An interview with Dr R. Michael Roberts

By Romana A. Nowak

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How did you become a scientist?

Our family lived in the country and I spent much of my time outdoors collecting and watching. I also became interested in observing plants and animals through “Nature Study” in grade school (primary school in the UK). This curiosity was very much reinforced by my father’s knowledge of the local fauna, particularly birds, the ups and downs of his bee-keeping hobby (birds and bees?), and being encouraged by both parents to work in the garden and to cook. In secondary school, I enjoyed chemistry, mathematics and geography immensely, but rather disliked modern and classical languages and history. So, by the time I was 14 years old, I had decided to become a scientist. My dad, who had a back-breaking dirty job as a wool sorter, and was regularly on short hours or even the dole, had aspirations for me to become a dentist. Eventually, even he recognized that this was a most improbable career for someone unable to work in three dimensions and to hammer a nail in straight.

When did you first become interested in reproductive biology and why?

Other than figuring out why our cats achieved pregnancy with such regular ease and watching the local dairy bull at work, I had no early introduction to reproductive biology. Sex education at home and after age 11 years in a single sex school was largely by default and reading racy novels. I went to university to major in biochemistry but switched to botany, which in Oxford at that time consisted largely of genetics and plant physiology. My D.Phil., as well as my postdoctoral training with Frank Loewus at SUNY at Buffalo, centered on plant cell wall development. Unlike Jock Findlay, who was interviewed earlier in this series, I never had a life-changing experience castrating sheep. Instead I became a reproductive biologist through playing cricket with the club team at the University of Florida where I became close friends with a physician scientist,

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and pretty good batsman, Jeff James, who was on sabbatical leave in the Ob/Gyn department. Through Jeff I met Fuller Bazer at a party and ended up discussing the purple protein, now known as uteroferrin, which transports iron across the pig placenta. Thomas Chen, a graduate student of Fuller’s, undertook what turned out to be the relatively simple task of purifying uteroferrin in my laboratory. This collaboration led to a successful NIH grant application, kissing plants goodbye, and a full embrace of sex in pigs, cattle, sheep, and horses. None of this was exactly hands-on; that aspect of the work I left to my colleagues, especially Fuller, Bill Thatcher, and Dan Sharp (horses made me particularly nervous), but by the mid-1970s I was a card-carrying reproductive biologist and starting to attend the SSR meeting on an annual basis.

**Looking back, what are the one or two decisions you made during your career that had the most impact?**

My career has taken a number of turns that in retrospect worked out well but were not entirely logical. The switch in majors from biochemistry to botany as an undergraduate and the fateful entry into the unknowns of reproductive biology while still an untenured assistant professor at the University of Florida clearly had a profound influence on my scientific career, but were certainly risky decisions. My move from Florida to Missouri was judged by some to be a mark of insanity. Among my leaving presents were several gifts of warm clothing and a pair of rubber boots. These and most other changes in my career path have been driven in part by a certain restlessness and an easily swayed curiosity, but I am thankful that they brought me to where I am now, a 77-year-old scientist who still enjoys going into work each day.

**Who were past scientists and mentors who inspired your research and influenced your career path?**

My chemistry teacher in high school, Mr J. Breeze Bentley, had a profound influence on my life. He fostered my love of chemistry and guided me to his old Oxford College, which I entered as a freshman in 1959. I also benefitted from the Oxford tutorial system with its weekly essays. My first tutor was Rex Richards (now Sir Rex and 95), a WW II veteran, renowned for his work on nuclear magnetic resonance and already a Fellow of the Royal Society at age 37 years. Others, equally influential followed, including my eventual D.Phil. supervisors, Vernon Butt and Lionel Clowes, who were generous enough to let me follow my own research path on maize root development. I moved from the UK to the USA in September 1965 to conduct postdoctoral work with Frank Loewus, well known at the time for his research on the biogenesis of ascorbic acid and for describing the metabolism of myo-inositol. Frank brought some discipline to my research, including how to keep a decent laboratory notebook and to conduct rigorous analytical experiments. Finally, I must acknowledge Bill Day who was the individual most responsible for recruiting me to the University of Missouri in 1985, and my Dean at the time, Roger Mitchell. Those two men, plus my faculty colleagues in the Animal Science Department, helped establish an outstanding program in large animal reproductive biology at MU which allowed my career to blossom.

