina School of Medicine, Chapel Hill, NC
- Discovery of Targets for Cancer Therapy, Nicholas Papadopoulos, PhD, The Johns Hopkins Institutions, Baltimore, MD

Early Registration Deadline - May 1, 2009
Late Registration Deadline - May 25, 2009

www.asip.org/sc09
CME Accredited  ▪  Trainee Travel Awards Available
A self-study online version of the ASIP 2009 Summer Academy “PathPack: Solid Tumors” will also be available September 2009
April 18 - 22, 2009
New Orleans, Louisiana, USA
ASIP 2009 Annual Meeting at Experimental Biology

Saturday, April 18, 2009

**KEYNOTE LECTURE:** Normal and Neoplastic Stem Cells, Speaker: Irving L. Weissman

**ASIP Excellence in Science Award Lecture:** Endoplasmic Reticulum Stress in Disease Pathogenesis
Award Recipient: Jonathan Lin

**Biology of Aging,** Chaired: David A. Sinclair and Ivonne Ronchetti, Sponsored by ASIP and the Italian Pathology Society

**Achieving Work-Life Balance,** Chaired: Marion Cohen and Vallie M. Holloway, Sponsored by the ASIP Committee for Career Development, Women & Minorities

**Minisymposium:** Cancer Genetics, Epigenetics, and Biomarkers, Chaired: Ashley Rivenbark and Akhilesh Pandey

**ASIMB Lecture:** TBD, Speaker: Elaine W. Raines, Sponsored by ASIP and the American Society for Matrix Biology

**Workshop:** 9th Annual Workshop on Graduate Education in Pathology, Chaired: Diane L.M. Bick

**Highlights:** Graduate Student Research in Pathology
Chaired: James R. Stone, Sponsored by the ASIP Committee for Career Development, Women & Minorities

**Cancer Stem Cells,** Chaired: Stewart Sell
Supported by an unrestricted educational grant from Academic Press, a division of Elsevier, Inc.

**Eaten Alive:** Autophagy in Cardiac Disease and Atherosclerosis, Chaired: Jonathon W. Homeister and Zhelong Xhu, Sponsored by ASIP and the Society for Cardiovascular Pathology

**PPS Symposium:** Stem Cells in Lung Development and Disease, Chaired: Sem Hin Phan and Victor Thannickal
Sponsored by ASIP and the Pulmonary Pathology Society

**Minisymposium:** Microbes, Mucosa and Inflammation, Chaired: Andrew T. Gewirtz and Elizabeth Galbreath

Sunday, April 19, 2009

**ISAMM Symposium:** Circulating Tumor Cells, Chaired: Larry E. Debault and Raymond R. Tubbs
Sponsored by ASIP and the International Society for Analytical and Molecular Morphology; Supported by an unrestricted educational grant from Veridex

**Patrolling the Vascular Interface by Leukocytes**
Chaired: Myron I. Cybulsky and Francis W. Luscinskas

**The Road to Independence – Careers in Pathology**
Chaired: Tara L. Sander, Sponsored by the ASIP Committee for Career Development, Women & Minorities and the FASEB Minority Access to Research Careers (MARC) office

**Minisymposium:** Angiogenesis and Neovascularization, Chaired: Luisa Iruela-Arispe and Brenda Lilly

**Minisymposium:** Pathobiology of Liver: Implications in Injury, Repair and Cancer, Chaired: George K. Michalopoulos and Janardan K. Reddy

**9th Annual Career Development Program and Lunch:** Winning in the Granting Process – Pathology,
Chaired: Dani S. Zander and Jayne Reuben, Sponsored by the ASIP Committee for Career Development, Women & Minorities, the American Association of Anatomists, and the FASEB Minority Access to Research Careers (MARC) office

**Liver Pathobiology Symposium:** Interdisciplinary Approaches to Liver Disease, Chaired: Harriet C. Isom,
Sponsored by the ASIP Liver Pathobiology Scientific Interest Group

