Carl G. Hartman Award *(sponsored by Johnson & Johnson Pharmaceutical Research & Development, L.L.C.)* The 2004 recipient of the Carl G. Hartman Award is Dr. Fuller W. Bazer. Dr. Bazer's many years of outstanding scholarly contributions to the field of reproductive biology, his leadership as a colleague and mentor, and his extraordinary service to the SSR make him a most deserving candidate for this prestigious award.

Dr. Bazer is one of the most eminent reproductive biologists in the world; his remarkable contributions span the fields of animal agriculture, biotechnology, reproductive biology, and human and veterinary medicine. His work over a period of 24 years at the University of Florida and the past 11 years at Texas A&M University has focused primarily on the interactions between the maternal environment of the uterus and the developing conceptus. At the University of Florida, Dr. Bazer carried out productive collaborations with colleagues, notably Drs. R. Michael Roberts and William H. Thatcher, by integrating biochemistry and physiology to define the spatial/temporal patterns, endocrine control, and function of numerous secretory products of uterine origin identified as transport proteins, regulatory molecules, growth factors and enzymes, collectively termed histotroph, that are necessary for embryo survival and development in domestic animals and humans. Uteroferrin is one of the first proteins identified and characterized by Dr. Bazer's group that is produced by pig endometrium under the control of steroid hormones and responsible for iron transport to the conceptus. This purple acid phosphatase was subsequently shown to be a hematopoetic growth factor that influences neonatal survival. The identification and characterization of other uterus-derived factors such as retinol, riboflavin, and other vitamins that are secreted at specific times during pregnancy have led to changes in the way that animals are fed to enhance pregnancy rate and embryo survival.

Dr. Bazer and colleagues also conducted similar studies to identify proteins and other factors produced by the conceptus that exert direct effects on the uterus including the signal for maternal recognition of pregnancy, which is obligatory for prolonging progesterone production by the corpus luteum and thereby maintaining pregnancy. These investigations have led to an appreciation that the signals for maternal recognition of pregnancy in domestic animals are antiluteolytic, and thus differ from the luteotrophic signals in primates and rodents. Dr. Bazer and colleagues discovered that estrogen, in combination with prolactin, is the pregnancy recognition signal in pigs and functions by redirecting luteolytic pulses of prostaglandin F2a, from an endocrine to an exocrine pathway, thereby preventing its delivery to the corpora lutea.

A seminal discovery was that interferon tau (IFNτ, originally referred to as ovine trophoblast protein-1) is produced for a short period of time by ruminant conceptuses and acts to block regression of the corpus luteum. Dr. Bazer's group subsequently investigated a number of interferon-induced genes in the uterus and established that the physiologic roles and signal transduction events responsible for the function of IFNτ as a pregnancy recognition signal involves inhibition of estrogen receptor and oxytocin receptor genes. They have identified spatial and temporal patterns of a variety of receptors, adhesion molecules, matrix proteins, cytokines and growth factors involved in autocrine and paracrine signaling at the uterine-conceptus interface that contribute to fetal survival and development.

Throughout his career, Dr. Bazer has demonstrated remarkable insight by effectively catalyzing links between animal agriculture and human health. Although the focus of his work has been on reproductive processes, recognition of the unusual properties of IFNτ led Dr. Bazer and others to consider therapeutic uses of recombinant ovine IFNτ for treatment of a variety of viral diseases, certain cancers, and multiple sclerosis. The hematopoetic growth factor properties of uteroferrin are also being examined for use in the treatment of diseases such as leukemia and osteoporosis.

Dr. Bazer is the author or co-author of over 370 publications in refereed journals, more than 40 chapters and review articles, and four books. According to *Science Citation Index* data, Dr. Bazer's work has been cited over 1,000 times in this decade, 17 of his papers have been cited over 100 times, and several others have been cited over 200 times. More than 60 graduate students and postdoctoral fellows have been mentored in his

laboratory. He has had significant impact upon trainees, fellows, and colleagues who have made their own authoritative contributions to the field of reproductive biology.