**What is the most important scientific accomplishment that you think you have made so far?**

I’ll list them chronologically. I’m particularly proud of how my collaboration with Fuller Fuller Bazer led to the
characterization of uteroferrin and legitimized the notion that uterine secretions play a role as a culture medium for the developing conceptus, particularly in species with a non-invasive type of placentation. Our identification of the protein responsible for maternal recognition of pregnancy in ruminants, originally named ovine trophoblast protein-1 (oTP-1), was, I believe, a landmark achievement. Its subsequent cloning at the University of Missouri and the revelation that oTP-1 was a type I interferon (IFN-tau or IFNT) was a great surprise to both reproductive biologists and scientists working on innate immunity. There was clearly no single mechanism used by different mammalian taxa to ensure that the corpus luteum of pregnancy survived and ovarian cyclicity temporarily halted. Likewise, interferons had a broader function than simply combatting viral disease. Later, a collaboration with Francois Beckers leads to the identification of an extensive family of mainly enzymatically inactive aspartic proteinases structurally resembling pepsin (pregnancy-associated glycol-proteins) from the placentas of ruminant species. Ultimately, this led to the development of a sensitive, reliable pregnancy test for the dairy industry that was eventually commercialized and presently has annual sales approaching $10 million. It’s nice to be involved in something of practical use. Strangely, the most cited papers of my long career came from yet another switch in direction when Toshihiko Ezashi and I decided in 2003 to use human embryonic stem cells to study human trophoblast development. Our top-scoring paper demonstrated that these cells much preferred a low-oxygen atmosphere than ambient conditions if they were to be prevented from spontaneous differentiation. Our second most popular paper described the generation of porcine-induced pluripotent stem cells from pigs. However, we were not alone; two other groups, one publishing a couple of weeks ahead of us, achieved the same end. I’m sure there’s a lesson here, although I don’t quite know what it is.

**What has been your philosophy in training and mentoring young scientists?**

It took me quite a while, but I eventually came to the conclusion that there aren’t any general rules to mentoring. If you are lucky enough, as I have often been, to recruit highly motivated, imaginative, individuals, a light touch and enthusiastic interest seem to work best. If a trainee seems never to know what experiment should be done next, you, the mentor, are in for a harder time, and so is the poor devil being mentored. However, I soon realized that closer guidance of a less able student can lead to publications and ultimately a worthy career. As I’ve grown older, I have certainly pushed my trainees less but most have done well despite my new-found mellowness, which a colleague attributes to a decline in testosterone.

**What do you consider the greatest breakthroughs in the field of reproductive biology and why?**

I find such questions to be perilous, but here are my favorites of the last half century:

1. **Discovery and purification of gonadotrophin releasing hormones from the hypothalamus and the elucidation of the hypothalamic-pituitary-gonadal axis.** These findings form the basis for understanding reproductive physiology at the organismal level.

2. **Cloning of Dolly because it was a brave quest and upset a lot of nay-sayer developmental biologists.**

3. **Understanding the mechanism of action of steroid
hormones, particularly estrogen, which is fundamental to understanding almost all aspects of reproductive biology.

(4) Human in vitro fertilization, because it worked and revolutionized fertility treatments.

(5) The concept of the developmental origins of health and disease because it affects us all.

(6) The generation of embryonic stem cells, because it formed the basis for genetic manipulation of the mouse and is helping elucidate the meaning of pluripotency and totipotency.

What do you see as the future for research in reproductive biology?

I’m still an optimist, although I do fear for our ability to fund so few risky projects through NIH and even for the USDA to support basic research at all. The present anti-science climate in the USA, particularly when it comes to dealing with human fertility issues, is disheartening, but I do believe the opportunity for “throwing the rascals out” by 2020 will improve prospects for government supported science.

What advice would you give students and new investigators entering the field?

Try to find a niche outside the mainstream field where you have a chance of avoiding the crowds. Also take a comparative approach with an appreciation of how reproductive systems have evolved. Don’t be frightened by new technologies; instead, exploit them. Finally, fight for and take opportunities in a hard-headed manner. Research is a competitive sport.

Would you enter this career again?

Yes, I would. Although I have regrets over some of my choices, I can’t think of a better way to spend a working life. I decided I wanted to be a research scientist in my mid-teens, although I had no idea what research entailed, and that the pleasures in it would come from small discoveries, gratifying to me and probably to no one else. There have been a few gee-whiz moments, which filled me with great joy and great ambition, and conversely there have been rejected manuscripts and disappointing grant reviews. My daughter aged about 6 years asked what I actually did “in the lab.” I explained patiently. Her response was “it sounds just like playing,” which of course it is and at the public expense no less. I am forever grateful for the opportunities that came my way.