**Mechanisms of Tumorigenesis in the Phakomatoses,** Chaired: Steven L. Carroll

**Minisymposium:** Permeability, Barrier Function and Intercellular Junctions, Chaired: Andrei Ivanov and Sean P. Colgan

**BLOOD VESSEL CLUB:** Genetic Approaches to Vascular Disease, Chaired: Luisa Iruela-Arispe and Douglas A. Marchuk
Sponsored by ASIP and the North American Vascular Biology Organization
Rous-Whipple Award Lecture: Liver Regeneration
Award Recipient: George K. Michalopoulos

Club Hepatomania, Sponsored by the ASIP Liver Pathobiology Scientific Interest Group

Monday, April 20, 2009
ACVP Symposium: One Medicine: Canine Genomic Models of Human Disease, Chaired: Elizabeth Whitley and John Erby Wilkinson, Sponsored by ASIP and the American College of Veterinary Pathologists

Pathobiology of Angiogenesis: Update 2009
Chaired: Harold F. Dvorak, A tribute to Judah Folkman

Trends in Experimental Pathology: miR’ely Making Sense of It All: Novel Implications of Micro RNA in Disease and Therapies, Chaired: Wing C. Chan and Mark Alan Feltelison Supported by an unrestricted educational grant from the Robert E. Stowell Endowment Fund

Minisymposium: Cell Death and Tissue Injury: Diverse Mechanisms in Different Organs, Chaired: Tara L. Sander and John J. Shacka

Minisymposium: Mechanisms of Epithelial Inflammation, Chaired: Nancy Louis and Andre Buret

ASIP Outstanding Investigator Award Lecture: New Approaches to the Pathology and Genetics of Neurodegeneration, Award Recipient: Mel Feany

ASIP Presidential Symposium: Resolving Cell Death and Inflammation: Implications in Disease, Chaired: Linda McManus

Minisymposium: Mechanisms of Injury in Neurodegeneration and Traumatic Brain Injury, Chaired: Steven L. Carroll and Kevin A. Roth

Minisymposium: Vascular Cell Signaling, Atherosclerosis and Restenosis, Chaired: David P. Hajjar and James R. Stone

ASIP Cotran Established Investigator Award Lecture: Developmental Pathways and Transcriptional Networks in Prostate Cancer Progression
Award Recipient: Carlos Moreno, Supported by an unrestricted education grant from Elsevier

Which Way the Wnt Blows: Implications in Tissue Pathobiology, Chaired: Asma Nusrat, Co-Chaired: Youhua Liu

Minisymposium: Stem Cells in Health and Disease, Chaired: Laure Croisille and Saverio Ambesi-Impiombato

Minisymposium: miRNA Microcosm - miRNAs in Disease and Therapy, Chaired: Elizabeth Uhl and William B. Coleman

Minisymposium: Regulation of Leukocyte Migration and Activation in Models of Inflammation, Chaired: Sussan Nourshargh and M. Hickey

Minisymposium: Pathogenesis of Cardiac Disease, Chaired: Monte S. Willis and Michael F. Allard

Wednesday, April 22, 2009
Pathobiology: Genetically Engineered Mouse Models
Chaired: Alexander Nikitin and Robert D. Cardiff

Minisymposium: Cancer Biology and Cancer Therapeutics, Chaired: Sanford Barsky and W-X Ding

Minisymposium: Pathogenic Mechanisms of Infectious Diseases, Chaired: Alfred Ayala and Jonathan Reichner

Guest Societies
- American Society for Matrix Biology
- American College of Veterinary Pathologists
- Pulmonary Pathology Society
- International Society for Analytical and Molecular Morphology
- International Society for Biological and Environmental Repositories
- Society for Cardiovascular Pathology
- Italian Pathology Society

Molecular Mechanisms and Dynamics of Leukocytes Breaching Tissue Barriers, Chaired: Sean P. Colgan and William A. Muller
American Society for Investigative Pathology
9650 Rockville Pike
Bethesda, MD 20814-3993 (USA)

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www.isber.org
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www.pulmonarypath.org

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