Dr. Bazer's research program, which has been continuously funded since 1970 by major funding agencies including NIH, NSF, and USDA as well as by industry and foundation sources, reflects the confidence of peers who have scrutinized his hypotheses and experimental designs. He has served on the editorial boards of *Biology of Reproduction, Journal of Animal Science, Domestic Animal Endocrinology, Theriogenology, Endocrine, Journal of Reproductive Endocrinology,* and *Oxford Reviews in Reproductive Biology*. As a reviewer of NIH grants for the Reproductive Biology Study Section and a number of USDA competitive grants programs, he has influenced the direction of research in reproductive biology.

The innovation and scholarship in his work is reflected in the diversity of awards he has accumulated over the years. While the individual awards are too numerous to list, several convey the respect with which the biomedical and agricultural research communities view his scholarship. He has been named the Goding Lecturer by the Australian Society for Reproductive Biology and Fertility (1988) and Sir John Hammond Lecturer by the Society for the Study of Fertility and Societe Francaise pour le Etude de la Fertilite (1991). He received the American Society of Animal Science Physiology and Endocrinology Award (1980), Society for the Study of Reproduction Research Award (1990), Biotechnology 94 Award (1994), American Society of Animal Science L.E. Cassida Award for Graduate Education (1995), Gamma Sigma Delta International Distinguished Achievement Award in Agriculture (1996), Society for the Study of Reproduction Distinguished Service Award (2000), and the Alexander von Humboldt Foundation Award (2000). This last award is presented annually to a person judged to have made the most significant contribution to American agriculture during the previous five years. More recently, he and Dr. R. Michael Roberts shared the 2002/2003 Wolf Prize in Agriculture "for discoveries of interferon-tau and other pregnancy-associated proteins, which clarified the biological mystery of signaling between embryo and mother to maintain pregnancy, with profound effects on the efficiency of animal production systems, as well as human health and well-being."

Dr. Bazer's visionary leadership has impacted the SSR and the institutions with which he has been affiliated. As a Director and as President he influenced the vitality of the SSR. His leadership in strategic planning has contributed to development of a long-range plan for the financial health of the society, to the timely and decisive move to electronic publication of *Biology of Reproduction,* and the use of the internet. As a member of the Editorial Board and as Editor-in-Chief he contributed to the growth and current stature of *Biology of Reproduction*. He was a Co-founder in 1971–1972, Vice- Chair, and Chair of a Gordon Conference now known as Reproductive Tract Biology.

Dr. Bazer has a long record of fostering interdisciplinary research in reproductive biology beginning at the University of Florida and continuing at Texas A&M University. At both institutions he has been an intellectual leader of interdisciplinary research teams in reproductive biology and animal biotechnology by merging the talents of researchers from a variety of disciplines. Soon after his arrival at Texas A&M in 1992, he was appointed Director of the Center for Animal Biotechnology, organized an Interdisciplinary Faculty of Reproductive Biology, and provided colleagues in this Center a core surgical support and animal care resource for sheep and pig research in reproductive efficiency. A few years later the center was renamed the Center for Animal Biotechnology and Genomics to reflect the growth and expanded research in all aspects of animal biotechnology. It has also evolved to provide strong programmatic linkages between scientists from Texas A&M University, the Texas Agricultural Experiment Station (TAES), Texas A&M University System Health Science Center, and other institutions within the Texas A&M University System. Through his contacts at several institutions within the Texas Medical Center in Houston, Dr. Bazer created synergies that enhance research in both the agricultural and biomedical sciences. He organized a flourishing Texas Women's Reproductive Health Consortium which fosters interactions among basic and clinical scientists at the Texas Medical Center (University of Texas Health Science Center at Houston, Baylor College of Medicine, MD Anderson Cancer Research Institute, USDA/ARS Children's Nutrition Research Center, and Institute of Biosciences and Technology

Houston), University of Texas Medical Branch at Galveston, Prairie View A&M University, Texas A&M University, Texas A&M University at Kingsville, and TAES.

To the dismay of many of his colleagues who benefited from daily interactions, his effectiveness as a scientist and vision as a leader has caused him to be pressed into considerable administrative service as the Director of the Institute of Biosciences and Technology as well as Director and Interim Vice President for Research and Dean of the Graduate School of Biomedical Sciences, Texas A&M University System Health Sciences Center. He currently serves as Executive Associate Dean, College of Agriculture and Life Sciences, Associate Vice Chancellor for Agriculture and Life Sciences, and Associate Director Texas Agricultural Experiment Station. However, his colleagues are grateful for his influence in defining the importance and shaping the future direction of reproductive biology and animal biotechnology research at the Texas A&M University and System levels.

