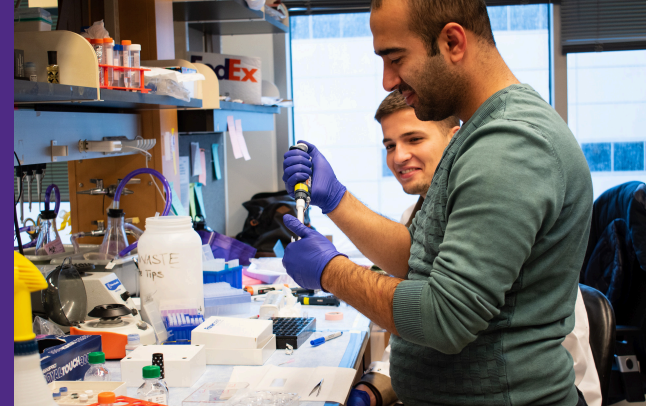
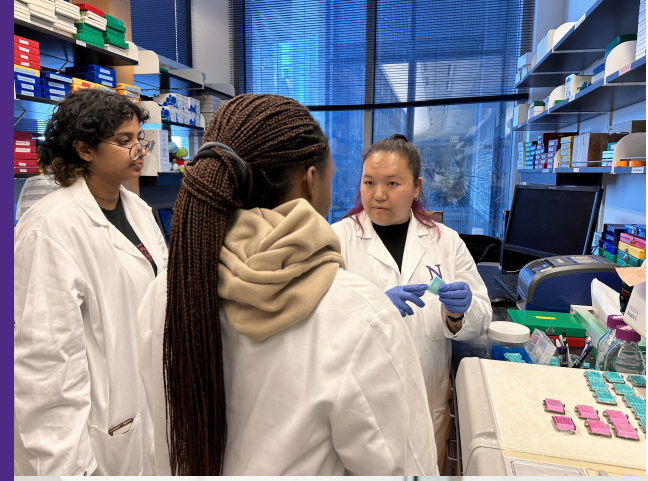


Northwestern CENTER FOR REPRODUCTIVE SCIENCE

FIVE YEAR REPORT
2020-2024



CRS Co-Directors

J. Julie Kim, PhD

Francesca Duncan, PhD

Compiled by Lauren Ataman-Millhouse, MA

Foreword

“Education is not the learning of facts but the training of the mind to think” – Albert Einstein

It is my privilege and great honor to write the foreword for the 5 Year Report of the Northwestern University Center for Reproductive Science (**CRS**). Founded by Neena Schwartz, PhD a pioneer in reproductive sciences, and significantly expanded by leaders in reproduction research, Kelly Mayo, PhD and Teresa Woodruff, PhD, the **CRS** continues to flourish under the current leadership of Francesca Duncan, PhD and Julie Kim, PhD. I have been fortunate to have had a long affiliation with the **CRS**, and I have witnessed its tremendous growth over the years. The goals and overall vision of the **CRS** are unique and outstanding.

The **CRS** is built upon strong pillars including research, education, community engagement, and various programs and events. The latter two have been particularly instrumental in spreading the **CRS** legacy through organization of numerous outreach activities, seminars, and symposia. Scientists from all over the country and overseas have visited the **CRS** and enriched the scientific community by delivering invited and various “named” lectures annually. The research portfolio of **CRS** faculty members is broad and encompasses nearly all facets of reproductive science. A notable strength of the **CRS** is the interdisciplinary nature of the research that often occurs across the classical biology boundaries and spreads into areas including chemistry, biomaterials engineering, religion, anthropology, law, bioethics, and beyond.

A unique and attractive feature of the **CRS** is its education focus which includes the Master of Science in Reproductive Science and Medicine (MS-RSM) program. In less than a decade, the MS-RSM program has already trained more than 100 trainees who have now gone onto careers in various academic (PhD, MD and MD/PhD), biotech/pharma, and patent law sectors. With the option of choosing the thesis or non-thesis tracks, the MS-RSM program has gained national and worldwide reputation with trainees represented from multiple nations across the globe. The **CRS** trainees are characterized by an incredible level of productivity with respect to numerous high impact publications, presentations at scientific meetings, and receipt of prestigious awards and accolades. This stellar track record is a great testimony to the educational strength of the **CRS**. Rightfully, this type of genuine, knowledgeable, and engaging community is the most promising way, in my opinion, to teach and train young minds by attracting them into the world of reproductive sciences and medicine.

Fertility is an important indicator of overall health, and the **CRS** is embedded in the Feinberg School of Medicine where its researchers are poised to translate research from bench to bedside and beyond. Reproductive sciences influence infertility/contraception, precision medicine, oncology and fertility preservation, and reproductive aging/cancers/toxicology. It is, therefore, the right time for the **CRS** to seamlessly combine sustainability and creativity to attract bright and promising junior faculty and trainees at various levels. However, simply recruiting is not enough. These young scientists must be nurtured and mentored and provided with plenty of resources and ample opportunities. The senior members and key stakeholders are acutely aware of these issues and fully support the **CRS** goals and mission so that it remains as a vibrant ecosystem where the next generation of researchers in our discipline can excel. I whole heartedly extend my congratulations and continued support for the success of the **CRS**. I look forward to seeing how the **CRS** will shape the careers and future of many in the years to come.

- T. Rajendra Kumar, PhD, Professor and Edgar L., Patricia M. Makowski and Family Endowed Chair, Associate Vice-Chair of Research, Director, Women’s Reproductive Health Research, Division of Reproductive Sciences, Division of Reproductive Endocrinology & Infertility, Department of Obstetrics and Gynecology, University of Colorado Anschutz Medical Campus, Aurora, CO 80045

Letter from the Directors

Dear Center for Reproductive Science Community,

On behalf of the entire **CRS** staff, we are thrilled to share with you the next iteration of the **CRS Five Year Report** which reports on all the Center's major accomplishments from 2020-2024. The first report was written in the middle of a global pandemic and uncertainty was abound. However, our community remained strong and collectively we persevered. The pandemic may have changed the way we were able to convene, it did not hinder any progress we have made towards our mission: to enhance and coordinate research in reproductive health, to promote the application of this research toward human welfare, and to optimize the training of future investigators, educators and clinicians in the reproductive sciences. The lessons we learned during the past five years – to demonstrate resolve in pursuit of our scientific curiosity, to be resilient, and to be kind – are ones we hold close to this day.

We are thrilled to report that in the past five years, we expanded our programmatic offerings, which now include the Upper Midwest Summit for Reproductive Science (UMSRS). This annual event, which grew out of the Illinois Summit for Reproductive Science (ISRS), and is supported by an R13 conference grant from the NIH, convenes trainees, faculty, and researchers from 16 institutions across five states in the upper midwest region. We also continued our other longstanding programs, including the weekly Reproductive Research Updates (RRUs), the monthly Career Catalyst series, the quarterly Translational Lectures in Reproductive Science, and other ad hoc events that bring our community together on a regular basis. **CRS** is truly the hub of reproductive science at Northwestern and beyond!

We also continue to educate the next generation of reproductive scientists through our educational offerings, including the Predoctoral T32 Training Program in Reproductive Science, Medicine, and Technology (**CRS** Training Program) and the Master of Science in Reproductive Science and Medicine (MS-RSM) program. We submitted a renewal of the **CRS** Training Program in 2024 which was recommended for funding for another five years! In 2025, we will welcome the 10th cohort of the MS-RSM program, and in a decade, will have trained >100 brilliant reproductive science scholars! We are also proud to report on the accomplishments of our trainees. **CRS** trainees continue to contribute to scholarship in the field through published papers and conference abstracts, and many trainees have secured prestigious independent funding which not only illustrates the value of our research and science but is a testament to the extraordinary mentorship our trainees receive from our outstanding faculty.

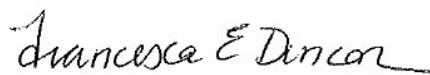
The **CRS** community expands beyond Northwestern. Our trainees go onto a broad array of careers in reproductive science, and we continue to expand our **CRS** alumni network. At every conference we attend, we are blown away by the number of current and past **CRS** members we encounter. We can confidently say **CRS** is a major force in the reproductive science community.

We hope you enjoy reading about all our accomplishments over the past five years in this report. YOU are the reason the **CRS** remains visible, viable, and valuable, and we are so excited to see what the next five years brings!

Sincerely,



J. Julie Kim, PhD
Susy Y. Hung Professor
Professor, Obstetrics and Gynecology
Co-Director, Center for Reproductive Science



Francesca Duncan, PhD
Thomas J. Watkins Memorial Professor of
Reproductive Science
Associate Professor, Obstetrics and Gynecology
Co-Director, Center for Reproductive Science

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Section 1: Who We Are

The Center for Reproductive Science (CRS) is a well-revered and long-standing part of Northwestern University that has kept the reproductive science and medicine community visible, viable and valuable.

Reproductive health underpins overall health. The male and female reproductive systems are essential for producing and supporting sperm and egg cells, respectively, which give rise to the next generation and for maintaining endocrine function. Reproductive hormones are essential for general health as they contribute to cognitive, cardiovascular, bone and immune system functions. As such, reproductive science and medicine will guide evolving and emerging treatments related to contraception, infertility, reproductive tract conditions, cancers, infectious diseases and pregnancy-related disorders. In other words, reproduction matters!

Since its formal inception in 1987, **CRS** has been at the forefront of reproductive science and medicine research, from basic research on cellular and molecular mechanisms to physiological integration across organ systems to clinical practices that impact fertility and health.

CRS is anchored by outstanding members who have made hallmark discoveries in the field. For example, **CRS** was founded by Neena Schwartz, PhD who was the first to characterize inhibin in follicular fluid. Another pioneering member, Erwin Goldberg, PhD was the first to identify the male germ cell-specific enzyme LDH-C4. Building on this foundation with strong institutional support from Northwestern, the center includes nearly 200 faculty members and 100 trainees across 25 departmental disciplines who bring unique perspectives to reproductive science and medicine (**Figure 1**). **CRS** member research interests include fertility and infertility, diseases of the female reproductive tract, gonadal development, germ cell biology, reproductive aging, fertility preservation, development and metabolism, epigenetics, neuroendocrinology, circadian rhythms, ovarian and testis function, prostate biology, infectious diseases, placental biology, reproduction and society, and bioethics.

This rich environment has been fueling the reproductive science and medicine pipeline, nurturing generations of reproductive scientists who have been assuming leadership positions in academia, medicine, industry, policy and beyond. **CRS** provides its community with a longstanding history, rich infrastructure, and comprehensive series of regularly scheduled programming and events, awards, scholarships, and professional development resources to ensure that reproduction science remains visible, viable, and valuable.

Leadership and Staff

Since the first **CRS** Five Year Report which was printed in 2020, Drs. Francesca Duncan and Julie Kim continue to co-direct the **CRS** through their oversight and vision (**Figure 2**). In addition to the **CRS** Co-Directors, **CRS** relies on a highly qualified leadership team to execute the overall mission. Since 2020, we welcomed two new **CRS** and Master of Science in Reproductive Science and Medicine (MS-RSM) staff to the team. Rebecca

Willingham, MFA, **CRS** Program Coordinator, joined the team in March 2021. She plays an integral role in coordinating all **CRS** programs and events and runs daily **CRS** operations. Nimra Chohan, MFA, joined the team in December 2021 as the MS-RSM Senior Program Coordinator. In this role, she oversees and supports

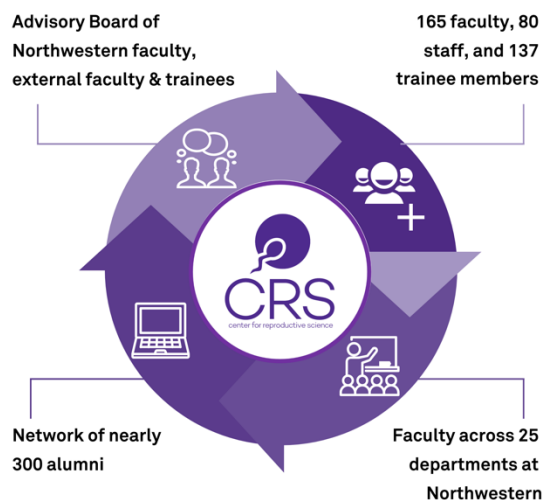


Figure 1: A diagram illustrating the composition of the members of CRS.



Figure 2: CRS Co-Directors Dr. Francesca Duncan (left) and Dr. J. Julie Kim (right).

all administrative tasks and operations of the MS-RSM program including communications, student and faculty support, recruitment, and academic and curricular management. In addition, Lindsey Block, PhD joined the MS-RSM program as a lecturer in June 2023. In this role, she develops curriculum, coordinates and teaches the laboratory-based class Reproductive Technologies Laboratory (REPR_SCI 440), directs Emerging Research in Reproductive Science & Medicine (REPR_SCI 406), and co-leads Reproductive Research Laboratory I & II (REPR_SCI 442/443). She also assists in teaching MS-RSM professional development courses, advises students, and supports other team-taught courses within the program.