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Faculty Spotlight Dr. Laura Schulz

Dr. Laura Schulz is an Associate Professor in the Department of Obstetrics, Gynecology and Women’s Health, and an adjunct faculty member in the Divisions of Animal Sciences and Biological Sciences. Laura earned a Ph.D. in Physiology with Dr. Janice Bahr at the University of Illinois, where she studied reproductive biology of carnivores – ferrets and black bears, before completing postdoctoral fellowships at Boston University and the University of Missouri, with Drs Eric Widmaier and Michael Roberts, respectively. Today, her research focuses on the development of the placenta, and how it influences the adult health of offspring. One of her current projects is a collaboration with Dr. Charlotte Phillips from...
Biochemistry, to improve bone health in patients with Osteogenesis Imperfecta (OI), also known as brittle bone disease. Phillips, who has been studying OI for many years, reasoned that the muscle-bone mechanostat could be exploited to strengthen bone in OI patients, and so she bred OI mice to mice lacking myostatin, an inhibitor of muscle growth. While inheriting the myostatin mutation indeed improved bone strength in mice with OI, surprisingly, having a mother with the myostatin mutation also improved bone strength in OI mice, even if they didn’t inherit the mutation themselves. So, Phillips and Schulz, with their student Arin Oestreich, used embryo transfer to test whether the intrauterine environment of myostatin deficient mothers is sufficient to rescue OI bones. Indeed, femora from 4 month old OI mice that had been transferred to myostatin deficient recipients were able to absorb about 35% more force prior to breaking than those control transfers. Interestingly, maternal myostatin was undetectable in fetal serum, suggesting that it acts on the placenta and the uterus, not directly on the fetus, to change fetal growth. Now they are starting to look at how the placenta and uterus are affected by loss of myostatin, and trying to mimic maternal myostatin deficiency with a drug. Schulz will present this work at a minisymposium at the Society for Reproductive Investigation meeting in Paris.

Another major collaboration is a project with Toshi Ezashi and Mike Roberts from Animal Sciences and Danny Schust from Ob/Gyn, using human pluripotent stem cells to study the earliest stages of trophoblast differentiation. Her student, Rowan Karvas, has shown that this system can be used to identify genes expressed by the human placenta in very early pregnancy that are no longer at expressed at term, when placentas are most often available for research. Schulz had studied trophoblast invasion at Boston University, so when she started working with Ezashi and Roberts on their stem cell model, they decided to test whether it generated invasive trophoblast cells. Today, they are using the model to better understand why trophoblast invasion is impaired in the disease preeclampsia.

Finally, Schulz’s major focus is understanding how the maternal environment during pregnancy affects metabolism of grown offspring. Several years ago, she planned experiments that would use an animal model of gestational diabetes, mice that are heterozygous for a leptin receptor deficiency. Unexpectedly, the Lepr db/+ mice had no signs of gestational diabetes. So, she and postdoctoral fellow Kathleen Pennington decided to repeat a previous study that found a brief high fat diet challenge was necessary to evoke gestational diabetes in the Lepr db/+ mice, with one crucial exception – they also tested the high fat diet challenge in wild-type mice. To their surprise, a high fat high sugar diet begun one, but not three, weeks prior to pregnancy caused a failure of pancreatic beta cell expansion and symptoms of gestational diabetes even in wildtype mice. Schulz and her student Omonse Talton are now using this model to study the effects of gestational diabetes on offspring and their work was presented at the Society for the Study of Reproduction meeting.
History of Reproduction

Focus on PGF2α

Leo Loeb is remembered as one of the giants of early twentieth century research pathology. Loeb, son of a Jewish family from the German Eifel region, was born in 1869 in Mayen, Prussia. In 1915, Loeb was appointed as professor of comparative pathology at Washington University School of Medicine in St Louis, Missouri. In 1923, Leo Loeb reported that hysterectomy in the guinea pig extended luteal lifespan and he hypothesized that “an internal secretion of the uterine mucosa might have a specific abbreviating effect upon the corpus luteum”. However, the significance of this observation was not pursued for a number of years. Wiltbank and Casida (1956) reported that hysterectomy caused maintenance of luteal function in cattle and subsequently a number of other investigators reported similar findings in other species. In the 1930s, fresh semen was shown to cause uterine contractions and this led to the discovery of a class of molecules called prostaglandins, for which in 1982 the Nobel Prize in Physiology or Medicine was awarded to Sune Bergström, Bengt Samuelsson, and John Vane. However, in the 1930’s there was no clear evidence that prostaglandins had a role in ovarian function. In 1965, there was a conference entitled “Ovarian Regulatory Mechanisms” which was sponsored by the UpJohn Company. During the discussion of a talk by Bill Hansel (Cornell University) on luteotropic and luteolytic mechanisms in bovine corpora lutea, John Babcock, a chemist working for UpJohn Co, said “I wonder if anyone here has thought of the possible role of a family of agents known as prostaglandins? …..It has been speculated that they may play a role in fertility because they are found in very high concentrations in the semen of some species. Whether or not release of prostaglandins from the uterus could have a luteolytic effect, I have no idea.” (Hansel, 1966). In the audience was Bruce Pharriss, who was also an employee of the UpJohn Co. He returned to the lab and initiated a series of experiments to examine the luteolytic action of PGF2α and reported that injection of PGF2α into the uterus induced luteolysis in rats (Pharriss and Wyngarden, 1969). Subsequently, John McCracken and coworkers (1972) provided compelling evidence that PGF2α is the uterine luteolysin in sheep and that same year PGF2α was reported to induce luteolysis in cattle. Subsequently, Jim Lauderdale (UpJohn Co.) initiated a series of experiments that generated the data which led to FDA approval of PGF2α for synchronization of estrus in cattle. FDA approval of PGF2α occurred for horses in 1976, beef cattle and dairy heifers in 1979, and lactating dairy cows in 1983. The development of a PGF2α analog was reported in 1974 by Cooper. Importantly, PGF2α is the most frequently used estrus synchronization product in current protocols for synchronizing estrus and ovulation in ruminants today.