There are few scientists who have had such an impact on the field of reproductive biology as a visionary researcher, mentor, and administrator. Dr. Bazer has effectively communicated the research findings of his laboratory and the interdisciplinary research teams he has assembled to expand our understanding of reproductive biology as well as extended the application of this knowledge to animal biotechnology as well as animal and human health.

SSR Distinguished Service Award *(sponsored by Serono Reproductive Biology Institute):* Dr. Anita H. Payne

Dr. Anita H. Payne has been named recipient of the SSR Distinguished Service Award for 2004. This award is given annually to a member of the SSR who has shown unselfish service and leadership in advancing the discipline of reproductive biology. Dr. Payne's lifetime of service to our discipline unquestionably fulfills this requirement. The following brief overview of her service to reproductive biology only highlights her many contributions to reproductive biology.

Dr. Payne was at the University of Michigan from 1961 to 1996, first as a research associate then as a tenured faculty member in the Department of Biological Chemistry. She was one of the key faculty in the Center for the Study of Reproduction and served as its associate director for 6 years. Faculty members like Dr. Payne have brought world recognition to the Reproductive Sciences Program at the University of Michigan. For her leadership, scholarship, and impact on the betterment of women in science, Dr. Payne has been recognized with the creation of the Anita H. Payne Annual Lectureship in Reproductive Endocrinology in the Department of Obstetrics and Gynecology at the University of Michigan. The establishment of the lectureship exemplifies the esteem in which she is held by her colleagues at the University of Michigan and throughout the world. Upon retiring from the University, Dr. Payne moved west and took a post as a Senior Research Scientist and Professor Emerita in the Division of Reproductive Biology at Stanford University, where she has continued to do research in steroid biochemistry and molecular endocrinology and to train students.

Indeed, the training of future scientists is a very important contribution to science—one that often has a greater impact on the field than one's own research. Dr. Payne has served as mentor for many reproductive biologists who have gone on to have very productive scientific careers of their own, some of whom have also held prominent positions in the SSR.

Another of Dr. Payne's major contributions has been the development and generous sharing of reagents with hundreds of scientists throughout the world. She was one of the first and principle suppliers of antibodies to steroidogenic enzymes, namely P450 side-chain cleavage, P450–17α-hydroxylase, and 3β-hydroxysteroid dehydrogenase. She has also provided cDNAs and expression plasmids for several steroidogenic enzymes to scientists needing them.

Dr. Payne's service to the SSR began at the beginning, as she is a Charter Member of the Society. Her first turn at SSR committee service was on the Membership Committee. Subsequently, she served on the Editorial Board of *Biology of Reproduction* and was elected to the Board of Directors, later serving as Secretary, and then as President (1990– 1991). As President, her greatest contribution to the Society was initiating the transfer of the business and editorial offices to independent and proactive management, a successful transition that has been integral to the increased growth and vitality of the Society. Even

after her term as President ended, Dr. Payne continued to serve on SSR committees including the Program, By-Laws, Nominating, and Development Committees.

Other societies, publications, and committees have also benefited from Dr. Payne's expertise. Among them is the Endocrine Society, where she served on various committees and was a council member. She has been a member of editorial boards for numerous other journals including *Journal of Andrology, Endocrinology, Endocrine Journal, Molecular Endocrinology, and Molecular* and *Cellular Endocrinology* and served as Associate Editor of *Steroids*. In addition, Dr. Payne has participated in two NIH study sections, Reproductive Biology and Biochemical Endocrinology, and served as a member of the Population Research Committee of the NICHD. Her high standards of science and her rigorous reviews certainly helped strengthen and enhance reproductive biology research.

Dr. Payne has shown lifelong leadership in the scholarship, advancement, and promulgation of reproductive biology through teaching, research, mentoring, and service to the SSR. She received the Carl G. Hartman Award in 1998, a credential that only emphasizes the high regard in which she is held by her colleagues. She is rightfully honored again by this Society with the Distinguished Service Award.

SSR Research Award *(sponsored by Organon, NV)*. Dr. Keith L. Parker is the recipient of the 2004 Research Award.