Francesca E. Duncan, PhD, Co-Director

Francesca E. Duncan, PhD earned her doctorate in Cell and Molecular Biology from the University of Pennsylvania and completed post-doctoral fellowships in reproductive science and medicine at the University of Pennsylvania and at Northwestern University. She is currently an Associate Professor in the Department of Obstetrics and Gynecology in the Feinberg School of Medicine at Northwestern University where she holds the Thomas J. Watkins Memorial Professorship in Reproductive Science. She co-directs **CRS** and is the faculty director for the MS-RSM program at Northwestern. She is also an Associate Professor-in-Residence at the Buck Institute for Research on Aging in the Center for Healthy Aging in Women. Dr. Duncan leads a research program focused on understanding the cellular mechanisms of how aging – both physiologic and iatrogenic - impacts reproductive potential at the levels of the gamete and ovary. Dr. Duncan has also expanded her research to encompass modulating reproductive capacity through identification of novel ovarian targets for non-hormonal contraception using innovative models such as in vitro follicle growth and ovulation. In her 25+ year history in the field, she has co-authored >120 manuscripts in the area of reproductive biology through collaboration with nearly 700 co-authors from 196 institutions. Her findings have been highlighted on BBC radio, in Discover Magazine, Marie Claire Magazine, CNN Health, the Wall Street Journal, Bloomberg News, National Geographic, Scientific American, Forbes Magazine, and USA Today. Dr. Duncan is committed to academic publishing and is an ad hoc reviewer for >30 journals, has served on numerous editorial boards, and is the current Deputy Editor-in-Chief of Molecular Human Reproduction. She is an active leader in professional societies, serving on the Board of Directors for the Society for the Study of Reproduction and on the Council for the Histochemical Society. Dr. Duncan is passionate about educating the next generation of leaders in the reproductive sciences, and she has served as a faculty member in prestigious programs such as Frontiers in Reproduction and Biology of Aging held at the Marine Biological Laboratories. Dr. Duncan is the recipient of several prestigious honors including a 2017 United States Fulbright Award, the 2019 Virendra B. Mahesh New Investigator Award from the Society for the Study of Reproduction, the 2024 Rolly Simpson Frontiers in Reproduction Distinguished Alumni Award, and the 2024 Roger V. Short Medal and Lecture.

J. Julie Kim, PhD, Co-Director

J. Julie Kim, PhD, is the Susy Y. Hung Professor of Obstetrics and Gynecology and the director of faculty mentorship and development in the Department of Obstetrics and Gynecology. She graduated from the University of Toronto with a BS in microbiology and earned her doctorate in cellular and molecular biology from Université Laval, Quebec. She trained with Asgi Fazleabas, PhD during her postdoctoral years to study mechanisms of decidualization in the primate endometrium and then joined Northwestern University as assistant professor in 2003. Kim is an internationally recognized expert in uterine biology and studies an array of reproductive diseases as it pertains to risk factors and hormone action. She has established projects in endometrial cancer, uterine leiomyoma, breast cancer and microphysiological systems of the reproductive tract. She is an active member of the Robert H. Lurie Comprehensive Cancer Center, the co-director of the Cancer Biology Cluster in The Graduate School at Northwestern University and the principal investigator of the T32 Predoctoral Training Grant in Reproductive Science. She has worked with and led education programs including the Northwestern Driskill Graduate Program in Life Sciences (DGP), the MD-PhD Medical Scientist Training Program (MSTP) and the master's program in bioengineering, as well as our MS-RSM program. She currently teaches in courses for DGP in tumor cell biology and for the MS-RSM in emerging research in reproductive science and medicine.

Current CRS Senior Staff

CRS is supported by a talented workforce who bring a high level of expertise and professionalism to the **CRS**. All staff members have distinct yet complementary portfolios which support the Center's broader mission. Staff members at the time of the writing of this report and a summary of their roles are listed in alphabetical order below.

Lauren Ataman-Millhouse, MA, Program Administrator

Lauren Ataman-Millhouse graduated from the University of Southern California in 2008 with a Bachelor of Arts in political science and business administration and went on to complete a master's in public policy and administration from Northwestern University. In 2011, Lauren joined the team as a program assistant for Teresa Woodruff, PhD, and has worked with Francesca Duncan, PhD, in a variety of capacities since then. Prior to her role with **CRS**, Lauren worked as the research project manager for Oncofertility Consortium and provided programmatic support for the Consortium's administrative activities, which included comprehensive grant and research administration support. She now oversees **CRS**'s grant, programming, development, and promotion portfolio. She was an integral part of writing the renewal for the T32 grant which supports the Predoctoral T32 Training Program in Reproductive Science, Medicine, and Technology (**CRS** Training Program) and the R13 conference grant which created the Upper Midwest Summit for Reproductive Science (UMSRS). She is actively looking for ways to bring sustainable support to **CRS** through grants, industry, and other mechanisms. Her portfolio also includes the **CRS** professional network, working closely with Rebecca Willingham on **CRS** programming and community relations. She leads the Programming & Events Subcommittee and works with the trainee organizing to plan UMSRS. Ultimately, Lauren promotes **CRS** programs to all relevant stakeholders and helps **CRS** sustain valuable research efforts in the reproductive health sciences community.

Lindsey Block, PhD, Lecturer

Lindsey Block, PhD, is a lecturer in the MS-RSM program. Lindsey graduated from the University of Illinois Urbana-Champaign (UIUC) with a Bachelor of Science degree in molecular and cellular biology and a minor in chemistry. During her time at UIUC, Lindsey joined the Gene E. Robinson, PhD, honeybee research laboratory. She then enrolled in the cellular and molecular pathology program at the University of Wisconsin-Madison to obtain her PhD. She completed her thesis work in the lab of Ted Golos, PhD, where she studied the impact of Zika virus on embryos and trophoblasts. After graduating, she was a postdoctoral research fellow in the Rebecca Simmons, MD, lab at the University of Pennsylvania where she established models to better study pregnancy complications and identify biomarkers of placental dysfunction. As a lecturer within the Master of Science in Reproductive Science and Medicine program, Lindsey develops curriculum, coordinates and teaches the laboratory-based class Reproductive Technologies Laboratory (REPR_SCI 440), directs Emerging Research in Reproductive Science & Medicine (REPR_SCI 406), and co-leads Reproductive Research Laboratory I & II (REPR_SCI 442/443). She also assists in teaching MS-RSM professional development courses, advises students, and supports other team-taught courses within the program.

Hoi Chang Lee, PhD, Research Assistant Professor

Hoi Chang Lee, PhD, is a Research Assistant Professor within the Department of Obstetrics and Gynecology at Northwestern University who spends part of his effort supporting the MS-RSM program. Hoi Chang earned his PhD from the University of Massachusetts Amherst in animal biotechnology and biomedical sciences. During his thesis study, his research focused on understanding the mechanisms of calcium signaling and channel pathway during fertilization. He joined the laboratory of Teresa Woodruff, PhD, as a postdoctoral fellow where he broadened his research interests and expertise to include mammalian ovarian follicle biology, zinc biochemistry, and oncofertility. During his postdoc, he focused on zinc signaling during egg maturation and fertilization in various species. His current projects focus on discovering novel targets for contraceptive development using the oocyte. He joined the **CRS** community as a lecturer in 2016. He has covered Reproductive Technologies (REPR_SCI 440) as an assistant course director, Medical Management

of Fertility Laboratory (REPR_SCI 415) as a lecturer, and the non-thesis track research curriculum (REPR_SCI 442 and 443) as a mentor.

Nimra Chohan, MFA, MS-RSM Program Senior Coordinator

Nimra Chohan joined **CRS** in December 2021. She received her MFA in Prose & Poetry from Northwestern University's School of Professional Studies. She oversees and supports all administrative tasks and operations of the MS-RSM program including communications, student and faculty support, recruitment, and academic and curricular management. Nimra also supports the MS-RSM Student Council and enjoys sharing her writing expertise with MS-RSM students through a formal communications workshop. Nimra comes to **CRS** from the OB/GYN Education Department at the Feinberg School of Medicine, where she supported third-year medical students, as well as Northwestern's OB/GYN residents. Prior to joining Feinberg, she worked in public relations at Penguin Random House in New York.

Pamela Monahan, PhD, Lecturer and Director of Graduate and Postdoctoral Affairs

Pamela Monahan, PhD, is the **CRS** Director of Graduate and Postdoctoral Affairs and is a lecturer in the MS-RSM program. She earned her BS in biological sciences from the University of Tennessee and her MS and PhD in molecular and integrative physiology from the University of Illinois at Urbana-Champaign. Following her postdoctoral fellowship at Northwestern, Pam transitioned from a trainee in **CRS** to a faculty position within the MS-RSM program. Her research has focused on uncovering the molecular mechanisms driving reproductive organ development and identifying markers of placental dysfunction through interdisciplinary collaboration. Pam has been instrumental in shaping the MS-RSM curriculum, particularly in core courses like Reproductive Physiology and Endocrinology Foundations and Reproductive Physiology and Endocrinology in Society (REPR_SCI 405 and REPR_SCI 407), and she co-directs Reproductive Research Laboratory I & II (REPR_SCI 442/443) alongside Lindsey Block, PhD. Additionally, she is a liaison for **CRS**'s Reproductive Science and Medicine Graduate Cluster predoctoral trainees as well as **CRS** postdoctoral scientists and undergraduate trainees. Beyond her academic roles, she co-leads the **CRS** Community Engagement Subcommittee with Giulia Vigone, PhD and heads the trainee editorial team for the **CRSPotlights** newsletter. Passionate about fostering an inclusive environment, she is also trained as a mental health first aid responder.

Giulia Vigone, PhD, Associate Director, MS-RSM Program

Giulia Vigone, PhD, is the Associate Director of the MS-RSM program and is a lecturer in the program. She completed her Master of Science and doctorate research in the laboratory of developmental biology at the University of Pavia in Italy, where she specialized in the biology of the ovarian follicle, with a focus on markers of the oocyte quality. For her postdoctoral training, she joined the laboratory of Laurinda Jaffe, PhD, at UConn Health, where she studied the signaling mechanisms by which luteinizing hormone controls meiotic resumption and ovulation. Along with her research, she has cultivated an interest in professional development and education which led to her co-founding of the Academia-Industry Opportunities Group (AIOG). Giulia joined **CRS** in 2020 and directs the course Responsible Conduct of Research in Reproductive Science (REPR_SCI 425) in addition to teaching the professional development courses Science Communication in Reproductive Science and Medicine (REPR_SCI 455) and Assessment and Career Planning (REPR_SCI 497). As the Associate Director of MS-RSM she oversees the complete student experience from recruitment and admission all the way through graduation, fostering a community where students can thrive, connect, and achieve their career goals.

Rebecca Willingham, MFA, Program Coordinator

Rebecca Willingham joined **CRS** in March 2021. She oversees administrative tasks and operations of **CRS**. Rebecca also coordinates all **CRS** programming and events. She previously worked in the Biomedical Engineering Department at Northwestern and at The Theatre School at DePaul University. She is an alumna of Emerson College and received her MFA in Directing from The Theatre School at DePaul University. She has

shared her communication expertise through several specialized workshops for the **CRS** and **MS-RSM** communities.

Advisory Board

An advisory board comprised of external and internal members provides support and advice to **CRS**. The Advisory Board also includes trainee representatives. The individuals listed in **Table 1** have served as members of the **CRS** Advisory Board from 2020-2024.

External Advisory Board Members	Northwestern Advisory Board Members
Jodi Flaws, PhD Professor, Comparative Biosciences, University of Illinois at Urbana-Champaign	Serdar E. Bulun, MD Chair, Department of Obstetrics and Gynecology, John J. Sciarra Professor of Obstetrics and Gynecology
T. Rajendra (Raj) Kumar, PhD Edgar L. and Patricia M. Makowski Endowed Professor & Associate Vice-Chair of Research, Department of Obstetrics & Gynecology, University of Colorado Denver-Anschutz Medical Campus	Luisa Iruela-Arispe, PhD Chair & Stephen Walter Ranson Professor of Cell Biology, Department of Cell & Developmental Biology
Kyle Orwig, PhD Professor, Department of Obstetrics, Gynecology & Reproductive Sciences, University of Pittsburgh	Kelly Mayo, PhD Dean, The Graduate School, Associate Provost for Graduate Education
Karen Schindler, PhD Professor, Department of Genetics, Rutgers University	Margrit Urbanek, PhD Associate Professor of Medicine (Endocrinology)
Trainee Representatives	
2023	2024
Mariam Charles, MS-RSM Student	Caitlin Buchholz, MS-RSM Student
Shweta Dipali, PhD candidate, Duncan Lab	Ilka Lorenzo, PhD candidate, Wignall Lab
Hannah McDowell, PhD candidate, Laronda Lab	Madeline Perry, MS-RSM Student

Table 1: A list of **CRS** Advisory board members

Development Partners

Additional support for **CRS** is provided by our partners in the Feinberg School of Medicine's Development & Alumni Relations office. We work with their office, in particular, Jillian Hazen, Associate Director, Major Gifts, to identify philanthropic partners who are willing to support **CRS**. We have also worked with Jordan Sund, Senior Director, Major Gifts, and Kathleen Praznowski, Director, Major Gifts, on campaigns to support **CRS** through philanthropy. Kathleen has been instrumental in securing funds for continued support of the Shaw Innovation Awards. We are grateful for this partnership and look forward to working with the team on ongoing campaigns in support of our mission.