Information for this article was taken from recent publication: Smith M.F., R.D. Geisert and J.J. Parrish. 2018. Reproduction in Domestic Ruminants During the Past 50 Years: Discovery to Application. J. Anim Sci 96:2952-2970 doi.org/10.1093/jas/sky139.
Faculty Spotlight Dr. Sofia Ortega

Dr. Sofia Ortega is a postdoctoral fellow in the laboratory of Dr. Tom Spencer at the Division of Animal Sciences, University of Missouri. Sofia completed a Bachelor of Agricultural Sciences at Zamorano Agricultural University in Honduras. Before starting graduate school, she worked as the manager of a bull stud owned by the National Cattlemen Association in Honduras. In 2009, she moved to Chile and completed a Master’s Degree in Animal Sciences where she studied a polymorphism in the Kappa-casein gene and its association with milk composition, and cheese yield in Holstein and Montbeliarde-Holstein cows. She got her Ph.D. at the University of Florida in 2016 under the supervision of Dr. Peter Hansen; and her research focused on the study of genes involved in female reproductive function and embryonic development in dairy cattle. One of her major research interests is the use of novel genomic approaches to understand complex phenotypes. At the University of Missouri, she is focused on understanding paternal influences on pregnancy establishment in cattle. A series of field and laboratory experiments using bulls with divergent fertility (high or low sire conception rate) showed that the reduced ability of embryos from low fertility bulls to establish pregnancy is multifactorial and encompasses sperm fertilizing ability, preimplantation embryonic development (Figure 1), and development of the embryo and placenta after conceptus elongation and pregnancy recognition (Table 1).

#### Table 1. Pregnancy differences between day 19 and 33 post insemination (Experiment 1)

<table>
<thead>
<tr>
<th>Bull SCR class</th>
<th>n</th>
<th>Day 19 (%)</th>
<th>Day 33 (%)</th>
<th>P value*</th>
<th>Pregnancy loss (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>29</td>
<td>89.6</td>
<td>79.0</td>
<td>0.005</td>
<td>10.6</td>
</tr>
<tr>
<td>Low</td>
<td>47</td>
<td>68.0</td>
<td>49.0</td>
<td>&lt; 0.0001</td>
<td>19.0</td>
</tr>
</tbody>
</table>

Figure 1. SCR classified bulls tested on in vitro embryo production. Open bars are high SCR bulls and solid bars low SCR bulls (high and low fertility respectively).

Whole-genome sequence analysis is being performed to identify genetic variants associated with pregnancy establishment/loss between days 19-33 after breeding. To further understand placentation, a cell culture system has been developed to differentiate binucleate cells in vitro from bovine blastocysts. Binucleate cell formation is a hallmark of placentation. Placental lactogen (CSH1) and pregnancy associated glycoprotein 1 (PAG1) are used as markers of their presence (Figure 2).

Figure 2. Expression of bovine placental lactogen (CHS1) and pregnancy associated glycoprotein 1 (PAG1) by binucleate cells derived in vitro. Bovine fetal fibroblasts were used as negative controls and caruncles from day 30 pregnancy were used as positive controls.
Functional studies will be performed using this cell culture system in combination with gene editing to understand the role of genes identified to be involved in pregnancy establishment in cattle.

To establish a CRISPR-Cas9 system in the laboratory, Sofia has developed a successful NANOG knockout model in the bovine blastocyst to study preimplantation development without the use of cloning. Immunofluorescence showed that the NANOG protein is absent in gene edited blastocysts (Figure 3).

Figure 3. Representative images of Nanog knockout in bovine embryos. Immunofluorescence staining of inner cell mass marker Nanog (red), hypoblast marker Gata6 (green), nuclear staining Hoescht (blue) and merged images. Nanog knocked-out embryos have an abnormal morphology, with incomplete blastocoel formation and undefined inner cell mass.

Sofia’s research highlights the importance of understanding genetic contributions of the sire to pregnancy establishment which is crucial to the improvement of reproductive efficiency in cattle. Sofia is part of the first cohort of Preparing Future Faculty for Faculty Diversity Postdoctoral Fellowship Program, which involves teaching and professional development activities and training. Sofia has presented part of her work at the SSR-ASAS Triennial Reproduction Symposia in the 50th meeting of the Society for the Study of Reproduction in Washington DC; and was the Postdoctoral Research poster winner in the 14th Annual Gilbert S. Greenwald Symposium on Reproduction and Regenerative Medicine in 2017. She also presented an invited talk at the 2018 American Dairy Science Association annual meeting in Knoxville, TN and has been invited to present her research at the 2018 International Ruminant Reproduction Symposium in Brazil.