Dr. Parker received his undergraduate education at Williams College in Williamstown, Massachusetts, and then an MD/PhD from Washington University in St. Louis in 1981. Dr. Parker pursued his interests in research as a Fellow in the Department of Genetics at Harvard Medical School. He currently serves as the Wilson Distinguished Professor of Biomedical Research in the Department of Pharmacology at the University of Texas Southwestern Medical Center in Dallas.

Dr. Parker and his group have made key contributions to our understanding of multiple aspects of reproduction. His foremost contribution to reproductive biology has been the identification and cloning of the orphan nuclear receptor steroidogenic factor 1 (SF-1) and the elucidation of its roles in endocrine development. The Parker laboratory first identified conserved promoter elements that regulated the expression of several mouse steroid hydroxylase genes. They found that several of these elements interacted with the same cell- selective DNA-binding protein, which they designated steroidogenic factor 1 (SF-1). Following their successful cloning and characterization of cDNA and genomic clones encoding SF-1, Dr. Parker and his group demonstrated that SF-1 is an orphan member of the nuclear hormone receptor family that acts as a key determinant of cell-selective expression of essentially all the cytochrome P450 steroid hydroxylases in gonadal and adrenocortical cells.

Because developmental expression studies suggested an integral role for SF-1 in adrenal and gonadal development and function, the Parker laboratory used targeted disruption of the gene encoding SF-1 to examine its role in vivo. These gene knockout studies revealed that the absence of SF-1 was associated with a dramatic phenotype—adrenal and gonadal agenesis and male-to-female sex reversal—establishing essential roles for SF-1 in the development of the primary steroidogenic tissues. These studies further showed that SF-1 is essential for the expression of multiple gonadotrope-specific genes, linking SF-1 to a second level of the reproductive axis. Finally, they showed that SF-1 was also essential for the structural integrity of the ventromedial hypothalamic nucleus, a discrete hypothalamic region implicated in reproductive behavior and appetite control. SF-1 thus acts as a global regulator of reproduction, directing the expression of multiple genes required for reproduction at all three levels of the hypothalamic-pituitary-gonadal axis. In addition to their intrinsic relevance to reproduction, these studies provided a paradigm for potential key roles of other orphan nuclear receptors in mammalian development.

More recently, the Parker laboratory has developed novel approaches to explore detailed mechanisms by which SF-1 exerts its key influence in reproduction. In one line of studies, they have used the Cre-loxP technology to make tissue- specific knockouts of SF-1. In collaboration with Dr. Sally Camper, they showed that mice with selective SF-1 ablation in gonadotropes were sterile secondary to hypogonadotropic hypo-

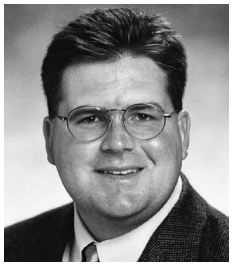
gonadism, proving that SF-1 is essential for normal pituitary gonadotrope function in vivo. In collaboration with Dr. Richard Behringer, they recently have shown that inactivation of SF-1 in Leydig cells causes impaired testes descent, feminization of the external genitalia, and sterility, associated with impaired expression of the steroidogenic enzymes. In females, SF-1 was inactivated selectively in the granulosa cells, and the mice were sterile, failed to ovulate, and developed hemorrhagic cysts in the follicles. These studies define essential in vivo roles of SF-1 in Leydig cells in processes of male sex differentiation and reproduction, and in granulosa cells in ovarian function. The Parker laboratory also recently used bacterial artificial chromosome transgenesis to develop a green fluorescent protein (GFP) marker for gonadal and adrenocortical cells that express SF-1. Using this marker to selectively purify eGFP-positive cells by fluorescence- activated cell sorting, they are starting to define additional target genes of SF-1 in the embryonic testis and ovary.