Membership and Community

CRS is a vibrant community of faculty, staff, and trainees (**Figure 3**). **CRS** consists of >150 faculty members at Northwestern and >130 trainees. Trainees are supported by educational offerings through the center such as the **CRS** Training Program, the MS-RSM program, and the Reproductive Science and Medicine Graduate Cluster.

Faculty

CRS faculty members bring scientific expertise, experience, and leadership to the center. Our diverse group of faculty members represent the multidisciplinary nature of reproductive science. **CRS** faculty have also made significant contributions to the field in terms of scientific discoveries, grants and funding, publication records, and teaching.



Figure 3: The CRS Community at the 2023 Upper Midwest Summit for Reproductive Science

The research expertise of **CRS** faculty members coalesces into six broad areas (**Figure 4**). This research encompasses numerous cells and tissues (gametes, gonads, embryos, endocrine axis, reproductive tract, vascular and immune systems), model organisms (cell lines, *Xenopus*, *C. elegans*, mouse, cow, pig, nonhuman primate, human), reproductive physiology across the lifespan (development and aging) and reproductive conditions and diseases (infertility, polycystic ovarian syndrome, endometriosis, fibroids, infectious disease).

Trainees

Keeping the reproductive science pipeline strong is of paramount importance to the **CRS**. We have two formal education programs within the Center: the MS-RSM program and **CRS** Training Program. **CRS** also houses the Reproductive Science and Medicine Graduate Cluster (RSM Cluster) in conjunction with The Graduate School (TGS) at Northwestern. Our trainees are valued members of the **CRS** community and many of our programs are tailored specifically to meet the needs of our trainees to advance their degrees and professional development.

Subcommittees

The **CRS** subcommittees were formed at the request of our community to enhance our members' ability to leverage our resources to make a greater impact and ensure we continue doing good science and science for good. Subcommittee members include faculty, pre- and post-doctoral trainees, graduate students, **CRS** staff and research staff. There are currently two subcommittees: Programming & Events and Community Engagement.

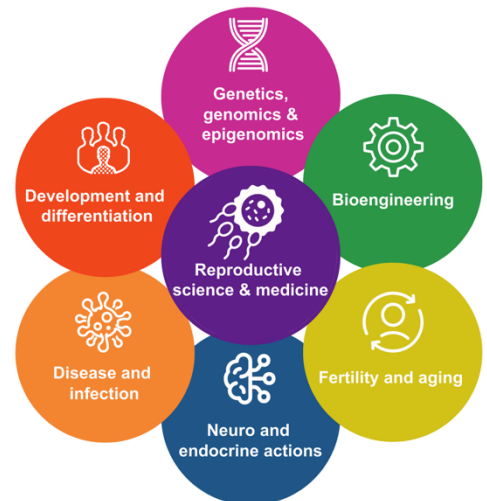


Figure 4: The research nodes of CRS faculty. Reproductive science encompasses many different disciplines, and our faculty members exemplify the width and breadth of the field.

Programming & Events

This committee engages our trainees in the planning and organization of **CRS** events to provide valuable professional development and leadership opportunities and make sure our community's voices are heard in the coordination of all our events. Committee members provide suggestions for topics and speakers for our annual events and take the lead in planning and hosting the annual UMSRS meeting. Committee members also serve as moderators for speaker events such as the **CRS** Trainee Coffee Hours.

Community Engagement

This committee aims to raise awareness and increase accessibility of reproductive science and medicine topics in the local community and with the broader public. The three pillars of the Community Engagement committee are:

- **Science Communication:** Bring reproductive science and medicine topics to the mainstream via social media. This includes the “This is what a Reproductive Scientist looks like” campaign which features members of the **CRS** community to highlight their research and bring attention to the individuals who are contributing to this vital field of medicine (**Figure 5**).
- **Mentorship:** initiatives/programs that provide mentorship and exposure to reproductive science to students from underprivileged communities. These include the Letters to a Pre-Scientist program and the Skype a Scientist program.
- **Community Partnerships:** Initiatives aimed at providing support, in terms of supplies and necessary goods, to local communities, such as the annual Flow Drive, which collects menstrual products to distribute to Chicago unhoused population in collaboration with Chicago Period Project and Homies Helping Humanity.



Figure 5: Maddie Perry, second year student in the MS-RSM program participates in the “This is what a Reproductive Scientist looks like” campaign. This campaign aims to bring awareness to research being conducted within CRS and highlight public relevance of reproductive science.

Section 2: What We Do

CRS is the hub of reproductive science at Northwestern and works to bring the entire reproductive science community together at numerous events on a weekly, monthly, quarterly, and annual basis. This includes weekly Reproductive Research Updates (RRUs), monthly Career Catalysts, quarterly Translational Lectures in Reproductive Science (TLRS), and the annual UMSRS meeting, which is a new addition to **CRS** programming that started in 2023. **CRS** also hosts several special seminars throughout the year. Details about all of **CRS**'s programming and events from 2020-2024 can be found below.

CRS is also the educational hub for reproductive science at Northwestern and actively trains the next generation of leaders in the reproductive sciences. This is accomplished through formal coursework in reproductive sciences, which is offered through the MS-RSM program, the **CRS** Training Program, and the RSM Cluster at Northwestern. We also support our trainees through dedicated awards and scholarships. These educational offerings have had tangible impact on **CRS** trainees. More information about the educational offerings and their impact in the past five years can be found in **Section 3** of this report.

To enable our success, it is vital that we stay connected with our community. All of what we do, from regularly scheduled events to educational offerings can be found on our dedicated websites for **CRS** and the MS-RSM program. These websites are updated regularly and are used to disseminate important research findings, news and events, and keep us connected with the reproductive science community at Northwestern and beyond. We also use social media, weekly announcements, and the monthly **CRS**spotlights newsletter to stay connected with the reproductive science community.

Events & Programming

Reproductive Research Updates

Each week for over 35 years, **CRS** has hosted RRU, a forum in which **CRS** members present their research to Northwestern University scientists across the Evanston and Chicago campuses. These forums are especially valuable to our trainees, as they provide opportunities to present their research and receive valuable feedback about their work from other members of the community.

In September 2024, **CRS** leadership changed the format of RRU to in-person at one location in the McGaw-Kellerman Classroom on the Chicago campus to foster more discussion and make the overall experience more valuable to our community (**Figure 6**). Zoom is still available to individuals who are in Evanston. Previously, only trainees presented at RRU. However, we added faculty presentations to the schedule to inform trainees about the cutting-edge science being conducted at Northwestern and to serve as a template to teach trainees how to deliver formal research talks. Since 2020, there have been 192 RRU presentations from members of our community. The Robert H. Lurie Comprehensive Cancer Center has also continuously supported RRU for over a decade, and we are grateful for their support.



Figure 6: An image from the weekly RRU meeting in the new classroom space on the Chicago campus. These weekly meetings provide a forum for trainees and faculty to present their research and bring the community together on a regular weekly basis. RRU have been a major part of CRS programming for almost 40 years.

Career Catalyst Series

The **CRS** Career Catalysts are a seminar and workshop series to expose trainees to various career paths and professional development skills in reproductive science. Since 2020, we hosted 25 Career Catalysts. These events are a platform to expose trainees to different career paths in science and is also a forum for hosting a variety of professional development workshops. The **Career Catalyst** series was developed by **CRS** programmatic leadership in 2017 after trainees indicated they wanted more practical workshops, advice, experiences, and reflections from professionals in relevant careers. See **Table 2** for a complete list of **Career Catalysts** since 2020.

Speaker Names and Affiliations	Topic	Date
Storytelling for Interviews	Craig Wortmann, Clinical Professor of Marketing and Executive Director, Kellogg Sales Institute, Northwestern University	November 2024
Grant Writing and Review	Malene Hansen, PhD, Chief Scientific Officer and Professor, Buck Institute for Research on Aging	October 2024
Bridging Academia to Industry	David Pépin, PhD, Associate Director of the Pediatric Surgical Research Laboratories, Massachusetts General Hospital; Co-founder and Scientific Advisor, Oviva Therapeutics	February 2024
Peer Review in Academic Scholarship	Romana Nowak, PhD, Professor of Animal Sciences, University of Illinois at Urbana-Champaign, Co-Editor in Chief, Biology of Reproduction Mary B. Zelinski, PhD, Professor, Oregon National Primate Research Center, Co-Editor in Chief, Biology of Reproduction	December 2023

Reproductive Scientists in Conservation Biology	Jason Herrick, PhD, Vice President of Conservation and Animal Health, Omaha Zoo Nucharin Songsasen, PhD, DVM, Head, Center for Species Survival, Smithsonian's National Zoo and Conservation Biology Institute Christopher Tubbs, PhD, Associate Director, Reproductive Sciences, San Diego Zoo Wildlife Alliance	November 2023
Constructive Feedback	Ellen Taaffe , Clinical Assistant Professor of Management & Organizations, Director of Women's Leadership Programs, Kellogg School of Management, Northwestern University	September 2023
Diversity, Equity & Inclusion in Reproductive Medicine	Michael A. Thomas, MD , Professor and Chair, Department of Obstetrics and Gynecology, University of Cincinnati College of Medicine & President, American Society for Reproductive Medicine	April 2023
Reproductive Scientists in Higher Education Administration	Paula Cohen, PhD, Professor of Genetics, Director, Center for Reproductive Genomics, Associate Vice Provost for Life Sciences, Cornell University Gary Hunnicutt, PhD, Research Scientist, Department of Medicine, Yale University and the Assistant Director for Research Affairs, Yale Cancer Center Kelly Mayo, PhD, Dean and Associate Provost for Graduate Education, Professor of Molecular Biosciences, Northwestern University	February 2023
How to Write a Scientific Manuscript	Stacey Tobin, PhD , Principal, The Tobin Touch	December 2022
Reproductive Scientists as Grant Program Officers	Travis Kent, PhD, Program Officer, Fertility and Infertility Branch, NICHD Candance Tingen, PhD, Program Officer, Gynecologic Health and Disease Branch, NIHCD Stephen Ward, PhD, Program Officer, Discovery & Translational Sciences, Global Health Program, Bill & Melinda Gates Foundation	November 2022
Saying Yes, Saying No: Doing "more" with intentionality and purpose	Gail Berger, PhD , Clinical Associate Professor at Kellogg School of Management and Deputy Director of the Kellogg Center for Executive Women	September 2022
Biomedical Visualization	Leah Lebowicz, MS, EdD, CMI , Program Director, Biomedical Visualization, Biomedical and Health Information Sciences & Clinical Assistant Professor, Biomedical and Health Information Sciences, University of Illinois Chicago	April 2022
Social Media for Scientists	Emily Copeland , Associate Director, Science Communication Network	February 2022
Storytelling and Presentation Skills in Science	Rebecca Willingham , CRS Program Assistant, and MFA Directing Candidate, The Theatre School at DePaul University	December 2021
Frameworks and Tools for Identifying and Interrupting Microaggressions	Shá Norman , Equity Outreach and Education Coordinator, Northwestern Office of Equity	November 2021
Utilizing Library Resources to Maximize Your Academic Potential	Molly Beestrum, MLIS , Education and Curriculum Coordinator, Galter Health Sciences Library & Learning Center, Feinberg School of Medicine, Northwestern University	September 2021
From Lab to Pharma: One Scientist's Career Path	Teru Jellerette-Nolan, PhD, TS (ABB) , Associate Director, Medical Science Liaison, Reproductive Medicine/Maternal Health, Ferring Pharmaceuticals	May 2021

A Career of Working at Science and Policy Intersection	Tracey Woodruff, PhD, MPH , Director of and Alison S. Carlson Endowed Professor for PRHE, Professor, UCSF Department of Obstetrics, Gynecology and Reproductive Sciences and the Philip R. Lee Institute for Health Policy Studies	April 2021
Using Your Time Well: Doing “more” through intentionality and purpose	Gail Berger, PhD , Kellogg School of Management, Northwestern University	December 2020
The Long and Winding Road: A Career in Academia, Pharma and the Non-Profit Sector	Greg Kopf, PhD , fhi360	November 2020
Utilizing Library Resources to Maximize Your Academic Potential	Molly Beestrum, MLS , Galter Health Science Library	September 2020
Academic Writing and Publishing, Part 2	Hugh Clarke, PhD , Co-Editor in Chief, Biology of Reproduction	May 2020
Science Journalism	Bonnie Rochman , Writer and editor at Fred Hutch Cancer Center	May 2020
Academic Writing and Publishing, Part 1	Hugh Clarke, PhD , Co-Editor in Chief, Biology of Reproduction	March 2020
Advocacy and Policy Work	Travis Kent, PhD , AAAS Science and Technology Policy Fellow Kristin N Smith , Program Manager for Fertility Preservation, Northwestern Medicine	January 2020

Table 2: A list of all the Career Catalyst seminars and workshops from 2020-present.