Interdisciplinary Reproductive and Health Group Awarded a Food and Agricultural Sciences National Needs Graduate and Postgraduate Fellowship (NNF) Grant

IHRG were awarded a five year NIFA graduate training grant entitled “Innovative Multidisciplinary Training of Animal Scientists in Reproduction and Genomics.” The NNF grant which was authored by Tom Spencer, Rod Geisert and Bill Lamberson will fund two PhD and two MS students this fall. IHRG faculty need to assist in recruiting outstanding graduate students into the program.

Society for the Study of Reproduction

52nd Annual Meeting of the Society for the Study of Reproduction will held at the San Jose McEnery convention Center in San Jose, California on July 18-21, 2019.
Fourteen trainee’s abstracts were accepted for either poster or oral presentation at the Annual SSR Meeting. Lauren Cienia, Megan McLean, Ashley Meyer, Jessica Milan-Foster, Joao Moraes, Eleanore O’Neil, Caroline Pfeiffer, Dr. Megan Scheridan, Omonseigho Talton and Dalen Zuidema presented posters of their research. Dr. Michael Zigo was invited to present a Flash Talk to highlight his poster during the SSR meeting and Dr. Bethany Mordhorst made an Oral Presentation during the Lessons in Reproduction form the Unusual: “Nontraditional Species” Focus Session.

Dr. Andrew Kelleher was selected to make a platform presentation for the Trainee Research Oral Talk Finalist Competition. Dr. Kelleher’s oral presentation was entitled “Uterine Glands Coordinate Synchrony Between the Endometrium and Embryo for Implantation and Pregnancy Success” which he was awarded first place. Posters for Ashley Meyer entitled “New Perspectives on Conceptus Estrogens and Pregnancy Establishment in Pigs” and Eleanore O’Neil “Effects of Uterine Luminal Secretions on Conceptus Growth in Sheep” were selected for the Trainee Research Poster Finalist Competition which Ashley received second place.

Ashley Meyer, Eleanor O’Neil and Bethany Mordhorst were the recipients of USDA NIFA-AFRI Merit Awards and Andrew Kelleher received the Lalor Foundation Merit Award. Karl Korns, Dalen Zuidema and Michal Zigo received Larry Ewing Memorial Trainee Travel Fund Awards.

Symposia presentations were made by Dr. Susan Nagel entitled “Endocrine Disrupting Activity Associated with Chemicals Used in Hydraulic Fracturing for Natural Gas and Oil,” and Dr. Greg Burns entitled “Insights into Conceptus-Maternal Interactions via Extracellular Vesicles.”

### Greenwald Symposium

The Gilbert S. Greenwald Symposium on Reproductive and Regenerative Medicine was held at the KU Medical Center in Kansas City, MO on October 19-20, 2017. Trainees Joao Moraes, Peng Wang, Megan Sheridan, Gregory Burns, Eleanore O’Neil, Sofia Ortega, Caroline Pfeiffer and Ashley Meyer presented research posters.

Megan Sheridan, Ashley Meyer and Sofia Ortega received recognition as Trainee Award Winners for best posters during the meeting.

Yahan Li, Omonseigho Talton and Andrew Kelleher were selected to make Trainee Oral Presentations during the symposium.
Greg Burns, a Ph.D. trainee in Dr. Thomas Spencer’s laboratory received 1st place in the Ph.D. Poster Presentations during the ASGA Graduate Research Forum. He also made a symposium oral presentation during the SSR meeting in New Orleans.

Andrew Kelleher, a Ph.D. trainee in Dr. Thomas Spencer’s laboratory received 1st place in the Ph.D. Poster Presentations during the ASGA Graduate Research Forum. Andrew was selected to make an Oral Presentation during the Greenwald Symposium at the KU Medical Center in Kansas City symposium. He received the Lalor Foundation Merit Award during the SSR meeting in New Orleans. Andrew was also a finalist for the SSR platform presentations for the Trainee Research Oral Talk Finalist Competition which he was awarded 1st Place.

Karl Kerns, Ph.D. trainee in Dr. Sutovsky’s laboratory received 1st place for his oral presentation during the Division of Animal Science ASGA Graduate Research Forum and 2nd placed for the University of Missouri Lifesciences Week poster competition. Karl also received the National Swine Improvement Federation (NSIF) Graduate Student Award.

Ashley Meyer, a M.S. student in Dr. Rodney Geisert’s laboratory, received a USDA NIFA-AFRI Merit Award, was 1st place in the Master’s Oral Talk Presentations during the ASGA Graduate Research Forum and was a Trainee Award Winner for best posters during the meeting Greenwald Symposium at the KU Medical Center in Kansas City. Ashley was a finalist for the SSR Trainee Poster Finalist Competition where she received 2nd Place.