The second major focus of the Parker laboratory has been the steroidogenic acute regulatory protein (StAR), an essential component of regulated steroidogenesis in the adrenal cortex and gonads. In collaboration with Dr. Doug Stocco, Dr. Parker and his group isolated the mouse StAR gene and characterized its pattern of expression. These studies showed a tight link between the onset of StAR expression and the acquisition of the capacity to make steroid hormones, supporting an important role for StAR in steroidogenesis. The paper describing these studies, along with four others by the Parker laboratory, ranks among the 50 most frequently cited papers published in *Molecular Endocrinology*. The Parker laboratory was among the first to study the promoter of *Star,* showing that *Star* was also a target gene for SF-1. To provide a system to study its functions in vivo, the Parker laboratory developed knockout mice deficient in StAR. These mice exhibited male-to-female sex reversal and died shortly after birth, closely mimicking human subjects with congenital lipoid adrenal hyperplasia. In more recent studies, they showed that the characteristic lipid deposits in the gonads are driven by gonadotropin stimulation and derive predominantly from cholesterol taken up from HDL by the scavenger receptor B1. They have also collaborated with Drs. King and Lamb to show that StAR is expressed in the mouse brain, raising the possibility that its expression may contribute to the generation of de novo production of "neurosteroids" in the central nervous system.

In addition to these accomplishments in his own laboratory, Dr. Parker and his group have collaborated with others to make important contributions in reproduction. These studies include: the demonstration with Birk, Westphal and colleagues that the homeobox gene *Lhx9* is essential for gonadal development, the finding with Mendonca and colleagues that a mutation in *SF-1* is associated with the syndrome of embryonic testes regression, and the demonstration with the Quaggins group that the bHLH transcription factor Pod1 represses *SF-1* expression to specify normal gonadal development and sexual differentiation.

Dr. Parker has become an internationally acknowledged leader in the area of gene regulation of the steroidogenic enzymes and in endocrine development. In recognition of his accomplishments, he has received a number of honors and awards that document the international recognition that his work has received. In 1990, he was elected to the American Society of Clinical Investigation and, in 1997, he was elected to the Association of American Physicians. In 1996, Dr. Parker received the Ernst Oppenheimer Award from the Endocrine Society ("the premier award to a young investigator in recognition of basic or clinical endocrinology"), and he was the Transatlantic Medalist of the British Endocrine Societies in 2003.

In support of SSR functions, Dr. Parker has been an invited speaker at three of our national meetings (in Davis, Ottawa, and Baltimore), certainly recognition of the caliber of science he is performing. In addition, he has served as chairperson for minisymposia in Ottawa, Baltimore, and Cincinnati. Lastly, he has proven to be a valuable member of the SSR in that he served very diligently on the Program Committee for the Cincinnati Meeting, putting together an excellent minisymposium as well as a platform session for that venue. He continues to serve on the Program Committee and provides very meaningful input regarding topics and potential speakers for plenary talks, minisymposia, and platform sessions. Indeed, he has been a highly functional and contributing member of our Society.



SSR New Investigator Award *(sponsored by Virendra B. Mahesh New Investigator Endowment Fund).* Dr. Thomas E. Spencer is the recipient of the 2004 SSR New Investigator Award.

There are many ways to measure success, but peer-evaluation is the most objective. Dr. Spencer's CV documents recognition by his peers who have invited him to provide service to scientific societies and editorial boards, given their approval to his science that is reflected in his outstanding record of publications in peer- reviewed journals, and recommended funding from competitive review in NIH and USDA panels for his research.

Other awards and honors that Dr. Spencer has received to date include Texas A&M Regent's Fellow (1992–1994), Tom Slick Fellow (1994–1995), Dr. A.M. "Tony" Sorenson Achievement Award (1995), Vice Chancellor's Award of Excellence for Graduate Student Research (1995), NIH National Research Service Award (1996), and Outstanding Young Animal Scientist Award-Research (2003) from the Southern Section of the American Society of Animal Science.

Dr. Spencer received his BS and MS degrees from Auburn University and PhD from Texas A&M University (1995). After completing his graduate education, Dr. Spencer obtained postdoctoral training with Drs. Bert O'Malley and Ming-Jer Tsai at Baylor College of Medicine (1995–1997) before returning to Texas A&M University to begin his academic career in research, graduate education, and service.

Dr. Spencer has developed an independent research program funded by grants from the NIH, USDA, and several biotechnology companies for studying uterine biology and pregnancy at the cellular and molecular levels. He has made many key discoveries in research that have significantly advanced our understanding of uterine biology and pregnancy. He developed the novel "uterine gland knockout" (UGKO) ewe model resulting from inappropriate exposure of neonatal lambs to progesterone for the first 56 days after birth. His research with UGKO ewes revealed that uterine glands are essential for them to experience normal estrous cycles and that uterine secretions are unequivocally required for conceptus survival and development beyond the pre-implantation period of pregnancy. He is now applying a comprehensive functional genomics and proteomics approach to identify key genes and gene products that discriminate between a uterus that will (normal) or will not (UGKO) support conceptus growth and development and establishment of pregnancy. These studies are defining the genes that are essential for pregnancy, affect uterine capacity, and influence prolificacy and fecundity in domestic animals.