Translational Lectures in Reproductive Science

The **CRS** sponsors the TLRS seminar series, featuring talks by luminaries in the field. Our named lectures include: the Erwin Goldberg Lecture in Male Reproduction; the Neena B. Schwartz Memorial Lectureship in Reproductive Science; and the Danielle Maatouk Memorial Lectureship. In January, we kick off the new year with the **CRS** New Year’s Lecture which now features an early career investigator and rising star in the field. Previously this lecture had featured a Northwestern faculty member, but we found value in providing early career faculty a platform to present their research and upstart their careers. Approximately 60 individuals attend our TLRS events either in-person or virtually.

New Year’s Lecture

In January 2021, we introduced the **CRS** New Year Lecture which replaced the **CRS** Holiday Lecture. Dr. Mazhar Adli from Northwestern University was the first speaker in this series in January 2021. This annual lecture was previously given by a Northwestern faculty member but has evolved to focus on early career investigators and serves as an inspiring touch point for the community as we start a new year (**Figure 7**). Our New Year’s Lectures are listed in **Table 3**.

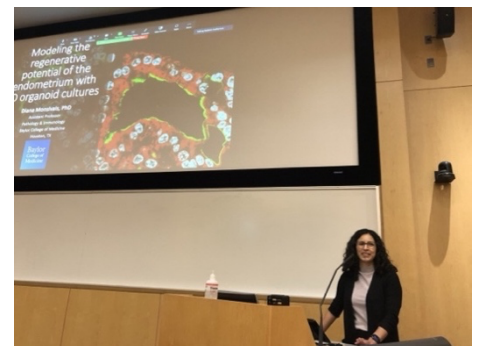


Figure 7: Dr. Diana Monsivais delivered the 2023 CRS New Year’s Lecture. We were thrilled to welcome back a CRS alum to deliver this talk.

Lecturer	Institution	Date
Kara McKinley, PhD	Harvard University	January 2024
Diana Monsivais, PhD	Baylor College of Medicine	January 2023
Debabrata Chakravarti, PhD	Northwestern University	January 2022
Mazhar Adli, PhD	Northwestern University	January 2021

Table 3: CRS New Year’s Lecture presenters from 2020-present.

Erwin Goldberg Lecture in Male Reproduction

This annual lectureship honors the legacy of Dr. Erwin Goldberg, professor emeritus, who is an expert in male reproduction and an active member of the **CRS**. A reproductive biologist, Erwin Goldberg has sought to extend basic observations from the lab to the bedside throughout his career. His landmark observation of a unique enzyme (LDH-C4, lactate dehydrogenase) in the testis is a foundation for understanding how sperm are produced. He also cloned and sequenced the LDH-C gene and successfully targeted the disruption of the gene, which results in male infertility. This finding was integral to the understating of sperm function and important to diagnosis of male infertility.

The inaugural *Erwin Goldberg Lecture in Male Reproduction* took place in October 2017 and is an ongoing part of **CRS** programming (**Figure 8**). Since 2020, Dr. Goldberg has selected the following individuals to deliver the Erwin Goldberg Lecture in Male Reproduction (**Table 4**):



Figure 8: Dr. Erwin Goldberg with 2022 speaker Dr. Erika Matunis. Dr. Matunis's research is currently focused on spermatogonia differentiation and germ line cells.

Lecturer	Institution	Date
Michael Griswold, PhD	Washington State University	February 2024
Bernard Robaire, PhD	McGill University	February 2023
Erika L. Matunis, PhD	Johns Hopkins University School of Medicine	February 2022
Thomas O'Halloran, PhD	Michigan State University	February 2021
Saher (Sue) Hammoud, PhD	University of Michigan	February 2020

Table 4: List of all the individuals who have presented the Erwin Goldberg Lecture in Male Reproduction since 2020.

Danielle Maatouk Memorial Lectureship

This annual lecture honors Danielle Marie Maatouk, PhD who was a valued faculty member of the CRS community until her untimely passing in 2016. Each year, together with her family, **CRS** selects a luminary in the field of sex determination to deliver this lecture in Danielle's honor (**Figure 9**).

Dr. Maatouk was an exceptional scientist who studied how changes in the epigenome regulate gene expression and cell fate determination during fetal development. She received her PhD from the University of Florida in Molecular Genetics. She then worked as a postdoctoral fellow in the Department of Biology and Genetics at Duke University, before working at Northwestern University as an Assistant Professor of Obstetrics and Gynecology. Danielle passed away on November 13th, 2016, at the age of 39, after a two-and-a-half-year battle with aggressive colon cancer. Danielle's legacy lives on in all of us in the department, her students, and in the next generation of learners who will reveal the fundamentals of sex.



Figure 9: CRS Co-Directors alongside the 2023 Maatouk Memorial Lectureship Speaker, Dr. Humphrey Yao.

The following individuals have presented the Danielle Maatouk Memorial Lectureship since the previous report (note there was no lecture in 2020 due to the pandemic) (**Table 5**):

Lecturer	Institution	Date
Blanche Capel, PhD	Duke University	April 2024
Humphrey Yao, PhD	NIEHS	September 2023
Tony De Falco, PhD	Cincinnati Children’s Hospital Medical Center	April 2022
Joan Jorgensen, PhD, DVM	University of Wisconsin-Madison	April 2021

Table 5: All presenters of the Danielle Maatouk Memorial Lectureship since 2020.

Neena B. Schwartz Memorial Lectureship in Reproductive Science

For the past 20 years, **CRS** has celebrated the life and work of our founder, Professor Neena B. Schwartz, with our annual Neena B. Schwartz Lecture in Reproductive Science. On April 15th, 2018, Professor Neena B. Schwartz, The William Deering Professor of Endocrinology Emerita at Northwestern University, passed away peacefully at the age of 91. We continue to celebrate her legacy through the Neena B. Schwartz Memorial Lectureship, which is held annually in fall quarter. The NBS Lecture in Reproductive Science highlights a luminary in the field of reproductive endocrinology or biology (**Figure 10**).

Since 2020, five distinguished scientists have delivered the Neena B. Schwartz Memorial Lectureship in Reproductive Science. See **Table 6** below for a complete list of speakers:

Lecturer	Institution	Date
Sarah K. England, PhD	Washington University	October 2024
Stephanie Seminara, MD	Massachusetts General Hospital, Harvard University	December 2023
Patricia Hunt, PhD	Washington State University	October 2022
T. Rajendra Kumar, PhD	University of Colorado – Anschutz Medical Campus	October 2021
Tom Thompson, PhD	University of Cincinnati College of Medicine	October 2020

Table 6: Individuals who have delivered the Neena B. Schwartz Memorial Lectureship in Reproductive Science since 2020.



Figure 10: CRS Co-Directors, Drs. Duncan and Kim, alongside Dr. Serdar Bulun, OB/GYN Department Chair, with 2024 NBS lecturer Dr. Sarah K. England. Dr. England delivered a talk on maternal chronodisruption and adverse reproductive outcomes.

Illinois Symposium on Reproductive Science

This annual symposium began in 2008, when a group of reproductive science faculty from across Illinois conceived of a trainee-focused meeting hosted by a rotation of Illinois universities including Northwestern, UIUC, UIC and Southern Illinois University (SIU). The Illinois Symposium on Reproductive Science (ISRS) offered trainees in the reproductive sciences the opportunity to plan a meeting and present their research to scientists from across Illinois with an average attendance of 100-150 individuals. This meeting served as the foundation for the new UMSRS meeting, which debuted in 2023 (more information about UMSRS can be found on page 19 of this report).

The final ISRS meeting was hosted by the University Illinois- Urbana Champaign in 2021. Speakers included Hugh Taylor, MD, Yale University, T. Rajendra Kumar, PhD, University of Colorado Anschutz Medical Campus. A highlight was a focus on alumni speakers including Patrick Hannon, PhD, University of Kentucky, Janelle Mapes, PhD, Pacific Northwest University, and Jennifer Wood, PhD, University of Nebraska. 21 trainees from **CRS** attended the event (**Figure 11**).



Figure 11: Members of the CRS community attend the 2021 ISRS meeting.

Reproductive Science & Medicine Summit

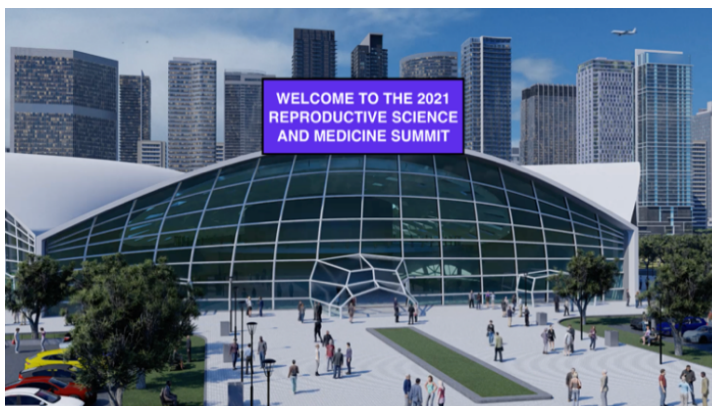


Figure 12: The virtual headquarters of the 2021 Summit. This event was held virtually due to the pandemic, but increased accessibility and attendance despite the virtual format.

Since 2020, **CRS** hosted two Reproductive Science & Medicine Summits (**CRS Summit**). The **CRS Summit** (formerly called the Mini-symposium) showcased reproductive sciences research conducted at Northwestern University and surrounding Chicago and Illinois institutions. The summit included presentations from internal and external distinguished speakers, as well as trainee oral and poster presentations. An organizing committee composed of **CRS** trainees was central to the success of this event. Importantly, like ISRS, the **CRS Summit** served as a foundation for the establishment of the larger scale UMSRS meeting which debuted in 2023. **CRS** leveraged its event planning experience and its strong presence in the

reproductive science community to expand the scope of these meetings while also maintaining trainee focus, which is central to these events.

Details about the 2021 and **CRS** Summits, including speakers, alumni speakers, award winners, and trainee planning committees, are listed below. Due to the COVID-19 pandemic, we were unable to host the 2020 meeting, and the **CRS Summit** resumed in 2021 in a virtual setting (**Figure 12**). In 2022, the **CRS Summit** was fully in-person for the first time since 2019.

2021 Reproductive Science and Medicine Summit

The 2021 **CRS** Summit took place virtually on May 7, 2021. The event was hosted on the vFairs virtual event platform. This year's summit was focused on "Diversity Across Reproductive Science and Medicine" (**Figure 13**). The virtual setting meant that the summit was more accessible than ever with more than 120 attendees. Trainee co-chairs for the 2021 Summit included Tracy Zhou, a research associate in the Duncan Lab, and Tanvi Potluri, a PhD candidate in the Bulun Lab.



Figure 13: The promotional flyer from the 2021 CRS Summit.

Reproductive Science and Medicine Summit Trainee Committee

- Tracy Zhou, Research Associate, Duncan Lab, Co-Chair
- Tanvi Potluri, Graduate student, Bulun Lab, Co-Chair
- Lauren Butler, MS-RSM student, Goldman Lab
- Ashley Diaz, MS-RSM student, Laronda Lab
- Feng Fei, MS-RSM student, Chakravarti Lab

Speakers

At the 2021 **CRS** Summit, we had three distinguished keynote speakers:

- Opening Keynote: Kelle Moley, MD, Deputy Director of Reproductive Health Technologies, Global Health at Bill & Melinda Gates Foundation; "Global Priorities in Reproductive Health Technologies"
- **CRS** Keynote: Sarah Temkin, MD, Associate Director for Clinical Research, Office of Research on Women's Health, NIH; "Achieving Equity in Reproductive Science"
- Closing Keynote: Chandra Jackson, PhD, MS, Stadtman Investigator, Epidemiology Branch, NIEHS; "Intersectionality and Reproductive Health Justice: The Sleep Exposome Example"

Attendees had the opportunity to attend three unique breakout sessions with two faculty speakers: Sex & Gender in Reproductive Health; Reproductive Sciences Research in a Pandemic; and Bench to Bedside: Translation of Reproductive Research & Medicine. Our illustrious speakers included:

- Diane Chen, PhD, Associate Professor, Psychiatry & Behavioral Sciences, Feinberg School of Medicine, Northwestern University
- Brian Mustanski, PhD, Director, Institute for Sexual & Gender Minority Health & Wellbeing, Northwestern University
- Sabra Klein, PhD, Professor, Molecular Microbiology & Immunology, Johns Hopkins Bloomberg School of Public School
- Maha Othman, MD, PhD, Professor, Department of Biochemical & Molecular Sciences, Queen's University School of Medicine
- Nanette Santoro, MD, Professor and E. Stewart Taylor Chair, Department of Obstetrics & Gynecology, University of Colorado
- Kaylon Bruner-Tran, PhD, Professor, Department of Obstetrics and Gynecology, Vanderbilt University

Alumni Speaker

CRS was pleased to welcome back Emily Su, MD, as our **CRS** alumni speaker (**Figure 14**). Dr. Su is the Director of Perinatal Research and an Associate Professor in the Divisions of Maternal-Fetal Medicine and Reproductive Sciences at the University of Colorado School of Medicine. She completed her OB/GYN residency in 2004 and Maternal-Fetal Medicine fellowship in 2007 at Northwestern University. Dr. Su was a member of the Bulun Lab and received her MS in Clinical Investigation during her time here. She was a

faculty member at Northwestern for several years following her fellowship. Dr. Su presented on "Severe, early-onset fetal growth restriction: An on-going clinical conundrum."