Eleanor O’Neil, a Ph.D. trainee in Dr. Thomas Spencer’s laboratory received a USDA NIFA-AFRI Merit Award during the SSR meeting in New Orleans and was one of six selected for the SSR Trainee Poster Finalist Competition.

Yahan Li, M.S. trainee in Dr. Rocío Rivera’s laboratory was selected to make an Oral Presentation during the Greenwald Symposium at the KU Medical Center in Kansas City symposium.

Omonseigho Talton, PhD trainee in Dr. Laura Schulz’s laboratory was selected to make an Oral Presentation during the Greenwald Symposium at the KU Medical Center in Kansas City symposium.

Dalen Zuidema, Ph.D. Trainee in Dr. Peter Sutosuky’s laboratory received an Oral Presentation Competition Award at the Biannual meeting of the Association for Applied Andrology in New Orleans.

Rowan Karvas, Ph.D. candidate in biological sciences, President of the IRHG Trainees was interviewed for the “#I AM SCIENCE” decoding science blog regarding her pursuit of recent scientific research interests in both the Roberts’ and Laura Schulz’s labs.

https://bondlsc.missouri.edu/2018/06/15/rowan-karvas-iamscience/
Dr. Jordan Thomas will join the Division of Animal Science in a non-tenure track extension position in applied reproduction and genomics in August. Jordan received his MS and PhD at MU under the direction of Dr. Dave Patterson. His responsibilities will be to assist in developing the National Center for Applied Reproduction and Genomics.

Dr. Amanda Patterson will join F21C reproduction group in November. She received her BS and MS at Colorado State University and PhD at the Washington State University. Dr. Patterson received Postdoctoral training in the laboratory of Dr. Jose Teixeira at Michigan State University. She will have a joint research/teaching position with the Division’s of Animal Sciences and Obstetrics & Gynecology. Dr. Patterson’s primary research focus is understanding the role of myometrial stem cells in uterine fibroid development.

Dr. Ahmed Balboula will join the F21C reproduction group in April of 2019. He has a PhD from the National Agricultural Research Institute in Japan. Dr. Balboula is a faculty member at Mansoura University in Egypt, and has post-doctoral training and sabbatical experiences at the University of Pennsylvania, Rutgers University, Hokkaido University and Cambridge University. Dr. Balboula’s interests are in genetic errors in oocytes and early embryos.

Dr. Wesley Warren has been hired jointly between Animal Sciences and the Department of Surgery. Dr. Warren was the Assistant Director of Comparative Genomics of the McDonnell Genome Institute at the Washington School of Medicine in St Louis. Dr. Warren is an internationally recognized expert in animal comparative genomics. His research interests focus on the use of whole genome analysis methods to dissect the underlying molecular signatures linked to biological observations in various species of vertebrates. Dr. Warren will be located in the Bond Life Sciences Center, and will have responsibilities for leading comparative genomics and Darwinian medicine programs at Mizzou.

Visiting Scholars

Professor Xueming Zhao is a professor of Animal Science at the Chinese Academy of Agricultural Sciences in Beijing, China, is a visiting scholar in Dr. Michael Roberts laboratory.

Miriam Stiavnicka is a visiting scholar in Dr. Sutovsky’s lab, on a scholarship from the Charles University, Faculty of Medicine in Pilsen, Czech Republic, where she is a graduate student in the laboratory of Sutovsky’s collaborator and past visiting scholar at MU, Dr. Jan Nevoral. She works on the sulfhydration-dependent signaling in spermatozoa.

Seda Ocakli is a visiting scholar in Dr. Sutovsky’s lab, on a government scholarship from the TUBITAK, Turkey where she is a graduate student at the Gaziosmanpaşa University Faculty of Medicine, Department of Histology and Embryology, in Tokat. She works on biomarkers of human male infertility.
Kathryn Storey will be a Ph.D. student in the Division of Biological Sciences under Dr. Laura Schulz. Kathryn earned her B.S. in Animal Sciences at the University of Illinois, where she became interested in reproductive biology. She has worked in the lab of Dr. Prabhakara Reddi on the role of TDP-43 in spermatogenesis, and with Dr. Thomas Jenson at the San Diego Zoo on testis xenotransplants for reproduction of endangered bird species.

Jaclyn Ketchum will begin an MS degree in August 2018 under the direction of Dr. Michael Smith. Jaclyn grew up on a seedstock cattle operation in Eastern Montana and recently received her BS degree in Animal Science from Kansas State University.

Bhaumik Patel recently joined the Rivera laboratory to pursue a Ph.D. Bhaumik received his BS of Veterinary Science & Animal Husbandry at the Anand Agricultural University, Gujarat, India in 2015 and a M.S. in Public Health with emphasis on Veterinary Public Health from University of Missouri in 2018.