Based on findings from the UGKO ewe model, Dr. Spencer initiated a research program to discover hormonal, cellular, and molecular mechanisms regulating uterine gland development or adenogenesis using the neonatal ewe as a model system. Novel findings are that prolactin from the pituitary acts on prolactin receptors that are expressed exclusively by uterine gland epithelium to regulate their coiling and branching morphogenetic development. His research has also revealed key regulators of endometrial adenogenesis, including insulin-like growth factors-I and -II, fibroblast growth factors-7 and -10, hepatocyte growth factor, and activins in the stroma that act on epithelial receptors. Finally, ovarian factors were shown to influence endometrial gland morphogenesis. This novel area of research is defining mechanisms that are relevant to endometrial adenogenesis in the neonatal human as well as to reconstruction of the endometrium during the menstrual cycle of women.

The most abundant uterine endometrial gene transcripts identified to date by Dr. Spencer are for the endogenous Jaagsiekte retroviruses (enJSRVs). The endogenous JSRV genes were discovered by Dr. Spencer by transcriptional profiling of genes expressed differentially in the endometrium of normal and UGKO ewes. In collaboration with Dr. Massimo Palmarini (University of Georgia), the published evidence and work in progress indicate that enJSRVs are uniquely controlled by progesterone and probably responsible for stimulating trophectoderm to proliferate, produce interferon tau, the pregnancy recognition signal in ruminants, and to differentiate by forming syncytia (binucleate cells) that produce ovine placental lactogen. Dr. Spencer has demonstrated that ovine placental lactogen binds to homodimers of the prolactin receptor and to heterodimers of the prolactin and growth hormone receptors in the endometrial glands to stimulate their proliferation and production of secretory proteins such as osteopontin and uterine serpins. Further, he has collaborated with colleagues in

Israel (Drs. Elisha Goo- twine and Arieh Gertler) to demonstrate that the biological activity of ovine placental lactogen is positively associated with lamb birth weight and milk production.

Dr. Spencer has played a key role in molecular and cellular studies that revealed that interferon tau inhibits transcription of the estrogen receptor alpha gene in uterine luminal and superficial gland epithelia. In the absence of these uterine estrogen receptors, oxytocin receptors are not expressed and uterine release of luteolytic pulses of prostaglandin $F_{2\alpha}$ is abrogated. He has also led efforts to determine the signal transduction pathways of interferon tau in the uterine endometrium. In collaboration with Dr. Fuller W. Bazer, he found that most interferon-stimulated genes are increased by interferon tau only in the endometrial stroma and glandular epithelium, because the endometrial epithelium expresses interferon regulatory factor 2 (IRF-2), a potent repressor of interferon-stimulated genes. A novel finding from this work is that interferon tau regulates genes, such as *Wnt7a,* in endometrial epithelia through an uncharacterized signal transduction pathway(s) that is independent of the classical JAK-STAT pathway.

Dr. Spencer's intellectual background, technical expertise, imagination, dedication, and organizational skills are such that he is already recognized as a leader in reproductive biology and endocrinology. For example, he will serve as Chair of the Session on Uterine Biology at the 2004 Gordon Research Conference on Reproductive Tract Biology, and he presented an invited lecture on "Lactogenic Hormones and Uterine Function" at the 2004 Gordon Conference on Prolactin in Ventura, California. He has also presented key papers on "Uterine and placental factors regulating conceptus growth in domestic animals" at the Triennial Symposium on Reproductive Biology of the 2003 joint meeting of the American Society of Animal Science and American Dairy Science Association. He also presented a paper on "Biology of Progesterone and Placental Hormone Actions on the Uterus" in a minisymposium on Steroids and Uterine Function at the 2003 annual meeting of the SSR.

The credentials detailed above make Dr. Spencer a worthy choice for the inaugural SSR New Investigator Award.