Award Winners

Since this year's summit was virtual, only oral presentations were selected from the submitted abstracts. The following trainees received Constance Campbell Research Awards:

- Enitome Bafor, PhD, Postdoctoral fellow, NIH
- Julia Balough, Graduate student, Buck Institute for Research on Aging
- Alina Murphy, Graduate student, Northwestern University
- Juhi Narula, Graduate student, Northwestern University
- Zainab Taghvaei, Graduate student, Northwestern University
- Elizabeth Wenzel, Graduate student, University of Illinois at Chicago



Figure 14: Dr. Emily Su, CRS alum, delivered her virtual talk at the 2021 Summit.

2022 Reproductive Science and Medicine Summit

The 2022 **CRS** Summit took place May 12-13, 2022, at the Simpson Querrey Biomedical Research Center in downtown Chicago. The theme of this year's summit was "Frontiers in Reproductive Science and Medicine" (**Figure 15**). We were thrilled to host the Summit in person for the first time since 2019. Kelsey Anderson and Katy Trotter, both graduates of the MS-RSM program, served as trainee co-chairs for the event.

Speakers

At the 2022 Summit we welcomed distinguished speakers from Northwestern and across the nation. This year's keynote speaker was Nicolas Plachta, PhD, William Richard Gordon President's Professor in Genetics in the Department of Cell and Developmental Biology at the University of Pennsylvania Perelman School of Medicine.

Session speakers included:

- Miguel Brieño-Enriquez, MD, PhD, Assistant Professor, Department of OBGYN and Reproductive Sciences, Magee-Womens Research Institute, University of Pittsburgh
- Jonathan Steller, MD, Clinician Scientist, Department of Maternal Fetal Medicine, University of California-Irvine
- Bérénice Benayoun, PhD, Assistant Professor of Gerontology, Biological Sciences, Biochemistry and Molecular Medicine, University of Southern California

This year, **CRS** invited the winner of the Shaw Innovation Award to present at the summit. The Shaw Innovation Awards provide funding for sex-inclusive research, focusing on sex-based mechanisms and determinants of health and disease (see the **Awards & Scholarship**



Figure 15: A copy of the save the date flyer for the 2022 CRS Summit. This was the first time the Summit was held in-person

Reproductive Science and Medicine Summit Trainee Committee

- Kelsey Andersen, MS-RSM Student, Duncan and Miller Labs, Co-Chair
- Katy Trotter, MS, Research Lab Manager, Duncan Lab, Co-Chair
- Pooja Devrukhkar, MS-RSM student, Duncan Lab
- Madison Gowett, MS-RSM student, Duncan Lab
- Tanvi Potluri, ScM, Graduate student, Bulun Lab
- Khadija Snowber, MS-RSM student, Miller Lab
- Tracy Zhou, MS, Research Associate, Duncan Lab

section of this report for more details). Dr. Hong Zhao, MD, PhD, Research Associate Professor in the Department of Obstetrics and Gynecology, Northwestern University, was the winner of this year's award. Dr. Zhao presented on "Estrogen, Astrocyte, and Sex Differences in Alzheimer's Disease."

Alumni Speaker

CRS was pleased to welcome back Molly Moravek, MD, MPH, MSCI, as this year's **CRS** alumni speaker. Dr. Moravek is a Clinical Associate Professor in the Department of Obstetrics and Gynecology in the division of reproductive endocrinology and infertility and the Department of Urology at the University of Michigan. She is also the director of the Fertility Preservation Program and the associate program director for the fellowship in reproductive endocrinology and infertility. Dr. Moravek completed her residency in obstetrics and gynecology at the University of Michigan, and her fellowship in Reproductive Endocrinology and Infertility at Northwestern University, where she also received a Master of Science in Clinical Investigation. She completed her fellowship thesis project in the lab of Serdar Bulun, MD, investigating the role of stem cells in uterine leiomyoma. Dr. Moravek presented on "Fertility and Fertility Preservation in Transmasculine Individuals."

The 2022 **CRS** Summit concluded with a Q&A session that featured a group of **CRS** Alumni who talked about their current roles and their experiences with **CRS**. Panelists included:

- Molly Moravek, MD, MPH, MSCI
Current Role: Associate Professor and Director of Fertility Preservation, University of Michigan
Former **CRS** Role: REI fellow at Northwestern
- Stacey Tobin, PhD
Current Role: Biomedical Writer and Editor, The Tobin Touch, Inc.
Former **CRS** Role: PhD student, Woodruff Lab
- Hunter Rogers, PhD
Current Role: Equity Research Associate, Biotech at William Blair
Former **CRS** Role: PhD student, Woodruff Lab
- Chanakarn Suebthawinkul, MD
Current Role: OB/GYN, Chulalongkorn University, Thailand
Former **CRS** Role: MS-RSM student, Northwestern University
- Beatriz Peñalver Bernabé, PhD
Assistant Professor, Department of Biomedical Engineering, College of Medicine, UIC
Former **CRS** Role: PhD student, Shea Lab

Award Winners

Nine trainees were invited to give oral presentations and the following trainees received Constance Campbell Research Awards:

- Chanakarn Suebthawinkul MD, MS-RSM student, Duncan Lab
- Tanvi Potluri, ScM, PhD candidate, Bulun Lab
- Hana Kubo, PhD candidate, Laronda Lab

The remaining 31 abstracts were presented as posters (**Figure 16**). All posters were judged at the Summit, and the top five received a Constance Campbell Research Award:

- Rosie Bauer, PhD candidate, Urbanek Lab
- Shweta Dipali, PhD candidate, Duncan Lab
- Luce Kassi, MD, Resident physician, Pavone Lab
- Alina Murphy, PhD candidate, Kim Lab
- Yinu Wang, PhD, Postdoctoral fellow, Matei Lab



Figure 16: A poster session at the 2022 CRS Summit.

What's New

Upper Midwest Summit for Reproductive Science

UMSRS debuted in 2023 at Northwestern University. UMSRS convenes institutions from Illinois, Indiana, Kentucky, Michigan, and Wisconsin and represents a unique opportunity to coalesce investigators and trainees from across the region to foster the exchange of scientific information in the reproductive sciences, facilitate the training and career development of future reproductive scientists, and leverage collective institutional strengths to maintain regional leadership in reproductive science (Figure 17).

The idea for this large scale meeting was spearheaded by **CRS** leadership and leadership at the University of Illinois- Urbana Champaign (UIUC) who saw an unmet need to convene a critical mass of reproductive scientists located in Illinois, Indiana, Kentucky, Michigan, and Wisconsin, which includes five master's program in the field, and 18 T32 grants from the NICHD, in addition to other undergraduate and pre-and post-doctoral programs that focus on related fields as well including animal sciences, cellular and molecular biology, zoology, chemistry, microbiology, and other interdisciplinary fields that have a stake in the reproductive sciences. This annual conference serves as a place where trainees, faculty, and staff can convene to present their research and identify field-wide priorities to drive future discoveries and accelerate the pace and quality of research.

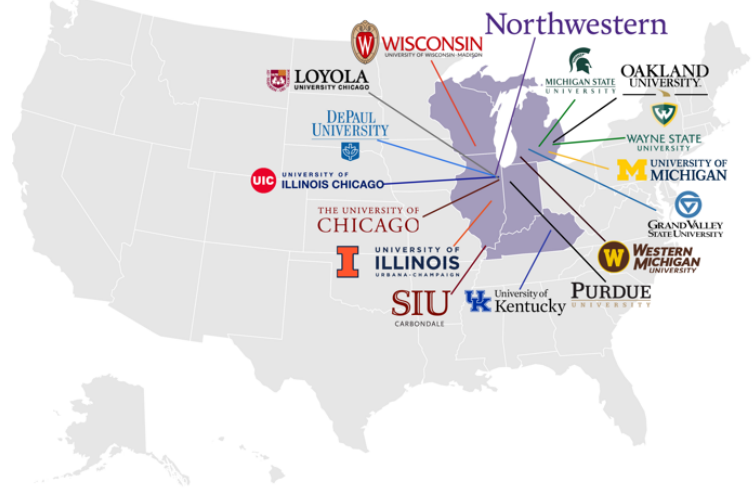


Figure 17: A map of the states and 16 institutions included in CRS's latest program offering, the Upper Midwest Summit for Reproductive Science. This annual event brings together trainee and faculty from all these partner institutions and serves to convene the community to showcase research being conducted in our region.

UMSRS is an expansion of the ISRS meeting, which began in 2008, when a group of reproductive science faculty from across Illinois conceived of a trainee-focused meeting hosted by a rotation of Illinois universities including Northwestern, UIUC, UIC and Southern Illinois University (SIU). Given the success of the ISRS, we surveyed key thought leaders in reproductive science and medicine at institutions in neighboring states in the region to see if there was interest in broadening the scope of ISRS, and the enthusiasm was overwhelming. Therefore, CRS and UIUC leadership wrote an R13 grant with full support of our colleagues to propose the continuation and expansion of this annual meeting to include institutions from Illinois, Indiana, Kentucky, Michigan, and Wisconsin. The grant received incredible reviews, receiving an impact score of 10 and a score in the first percentile. UMSRS then became a reality!

This event offers graduate students, postdoctoral fellows and others in the reproductive sciences from across the region the opportunity to plan a meeting and present their research to peers, mentors, faculty and other scientists. A traditional and highly valued component of this event is the trainee committee who plan and organize many aspects of the meeting. The trainee committee includes members from across Illinois and the Midwest and promotes a regional peer and mentor network for our trainees. UMSRS alternates locations every year between Northwestern (2023, 2025, 2027) and UIUC (2024, 2026). To date, there have been two UMSRS meetings and the plans for the 2025 meeting have already been finalized.

2023 Upper Midwest Summit for Reproductive Science

The 1st Annual UMSRS was held on October 30-31, 2023, at Northwestern University in Chicago, Illinois. The theme of the meeting was “*Reproductive Technologies: From ‘Conception’ to the Future.*” The 2023 Planning Committee was led by MSTP student and T32 trainee Caroline Kratka and MS-RSM student Mariam Charles, both trainees in the Duncan Lab. There was a total of 181 registered attendees from 13 partner institutions. Notably, 69% of attendees self-identified as trainees, which includes graduate students, postdocs, and undergrads. Other event highlights included a talk and book signing with Deena Emera, PhD, author of *A Brief History of the Female Body* (**Figure 18**), a *Meet the Experts* Luncheon, poster sessions, and a panel on startups and companies.

The UMSRS is organized by trainees for trainees. Trainees had ample opportunity throughout the conference to present their research and meet with faculty. Key events for trainees included three poster sessions, a *Meet the Experts* luncheon, and nine 15-minute trainee talks chosen by the trainee organizing committee. During the two formal poster sessions, faculty judged 87 posters (**Figure 19**). In addition to the R13 grant, we secured three additional financial supporters of the event, including GenScript, The Male Contraceptive Initiative, and the Society for the Study of Reproduction. Overall, the first annual UMSRS meeting was an overwhelming success, and all the major activities of the event are described in detail below. Notably, a majority of the UMSRS program and speakers were identified by the trainee organizing committee and their talks fit under the larger umbrella theme of cutting-edge technologies and research in reproductive science.



Figure 18: Dr. Deena Emera interacted with trainees and signed copies of her book at the 2023 UMSRS meeting.

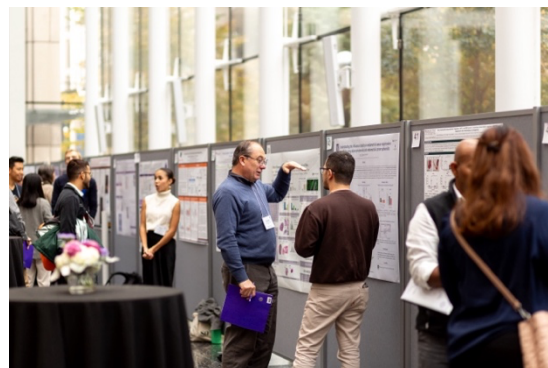


Figure 19: A poster session at the 2023 UMSRS meeting.