Destiny Johns will begin her MS program in the laboratory of Dr. Geisert in August, 2018. Destiny, a native of Forney, TX, received her BS from the Department of Animal Science at Oklahoma State University this past spring. She will undertake research to evaluate the role of interferon gamma and delta in pig conceptus development and survival.

Shelbi Perry will will start her M.S. program at Mizzou fall semester 2018 focused on swine reproductive biology. She earned her B.S. degree at Purdue University in Animal Science. She participated in multiple undergraduate research projects with Dr. Kara Stewart while at Purdue. She also has experience in feed sales, as a laboratory technician at a boar stud and as a sales intern with Merck Animal Health.

Katy Stoecklein is from Moberly, MO. She completed her BS at MU in the spring of 2018. Katy will be working on a project to improving and understanding in vitro maturation, in the bovine. This is proposed to be a multidisciplinary project spanning the Prather, Spencer and Roberts laboratories.

Emma Knickmeyer started her joint MS/DVM program with Dr. David Patterson in Spring of 2018. Emma is from a farm in Cedar Hill, MO. She received her BS from the University of Missouri and will continue her DVM program at the MU College of Veterinary Medicine in Spring of 2019.

Fayth Kumro is originally from Kingsville, TX. She received her BS from Texas A&M University. In the summer of 2017, Fayth attended the U.S. Dairy Education and Training Consortium in Clovis, NM where she met Drs. Lucy and Pooch who teach the reproductive module. She then worked on an AI crew at a large dairy in Colorado in the fall before moving to MU in January 2018.

Dr. Harriet Fitzgerald completed her Bachelor of Science majoring in Zoology at the University of Melbourne, Australia. She then undertook both her Honours research year and PhD under the supervision of Professor Lois Salamonsen and Dr Tracey Edgell at the Hudson Institute of Medical Research and Monash University in Melbourne. Harriet’s PhD research investigated the proliferative phase uterine microenvironment and its contribution to idiopathic infertility in women. Harriet recently joined Dr Thomas Spencer’s laboratory as a postdoctoral fellow, where she will continue to research the dynamic nature of the endometrium. Her research will investigate the impact of uterine glands on stromal cell decidualization and female fertility, utilizing both mouse models and a human-derived 3D model co-culture system.
Paul Cooke
Professor and Chair in Department of Physiological Sciences, University of Florida. Wednesday, September 5, Noon in 103 ASRC.
Title: Mechanism of Action and Function of Membrane Estrogen Receptor 1 in Male and Female Reproduction

David Aylor
Assistant Professor in Department of Biological Sciences, North Carolina State University. Wednesday, September 12, Noon in 103 ASRC.
Title: Gene x Environment Interactions Cause Sperm Decline and Male Infertility in Mice

Indrani Bagchi
Professor in Department of Comparative Biosciences, University of Illinois. Wednesday, September 19, Noon in 103 ASRC.
Title: Adaptive Mechanisms during Implantation and Placentation

Adam Schrum
Assistant Professor, Department of Microbiology and Immunology, School of Medicine, University of Missouri. October 3, Noon in 103 ASRC.
Title: How Can One Receptor (alpha-beta TCR) Instruct Three Different Developmental Signals for T Cells: Positive Selection, Negative Selection, and Leukemogenesis?

Romana Nowak
Professor, Department of Animal Sciences, University of Illinois. Wednesday, October 31, Noon in 103 ASRC.
Title: The Adverse Effects of Phthalates on Reproduction Involve Inflammation.

Jae-Wook Jeong
Associate Professor in the Department of Obstetrics, Gynecology and Reproductive Biology Michigan State University. Wednesday, November 7, Noon in 103 ASRC.
Title: Steroid Hormone Signaling and Endometrial Progesterone Resistance

Janice Bailey
Professor Department of Animal Science, Universite’ Laval, Canada. Wednesday, November 28, Noon in 103 ASRC.
Title: Fun Sperm Facts that You Should Know: How the Paternal Environment Influences Future Generations

Michael Soares
Director, Institute for Reproductive Health and Regenerative Medicine University Distinguished Professor Kansas University Medical Center. Wednesday, December 5, Noon in 103 ASRC.
Title: Adaptive Mechanisms Regulating Placental Development

Francesca Duncan
Assistant Professor of Obstetrics and Gynecology, Northwestern University. December 12 Title: Female Reproductive Aging - from the Gamete and Beyond
Faculty Awards

**Randy Prather** received the *St Louis Academy of Science Fellows* 2018 Science Leadership Award.

**David Patterson** received the 2018 *American Society of Animal Science* Management Award during the ASAS meeting in Vancouver, British Columbia.