Trainee Planning Committee

- Mariam Charles, MS Student, Northwestern University (co-chair)
- Caroline Kratka, Graduate Student, Northwestern University (co-chair)
- Teresa Chou, Graduate Student, Northwestern University
- Pooja Devrukhkar, MS, Research Staff, Northwestern University
- Shweta Dipali, Graduate Student, Northwestern University
- Chad Driscoll, Graduate Student, Michigan State University
- Samantha Exner, MS Student, Northwestern University
- Endia Fletcher, Graduate Student, University of Illinois-Urbana Champaign
- Mohammad Mousaei Ghasroldasht, PhD, Postdoctoral Fellow, University of Chicago
- Dilan Gokyer, MD, Postdoctoral Fellow, Northwestern University
- Alaina Houghton-Chamberlain, Graduate Student, University of Wisconsin
- Kendall Hyde, Graduate Student, Southern Illinois University
- Hayce Jeon, Graduate Student, University of Kentucky
- Emma Lee, Graduate Student, University of Illinois, Chicago
- Ilka Lorenzo, Graduate Student, Northwestern University
- DruAnne Maxwell, Graduate Student, Wayne State University
- Hannah McDowell, Graduate Student, Northwestern University
- Sierra Orr, MS Student, Northwestern University
- Taylor Schissel, Graduate Student, University of Michigan
- Bruna Tatematsu, Graduate Student, Loyola University
- Janavi Thyagraj, MS Student, Northwestern University

Speakers

The opening keynote lecture was presented by Barbara VanderHyden, PhD, Distinguished Professor, University of Ottawa, and focused on the aging ovary. Lonny Levin, PhD, Professor, Cornell University, delivered the closing keynote on male contraception.

The event also featured three sessions, each featuring an invited faculty speaker:

- Binyam Mogessie, PhD, Assistant Professor, Yale University
“Deciphering chromosome segregation mechanisms in female meiosis”
- Ripla Arora, PhD, Associate Professor, Michigan State University
“Insights from imaging the implanting embryo and the uterine environment in three dimensions”
- Shuo Xiao, PhD, Assistant Professor, Rutgers University (CRS Alum)
“A small follicle tells a big story”

The winners of the 2022 Shaw Innovation Awards also presented on their research. These two talks exposed our audience to important research being conducted in sex differences, and the **CRS** will continue to promote sex-inclusive science through collaborative and innovative research.

- Jennie Lin, MD, Assistant Professor, Northwestern University, “Sex-Based Differences in Immune-Mediated Kidney Injury”
- Heather Mahoney, PhD, Postdoctoral Fellow, Northwestern University, “Sex differences in visual modulation of mood and nicotine abuse”

A panel focusing on *Innovations and Applications of Reproductive Science* chosen by the trainee organizing committee, featured three panelists who worked for reproductive science start-ups. Given the diverse global locations with of the panelists, this event was held virtually via Zoom. Panelists included:

- Petrina Kamy, PhD, Global Business Development Director, Insilico Medicine
- Marcos Meseguer, PhD, Senior Scientist, IVIRMA Innovation
- Mariano Buffone, PhD, Co-Founder and Co-CSO, Fecundis

Constance Campbell Research Awards

Outstanding Oral Presentation (Figure 20)

- Emily T. Hayes, Graduate Student, UIC
- Emmanuel Paul, PhD, Postdoc, Michigan State University
- Bruna K. Tatematsu, Graduate Student, Loyola University Chicago

Outstanding Poster Presentation

- Maria Victoria Bariani, PhD, Postdoc, University of Chicago
- Harun Cignöz, Graduate Student, Northwestern University
- McKenna Crossen, Graduate Student, University of Wisconsin – Madison



Figure 20: Winners of the Constance Campbell Research Awards with CRS Co-Directors Dr. Francesca Duncan and Dr. Julie Kim at the 2023 UMSRS.

2024 Upper Midwest Summit for Reproductive Science

The 2nd annual UMSRS was held on October 14, 2024, at University of Illinois Urbana-Champaign. The theme of the meeting was “Environmental Impacts on Reproductive Health” (**Figure 21**). There were 204 registered attendees from 15 partner institutions. 70% of attendees self-identified as trainees, which includes graduate students, postdocs, and undergrads (**Figure 22**). There were nine trainee talks and 94 poster presentations.

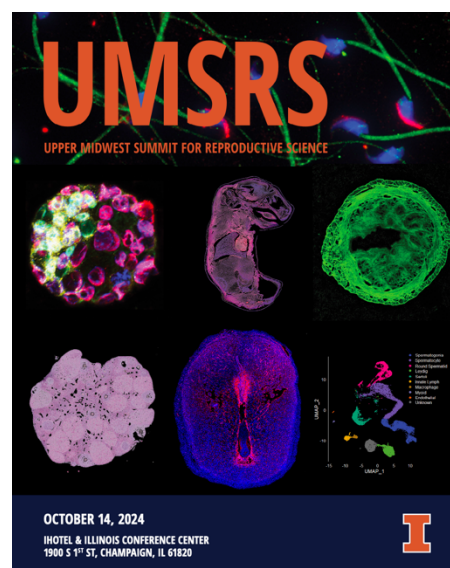


Figure 21: The promotional flyer from the 2024 UMSRS meeting.

Trainee Planning Committee

- Arpita Bhurke, PhD, Postdoc, Committee Chair, University of Illinois Urbana-Champaign
- Kavyashree Basavaraju, Graduate Student, University of Illinois Urbana-Champaign
- Jacob Beal, Graduate Student, University of Illinois Urbana-Champaign
- Sam Bhaye, Graduate Student, University of Illinois Urbana-Champaign
- Cary Brandolino, Master's Student, DePaul University
- Hannah McDowell, Graduate Student, Northwestern University
- Shams Saad, Graduate Student Purdue University
- Rik Shukla, Graduate Student, University of Illinois Urbana-Champaign
- Janavi Thyagraj, Master's Student, Northwestern University

Speakers

The A.V. Nalbandov Lectureship in Reproductive Science was presented by Francesco J. DeMayo, PhD, Chief and Senior Principal Investigator, Reproductive and Developmental Biology Laboratory, National Institute of Environmental Health Sciences. The Janice Bahr Reproductive Biology Lecture was given by Carmen J. Williams, MD, PhD, Senior Investigator, Reproductive Medicine Group, Reproductive & Developmental Biology Laboratory, National Institute of Environmental Health Sciences.

The program included four alumni speakers from UIUC:

- Irene O. Aninye, PhD, Chief Science Officer, Society for Women's Health Research, “From Bench to Boardroom: A Journey through Science and Leadership”
- Ye Yuan, PhD, Research Director, Colorado Center for Reproductive Medicine, “Translational Research in human ART”
- Jaeyon Kim, DVM, PhD, Associate Professor of Biochemistry and Molecular Biology at Indiana University School of Medicine, “Lessons from a former trainee”
- Genoa Warner, PhD, Assistant Professor of Chemistry and Environmental Science, New Jersey Institute of Technology, “Safer chemical design: avoiding endocrine disruption”



Figure 22: Members of the CRS community at the 2024 UMSRS meeting at UIUC. Northwestern and UIUC will alternate hosting the meeting until 2027.

CRS Award Winners

Hannah McDowell (PhD candidate and T32 trainee, Laronda Lab) received first place in the oral presentation section. Prianka Hashim (PhD/MPH candidate, Duncan lab) and Anna Heinrich (PhD candidate, Duncan Lab) received second and third place in the poster competition, respectively (**Figure 23**).

2025 Upper Midwest Summit for Reproductive Science

The 2025 UMSRS is scheduled for October 13-14, 2025, at Northwestern in Chicago, Illinois. The theme of the meeting is Next-Gen Reproduction: Shaping the Future of Reproductive Science and Medicine. There are two trainee co-chairs for the meeting: Prianka Hashim (MPH/PhD student, Duncan Lab), and Hannah McDowell (PhD candidate and T32 trainee, Laronda Lab). The trainee planning committee has put together an agenda for the meeting and all speakers have been confirmed for the third annual meeting. We have also identified the Trainee Planning Committee listed below. Our goal this year is to host the meeting free of cost for all attendees. We hope this will increase accessibility and remove any barriers to participation.



Figure 23: 2024 UMSRS award winners from left to right: Anna Heinrich, Hannah McDowell, and Prianka Hashim.

Trainee Planning Committee

- Prianka Hashim, Graduate Student, Northwestern University (co-chair)
- Hannah McDowell, Graduate Student, Northwestern University (co-chair)
- Erin Vegter, Research Assistant, Michigan State University
- Bruna Tatematsu, Graduate Student, Loyola
- Rik Shukla, Graduate Student, University of Illinois, Urbana-Champaign
- Kendall Hyde, Graduate Student, Southern Illinois University
- Cora Thompson, Graduate Student, University of Wisconsin
- Emily Hayes, Graduate Student, University of Illinois, Chicago
- Brittney Williams, Graduate Student, University of Kentucky

Awards and Scholarships

Awards from the **CRS** help advance our mission to enhance and coordinate research in the reproductive sciences at Northwestern University, promote the application of this research toward human welfare, and optimize the training of future investigators, educators and clinicians in reproductive health. More details about our awards and scholarship, including all award winners since 2020 can be found below.

Constance Campbell Memorial Research Award

The Constance Campbell Memorial Research Awards have been presented to trainees with the best oral and poster presentations at **CRS** events including the CRS Summit and ISRS, and now USMRS, since 1989 (**Figure 24**). These awards are provided through the Constance Campbell Memorial Fund, established in memory of Constance (Connie) Campbell by her husband Dr. Jack Davis, family, friends and colleagues.

Dr. Campbell cared deeply about student research. She did her postdoctoral training with **CRS** founding director Neena Schwartz, PhD, at the University of Illinois at Chicago. In 1974, Dr. Campbell was hired as an assistant professor in the Northwestern Department of Biological Sciences, where her research focused on the relationship between the environment and sexual and other behaviors. Dr. Campbell administered the undergraduate honors program and served as a preceptor in the Program for Reproductive Biology that

preceded **CRS**. The program launched the first Minisymposium in Reproductive Biology in 1980 with Dr. Campbell's enthusiastic participation. That same year she was promoted to associate professor and granted tenure, however, lost her battle with cancer the following year. We are grateful for this award which honors Dr. Campbell's contributions to **CRS**.

Constance Campbell Trainee Travel Award

Since 1989, Constance Campbell Trainee Travel Awards have helped defray travel costs to scientific meetings and conferences for recipients. These awards are provided through the Constance Campbell Memorial Fund, established in memory of Constance Campbell by her husband Dr. Jack Davis, family, friends and colleagues. A complete list of previous recipients and their respective meetings can be found below in **Table 7**.



Figure 24: CRS Co-Director Dr. Francesca Duncan with three winners of the Constance Campbell Memorial Research Award at the 2022 Reproductive Science and Medicine Summit

Constance Campbell Memorial Research Award		
Year	Oral Winners	Poster Winners
2023	Emily T. Hayes, University of Illinois at Chicago Bruna K. Tatematsu, Loyola University Chicago Emmanuel Paul, PhD, Michigan State University	Harun Cignoz, Northwestern University Maria Victoria Bariani, PhD, University of Chicago McKenna Crossen, University of Wisconsin - Madison
2022	Hana Kubo, Northwestern University Tanvi Potluri, Northwestern University Chana Suebthawinkul, MD, MS, Northwestern University	Rosie Bauer, Northwestern University Shweta Dipali, Northwestern University Luce Kassi, MD, Northwestern University Alina Murphy, Northwestern University Yinu Wang, PhD, Northwestern University
2021	Enitome Bafor, PhD, NIH Julia Balough, Buck Institute for Research on Aging Alina Murphy, Northwestern University Juhi Narula, Northwestern University Zainab Taghvaei, Northwestern University Elizabeth Wenzel, University of Illinois at Chicago	Due to the virtual nature of the 2021 Summit, there were no poster presentations
Constance Campbell Trainee Travel Award		
Year	Recipient	Meeting
Fall 2024	Dilan Goyker, MD	ASRM Scientific Congress and Expo, October 19-23, 2024
	Harun Ozturk	Max Planck Freiburg 7th Epigenetics Meeting, December 4-6, 2024

Spring 2024	Prianka Hashim	Society for the Study of Reproduction Annual Meeting, July 15-19, 2024
	Kathryn McElhinney, MD	American Pediatric Surgical Association Annual Meeting, May 16-19, 2024
Fall 2023	Grace Foley	AACR Special Conference in Cancer Research: Endometrial Cancer, November 15-18, 2023
	Chloe Parker	American Society of Human Genetics Annual Meeting, November 1-5, 2023
Spring 2023	Cassandra Huerta	15 th World Congress on Endometriosis, May 2-6, 2023
	Ria Marathe	2023 Reproductive Aging Conference, April 30-May 3, 2023
Fall 2022	Juhi Narula	Cell Bio 2022 (joint meeting of the American Society for Cell Biology and European Molecular Biology Organization, December 3-7, 2022
	Tanvi Potluri	Orthopaedic Research Society Annual Meeting, February 10-14, 2023
Spring 2022	Hannes Campo, PhD	Microphysiological Systems World Summit, May 30-June 3, 2022
	Chanakarn Suebthawinkul, MD	Oncofertility Consortium Annual Conference, May 2-4, 2022
	Andres Valdivia, PhD	American Association for Cancer Research Annual Meeting, April 8-13, 2022
Winter 2021	Hana Kubo	Society for the Study of Reproduction Annual Meeting, December 15-18, 2021
	Khadija Snowber	Society for Maternal Fetal Medicine Annual Meeting, January 31-February 5, 2022
	Karen Velez	Society for the Study of Reproduction Annual Meeting, December 15-18, 2021
Summer/Fall 2021	Hannah Anvari	SRI 68 th Annual Scientific Meeting, July 6-9, 2021
	Lauren Butler	ASRM Scientific Congress and Expo, October 16, 2021
	Yu-Ying Chen	SSR Contraceptive Symposium, July 21, 2021
	Madison Gowett	ASRM Scientific Congress and Expo, October 16, 2021
Fall 2020	Irina Cassimatis, MD	Society for Maternal Fetal Medicine, January 25-30, 2021, virtual conference
	Batzaya Davaadelger, PhD	Endocrine Society 2021, March 20-23, 2021, virtual conference
Spring 2020	Olena Odnokoz, PhD	Advances in Breast Cancer Research, October 9-12, 2020, virtual conference
	Guangyuan Zhao	Biennial Ovarian Cancer Research Symposium, September 26-28, 2020, virtual conference
	Yu-Ying Chen	SSR Annual Meeting, July 9-12, 2020, virtual meeting
	Farners Amargant i Riera, PhD	Mechanisms in Ovarian Aging, September 21-25, 2020, virtual meeting

Table 7: A complete list of all Constance Campbell Awards winners since 2020.

Marcia L. Storch Scholarship Fund for Undergraduate Students

Before her death from ovarian cancer in 1998, women's healthcare pioneer Marcia Storch, MD, expressed her desire to establish a scholarship fund through the **CRS** to encourage undergraduate students to study reproductive science. Undergraduate students working in the laboratories of **CRS** faculty can apply to the Marcia L. Storch Scholarship Fund for financial support of their research. A list of award winners from 2020-2024 can be found in **Table 8**.

Marcia L. Storch Scholarship Fund for Undergraduate Students		
Year	Recipient	Research Lab
July 2024	Shravya Pant	Laronda Lab
May 2023	Carol Magalhaes	Duncan Lab
April 2023	Sophia Akinboro	Babayev Lab
February 2022	Rebecca Gu	Duncan Lab
February 2022	Rhea Sharma	Duncan Lab
June 2021	Adebukola Fetuga	Duncan Lab

Table 8: A list of Marcia L. Storch Scholarship award winners since 2021.

Makowski Award for Most Outstanding MS-RSM Student

The Makowski Award recognizes a single exemplary MS-RSM student on the thesis track based on their academic performance, engagement in the CRS, overall contributions to reproductive science and medicine, and future career plans within the field.

This award is endowed by the family of Edgar Makowski, MD, a prominent physician who practiced at the University of Colorado and whose named endowed chair is now held by T. Rajendra Kumar, PhD. Dr. Kumar, the Edgar L., Patricia M. Makowski and Family Endowed Chair in the division of reproductive sciences and associate vice chair of research in the department of obstetrics and gynecology at the University of Colorado School of Medicine, has partnered with the **CRS** to confer the annual Makowski Award for Most Outstanding MS-RSM Student (**Figure 25**). Winners of this award can be found in **Table 9**.



Figure 25: Dr. Kumar with Randa Abboud, MS, winner of the 2023 Makowski Award.

Makowski Award for Most Outstanding MS-RSM Student			
Graduation Year	Recipient	Thesis Mentor	Thesis Title
2024	Mariam Charles	Francesca Duncan, PhD	Dynamics of the primordial follicle microenvironment across the timecourse of ovulation
2023	Randa Abboud	Joshua Halpern, MD	Fertility Preservation in Transfeminine Patients
2022	Chanakarn Suebthawinkul, MD	Francesca Duncan, PhD	Quantitative morphokinetic parameters identify novel dynamics of oocyte meiotic maturation and cumulus expansion
2021	Hannah Anvari	Francesca Duncan, PhD & Melissa Simon MD	Comparison of ovarian aging markers does not reveal differences between black and white women
2020	Emily Hayes	Teresa K. Woodruff, PhD	Integrins: The Alarm Clock that Wakes Up Our Follicles?

Table 9: A list of all Makowski Award winners since 2020.

Teresa K. Woodruff Award for Most Outstanding MS-RSM Student

CRS aims to enhance and enable research in reproductive science and medicine across disciplines, to apply state-of-the-art research and technologies to human reproductive health, and to train the next generation of research, clinical and thought leaders in our field. Named after the founder of the MS-RSM program and recognizing exceptional work of the next generation, the Teresa K. Woodruff Award for the Most Outstanding MS-RSM Student (formerly the **CRS** Award for the Most Outstanding MS-RSM Student) honors a single exemplary student on the non-thesis track each year at graduation. A complete list of award winners can be found below in **Table 10**.

Teresa K. Woodruff Award for Most Outstanding MS-RSM Student		
Graduation Year	Recipient	Project Title
2024	Kara Wingo	A Tale of Two Pathways: Examining the Interactions Between Notch and Activin Signaling in the Prepubertal Granulosa Cell
2023	Jessica Miller	Examining interactions between notch and activin signaling in ovarian granulosa cells
2022	Pari Johnson	Characterization of vascular defects in a rat model of preeclampsia
2021	Katy Trotter	Characterization of vascular defects in placental development in a rat model of preeclampsia
2020	Noelle Ozimek	Investigating relationship between chromosome structure and the basis of chromosome missegregation

Table 10: A list of Teresa K. Woodruff Award winners since 2020.

Shaw Innovation Awards

Established in 2018, the Shaw Innovation Awards were previously sponsored by the Women's Health Research Institute. **CRS** is honored to now administer these awards. The awards were established by Robert Shaw ('70, '81) and Charlene Shaw ('70) and provide funding for sex-inclusive research, focusing on sex-based mechanisms and determinants of health and disease. Applicants must be early-career investigators (assistant professor), research-track faculty, or postdoctoral fellows at Northwestern. The Innovation Awards are not designed to provide ongoing support for a long-term project. Rather, they are intended to assist in obtaining pilot data required for larger grant applications.

To date, 13 investigators from nine departments have been supported by these awards. Pilot data derived from the Shaw Innovation Awards have resulted in 11 grants submitted, 23 presentations delivered, and 5 publications

(**Figure 26**). Laudably, Dr. Hong Zhao, a Research Associate Professor (at the time of her award) in the Department of OB/GYN used the pilot data to obtain a successfully funded R01 award from the NIH. This is a major accomplishment for a junior investigator and exemplifies the purpose of these awards.



Figure 26: The impact of the Shaw Innovation Awards since CRS began administering the awards in 2018. These awards are a vital part of our commitment to supporting early career faculty at Northwestern.

In 2024, **CRS** partnered with the Potocsnak Longevity Institute to solicit applications that focused on sex differences and aging. We received five exceptional applications and of those, two were selected for funding. The Shaws made a recent pledge to further support the awards in perpetuity, and we are incredibly grateful for their continued support. A complete list of all Shaw Innovation Award Winners since 2020 can be found below in **Table 11**.

Shaw Innovation Award Recipients		
Year	Recipient	Project Title
2024	Alexa Freedman, PhD, Assistant Professor, Assistant Professor, Department of Preventative Medicine	Sex-specific effects of placental aging on adverse pregnancy outcomes
2024	Jane Joy Thomas, PhD, Postdoctoral Fellow, Division of Nephrology and Hypertension, Department of Medicine	Age-dependent molecular determinants of skeletal health in male and female mice
2023	Julia Cox, PhD; Research Assistant Professor of Neuroscience, Northwestern University	Neural mechanisms of cost-benefit decision making in males and females
2023	Dominik Kentrup, PhD; Postdoctoral Fellow, Division of Nephrology and Hypertension, Department of Medicine, Northwestern University	Role of FGF23 on cardiac outcomes in male and female mice with autosomal recessive hypophosphatemia
2022	Jennie Lin, MD, MTR; Assistant Professor of Medicine (Nephrology & Hypertension), Northwestern University	Sexual Dimorphism of Aging and Immune-Mediated Kidney Injury
2022	Heather Mahoney, PhD; Postdoctoral Fellow, Schmidt Lab, Department of Neurobiology, Northwestern University	Sex differences in visual modulation of mood and nicotine abuse
2021	Hong Zhao, MD, PhD; Research Associate Professor, Department of Obstetrics & Gynecology, Northwestern University	Estrogen Signaling and Brain Function: Potential Link of Women's Vulnerability to Alzheimer's Disease
2020	Erin Hsu, PhD; Research Associate Professor, Department of Orthopedic Surgery, Northwestern University	Elucidating sex-based differences in bone regenerative response of spinal fusion
2020	Steven J. Schwulst, MD, FACS, FCCM; Assistant Professor, Department of Surgery (Trauma & Critical Care), Northwestern University	Sex Influences on the Microglia Response to Traumatic Brain Injury

Table 11: A list of Shaw Innovation Award winners since 2020.

Education and Training

Educating the next generation of leaders in reproductive science remains one of the main goals of **CRS**. **CRS** houses two distinct training programs to achieve this goal. This includes the **CRS** Training Program, which is support by a training grant from the NIH (T32HD094699) and the MS-RSM program. We also broaden our educational reach by expanding the **CRS** offerings to the RSM Cluster at Northwestern.

CRS T32 Training Program in Reproductive Science, Medicine, and Technology

The mission of our **CRS** Training Program is to train future researchers, educators, and thought leaders in the reproductive sciences while simultaneously improving human health. The **CRS** Training Program is housed within **CRS**, and is currently co-directed by J. Julie Kim, PhD (PI, Program Director (PD/PI)) and Francesca E. Duncan, PhD (Associate Director (AD)). The program started in 2019, and 2024 marked the end of the first full cycle of funding for the **CRS** Training Program. **CRS** provides the **CRS** Training Program with a rich

infrastructure and comprehensive series of regularly scheduled programming and events, awards, scholarships, and professional development resources.

Trainees are recruited from five graduate programs within The Graduate School (TGS): the Driskill Graduate Program in the Life Sciences (DGP), the Interdisciplinary Biological Sciences Program (IBiS), the Medical Scientist Training Program (MSTP), Northwestern University Interdepartmental Neuroscience Program (NUIN), and Biomedical Engineering (BME) and are supported by 21 faculty members within 13 departments at Northwestern. In addition to their graduate coursework, trainees are required to take two specialized REPR_SCI courses as well as a Responsible Conduct of Research course. In fact, CRS faculty designed an RCR course (REPR_SCI 425) which addresses the topic through the specific lens of reproductive science and medicine. In addition to a rigorous curriculum, our program is complemented by the addition of unique career and professional development programs like the Academic Accelerator Partnerships which provide students with valuable intern/externship experiences focused on exploring leading edge technologies that are designed to augment their scientific and research training. The overarching goal of the **CRS Training Program** is to support and train a well-rounded workforce in reproductive science and medicine - one that will make the discoveries necessary to sustain a healthy future for all people (**Figure 27**).

			
Foundational and advanced topics courses in reproductive science and medicine	Faculty mentor leaders in basic, clinical, and translational reproductive science and medicine	Participation in Academic Accelerator Partnerships and Career Catalyst Series	Cutting edge programming and events through the Center for Reproductive Science

Figure 27: Key features of the CRS Training Program.

We are thrilled to have completed one full funding cycle in 2024. To date, we have trained 10 trainees under the auspices of the program and their accomplishments include 24 papers published, three F30/F31 awards secured, almost 100 presentations (both poster and oral), and many other major accomplishments and metrics of graduate student success. Two trainees also graduated from the program during this period. A more detailed list of their accomplishments can be found in **Section 3** of this report.

Master of Science in Reproductive Science and Medicine Program

The MS-RSM program is a specialized Master of Science program that focuses on human reproductive health and is embedded within both TGS and the Feinberg School of Medicine. Established in 2016, the MS-RSM program has a tripartite mission to: 1. Train students in the fields of reproductive science and medicine, thereby enabling the next generation of fundamental and applied research; 2. Build competence in general and reproductive science teaching skills; and 3. Create an advanced new curriculum suitable for master’s level training in our discipline.