**Thomas Spencer** received the 2018 *College of Agriculture and Natural Resources* Research Award.

**Thomas Spencer** became a 2018 Fellow for the *American Association for the Advancement of Science*.

**Jared Decker** received the *University of Missouri* 2018 Extension J.W. Burch Award.

Faculty Honors

**Laura Schulz** was recognized with an award for “Top Reviewer” for the *Journal of Biology of Reproduction*.

**Ricío Rivera** was appointed as 6 year permanent member of the NIH Cellular, Molecular and Integrative Reproduction Study Section, Center for Scientific Review. July 01, 2018 - June 30, 2024.

**Peter Sutovsky** was the featured mentor at the Morulae Trainee-Mentor Lunch, 44th International Embryo Technology Society (IETS) Annual Conference in Bangkok, Thailand.

New Faculty Grants (Total $7,801,000)


AFRI-NIFA Dual Purpose with Dual Benefit Grant. (2018-2022) “Use of a bovine overgrowth syndrome to characterize the molecular etiology of BWS.” PI **RM Rivera**.

National Pork Board Grant. (2017-2018) Title: “Mitigation of summertime boar infertility by evaporative and conductive cooling.” PI **TJ Safranski** and Co-I **P Sutovsky**.


New Faculty Grants (continued)


NICHD R01. 2018-20123) “Biological Role of Uterine Glands in Pregnancy.” PI **TE Spencer**, Co-I **SK Behura** and **P Dhakal**.


Dual Purpose R01: NICHD “Disease Mechanisms and Uterine Programming of Infertility in Dairy Cows” PI: **MC Lucy**; Co-I: **TE Spencer**.

The 15th Annual Gilbert S. Greenwald Symposium on Reproduction and Regenerative Medicine

October 18-19, 2018
Faculty Invited Presentations

Rodney Geisert


Rethinking the Role of Estrogen in Maternal Recognition of Pregnancy in the Pig. 2018. Interdisciplinary Faculty of Reproductive Biology, Texas A&M University, College Station, TX.

Anatomy and Physiology of Pregnancy and Parturition. 2018. Regional Swine Symposium, South Dakota State University, Brookings, SD.

Matthew Lucy


The Postpartum Uterus of the Dairy Cow a Model for Host-Pathogen Interactions During Tissue Regeneration. 2017. 10th Annual Symposium of the Réseau Québécois en Reproduction, Saint-Hyacinthe, Quebec, Canada.

Canada, Embryonic Loss- What Causes It, What Amount is Normal, and How Do We Manage It. 2018. Herd Management Conference (CANWEST DHI), Crysler, Tavistock, and Drayton, Ontario.

Nutrition, Metabolism and Uterine Health in Postpartum Dairy Cows. 2018. Zhejiang University, Hangzhou China.


Translating the Physiology of Fertility into Improved Phenotypes for Genetic Selection. 2018. Annual Meeting of the American Dairy Science Association, Knoxville, Tennessee. Randy Prather


Susan Nagel


Michael Roberts


Laura Schulz

**Faculty Invited Presentations**

**Thomas Spencer**

**Interferon Tau and Conception.** 2017. American Society for Reproductive Immunology annual meeting, Chicago, IL.

**DNA Markers for Fertility.** 2018. American Embryo Transfer Association annual meeting, Orlando, FL.

**Biological Role of Uterine Glands in Pregnancy: Insights from Mice to Humans.** 2018. Department of Physiology and Pharmacology, University of Georgia, Athens.

**Forkhead Box A2 (FOXA2) and Endometrial Glands in Pregnancy Establishment.** 2018. Endometrium Satellite Symposium, Society for Reproductive Investigation annual meeting, San Diego, California.

**Biological Role of Uterine Glands in Pregnancy: Insights from Mice to Humans.** 2018. Pre3 Lecture, Vanderbilt University Medical School, Nashville, TN.

**Peter Sutovsky**

**Sperm-Oocyte Interactions and Their Implications for Bull Fertility (With Emphasis on the Ubiquitin-Proteasome System).** 2018. International Bull Fertility Conference - Theory to Practice, Westport, North Ireland

**Sperm Mitophagy During Fertilization (The Tale of Mitochondrial Eve and Steve).** 2018. 44th International Embryo Technology Society (IETS) Annual Conference, Bangkok, Thailand

**Lessons from Sperm Phenotypes of Livestock Animal Models and Their Translation to Human Male Infertility.** 2017. International Conference on Analytical Cytometry, Prague, Czech Republic

**Sperm Mitophagy during Fertilization.** 2017. XVI Reunion Cientifica ICBAR, Latin American Science Congress Organized by Universidad Nacional San Marcos, Lima, Peru


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**Publications**


Publications


Review


Johnson SA, Ellersieck MR, Rosenfeld CS. 2018. Hypothalamic gene expression changes in F1 California mice (Peromyscus californicus) parents developmentally exposed to bisphenol A or ethinyl estradiol. Heliyon 4:e00672.