While research is a large component of the program, another focus is competence in science teaching. Ultimately, when designing the MS-RSM program, the goal was to create a new curriculum so that reproductive science was not one small section in a book chapter, but rather a field worthy of having entire programs dedicated to it. Graduate level curriculum was sparse, so the MS-RSM program created a more robust curriculum dedicated to training the next generation of reproductive scientists.

2024 marks the ninth cohort of students to join the MS-RSM program. In 2025, we will celebrate a full decade of the program. Since its inception in 2016, we have welcomed 108 total students in reproductive science and medicine to the program. A degree in the MS-RSM program prepares students for diverse careers including



Figure 28: 2024 graduates of the MS-RSM program.

advanced training (MD, PhD, MD/PhD, PharmD, residency), research careers (laboratory management, research operations, bench science), clinical careers (embryology, andrology, clinical research, regulatory and compliance), and consulting careers (industry, pharmaceuticals).

After completing the program, MS-RSM graduates become part of the MS-RSM Alumni Network, which provides a place for MS-RSM alumni to connect with current students, faculty, and staff (Figure 28). The Alumni Network is a collaborative community where alumni can expand their network, build professional relationships, share career resources, seek/provide support and mentorship and discuss issues and news in the reproductive science and medicine world. More program accomplishments can be found in Section 3 of this report.

Reproductive Science and Medicine Graduate Cluster

TGS’s interdisciplinary clusters facilitate connections between doctoral students and faculty who share research interests yet may not be in the same department or program. These initiatives enable participating graduate students to join a cohort of students not only in their degree program but also potentially in many other departments, labs, and research traditions who are working on a common set of problems. In this way, many TGS students experience “dual citizenship” in both a degree program and interdisciplinary area. Many draw upon these experiences when designing their research projects, preparing for qualifying exams, and selecting dissertation committees.

CRS directs the RSM Cluster, which links graduate students across graduate programs with a common interest in reproductive science and medicine. These students become **CRS** members and participate in a plethora of programming and events including weekly RRU’s, monthly Career Catalysts, quarterly TLRS, and the annual UMSRS, along with additional ad hoc events. Training in research is supplemented with core and elective coursework, mentorship, teaching, and other professional development opportunities.

Connecting with the Community: Dissemination and Outreach

CRSSpotlights Monthly Newsletter: At the beginning of each month, a digital newsletter is sent to all members of the **CRS** community to keep them abreast of the happenings not only at Northwestern, but also in the greater reproductive health sciences community. Dr. Pamela Monahan and a trainee driven editorial team procure the content for the newsletter each month, which includes a spotlight on current and former **CRS** community members, including faculty, staff, trainees, and MS-RSM students and alumni. Events, job-postings, new publications, and other relevant announcements are also included in the monthly newsletter. This newsletter also ensures that the content on the **CRS** website is frequently updated, so the community has the most of to date information in multiple different mediums.

CRS Weekly Announcements: To stay connected with the community, we send a weekly **CRS** announcements email to all members of the **CRS** community. These announcements include information about upcoming **CRS** events, job postings, and funding opportunities.

Websites: Since the last Five-Year Report, we updated the websites for both the **CRS** and the MS-RSM program. Prior to this update, the MS-RSM program website was housed as a page within the **CRS** site, but given the program’s prominence, it required a dedicated website. We worked with the FSM IT department on these updates. Both websites were moved to the Feinberg platform, giving them a more cohesive look. These updates also enhanced the overall user experience. The websites are now managed, maintained, and updated by **CRS** and MS-RSM Program Coordinators, Rebecca Willingham and Nimra Chohan.

Social Media: **CRS** uses various social media (Instagram, Facebook, and BlueSky) to stay connected with current and former members

CRS Social Media



@northwesterncrs
400 followers



Northwestern Center for Reproductive Science
550 followers



@nu-crs.bsky.social
150 followers
(new platform, joined December 2024)

Figure 29: CRS social media handles and number of followers for each platform.

of the community (**Figure 29**). We use social media to highlight upcoming **CRS** events and activities and research accomplishments and accolades of our trainees and faculty. We also use social media for MS-RSM recruitment and to broadcast program offerings to future and prospective students.

CRS Summer Book Club: Reproductive science is of immense interest to our community even outside the laboratory. In 2021, **CRS** T32 Training Program trainees developed and led a **CRS** Book Club. Each year, **CRS** trainees and leadership identify a book that is of particular interest to our community. These books generally focus on contemporary issues in medicine, namely reproductive science. Books have included *Medical Apartheid: The Dark History of Medical Experimentation on Black Americans from Colonial Times to the Present* by Harriet A. Washington, MA, *Just get on the pill* by Krystale E. Littlejohn, PhD, *A Brief History of the Female Body: An Evolutionary Look at How and Why the Female Form Came to Be* by Deena Emera, PhD, and *GUYnecology: The Missing Science of Men's Reproductive Health* by Rene Almeling, PhD (**Figure 30**). The **CRS** Summer Book Club has been very well received by the community. In fact, Dr. Deena Emera was a featured speaker at the 2023 UMSRS meeting where she delivered a brief presentation about her book and then held a book signing for the audience. The **CRS** community had read the book in advance of her talk, so both her talk and the book signing resulted in robust conversation. In addition, Dr. Rene Almeling was invited to deliver a **CRS** Special Seminar. In spring 2024, she presented her research in a lecture titled "The Politics of 'Male' Reproductive Health."

Section 3: What We've Done: Major Accomplishments since 2020

The impact of **CRS** can be quantified in tangible ways. From grant funding to education and training, **CRS** is enabling and positively impacting the next generation of reproductive scientists.

Grants and Funding

A testament to outstanding mentorship and institutional support, we are proud to report that many **CRS** research faculty and trainees have secured independent grant funding for their research projects. This includes three research assistant professors, three postdocs, and six graduate students (all part of the RSM Cluster), all of whom received independent grant funding from the NIH, foundations and societies, and the Global Consortium for Reproductive Longevity & Equality (GRCLE) since 2020. A complete list of **CRS** trainees, their mentors, departments, awards, and project titles can be found in the **Table 12** below.

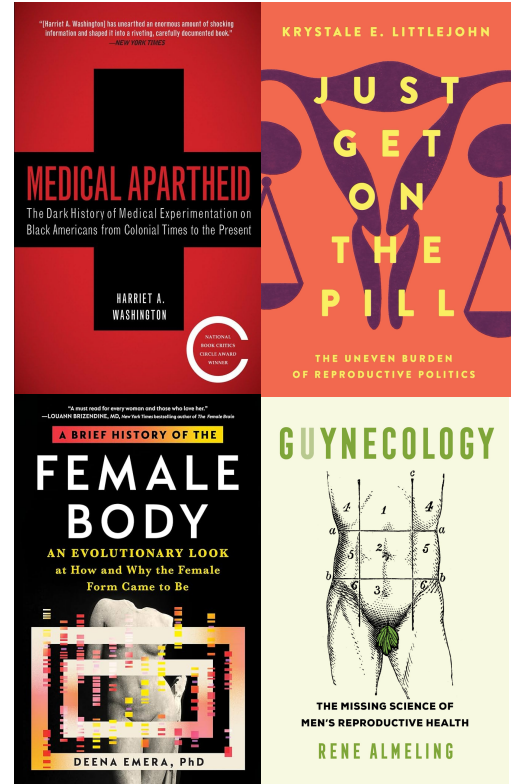


Figure 30: Covers from all CRS Book Club

Name	Faculty Mentor	Department	Grant/Award	Project Title
Research faculty				
Aubrey Converse, PhD	Francesca Duncan, PhD	Ob/Gyn	GCRLE	Macrophage-derived multinucleated giant cells as drivers of aging in the mammalian ovary
Ping Yin, MD, PhD	Serdar Bulun, MD	Ob/Gyn	R01	Environmental Pollutants and AHR pathway in Uterine Leiomyoma
Hong Zhao, MD, PhD	Serdar Bulun, MD	Ob/Gyn	R01	Estrogen and Abdominal Muscle Fibrosis
Postdocs				
Farners Amargant Riera, PhD	Francesca Duncan, PhD	Ob/Gyn	K99/R00	Mechanotransduction mechanisms of ovarian aging

Hannes Campo, PhD	Francesca Duncan, PhD	Ob/Gyn	GCRLE	Development of a vascularized microfluidic ovarian senescence model for senolytic drug screening
Conor Templeton, PhD	Laimonis Laimins, PhD	Microbiology-Immunology	F32	Uncovering the Roles of DNA-pkcs in Regulating R-loops during HPV Replication
Graduate students				
Rosemary Bauer	Margrit Urbanek, PhD	Medicine (Endocrinology)	Waterloo Foundation-AE PCOS Award	The role of genetic insulin resistance in PCOS
Claire Chaikin	Clara Bien Peek, PhD	Biochemistry and Molecular Genetics	F31	Circadian Clock Regulation of HIF1a-dependent Skeletal Muscle Metabolism during Diet-induced Obesity
Shweta Dipali	Francesca Duncan, PhD	Ob/Gyn	F31 Cornerstone Grant-Histochemical Society	Ovarian Inflammaging as a Mechanism for Ovarian Cancer
Hannah McDowell	Monica Laronda, PhD	Pediatrics	F31	Elucidating the mechanism by which Elastin Microfibril interface-located protein 1 (EMILIN1) contributes to folliculogenesis
Elizabeth Tsui	Monica Laronda, PhD	Pediatrics	F30	Understanding the microenvironment of the pediatric ovary across the pubertal transition: implications for fertility
Emily Zaniker	Francesca Duncan, PhD	Ob/Gyn	F30 Cornerstone Grant-Histochemical Society	Follicle-Inherent Biomechanical Mechanisms Underlying Ovulation

Table 12: A list of all **CRS** trainee members who have received independent funding since 2020.

Expanded Programming and Events

Since 2020, we have expanded our impressive meetings, namely by including UMSRS as a large scale regularly scheduled meeting for our community. This meeting, funded by an R13 grant from the NIH, broadened the scope of the ISRS and the **CRS** Summit meetings and now exemplifies the sustainability of our programs. In five years, we have hosted 192 weekly RRUs, 25 Career Catalysts, 19 TLRS, two **CRS** Summits, one ISRS, and two UMSRS meetings (**Figure 31**). UMSRS marks the expansion of our programming to include additional institutions outside of the Chicagoland and Illinois area. **CRS**'s reach now extends beyond Northwestern, and we are thrilled to welcome trainees and faculty from other institutions in our programming.

Exceptional Education and Training

CRS is committed to educating the next generation of scientific leaders in reproductive science and medicine. Our commitment to education has resulted in tangible outcomes, including the

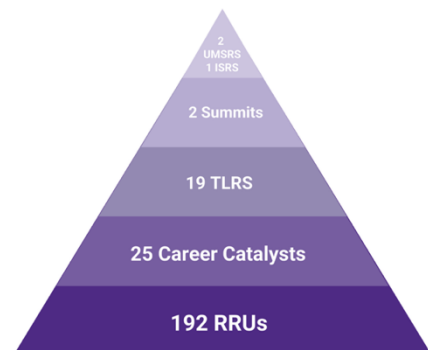


Figure 31: A pyramid figure highlighting the number of regularly scheduled CRS events from 2020-present. These events are of paramount importance to our community and provide us multiple different venues to come together to present our research in both formal and informal settings.

training of hundreds of graduate students under the auspices of the **CRS** Training program and the MS-RSM program.

CRS Training Program

2024 marked the end of the first funding cycle of the **CRS** Training Program. The mission of the **CRS** Training Program is to support and train a well-rounded workforce in reproductive science and medicine, which will make discoveries necessary for a healthy future for all people. We have trained 10 trainees through this program, all of whom made exceptional progress in their overall training (**Figure 32** and **Table 13**). Students published and received awards and accolades for their research. Trainees were also able to secure independent funding to support their research.. These students hailed from four different Northwestern graduate programs (MSTP, DGP, BME, and IBiS). Shweta Dipali successfully defended her thesis in April 2024 and graduated in June 2024. Dr. Dipali is now working as a postdoc of the lab of Yousin Suh at Columbia University. Grace Foley defended in August 2024 and received her degree in December 2024 and is now working as Life Science Specialist at L.E.K. Consulting.



Figure 32: The impact the CRS Training Program had during its first five years (2019-2024).

In 2024, we submitted the renewal application for continued support of the **CRS** Training Program. In early 2025, we received notice that this award will be funded and are currently awaiting a Notice of Award, which will fund the program for another five years.

Our **CRS** Training Program trainees have co-authored 24 manuscripts (18 first author). Our trainees have also secured independent funding, including three NIH F30/31 awards which were awarded to Shweta Dipali, Emily Zaniker, and Hannah McDowell. Trainees have also received additional funding that includes a Histochemical Society Cornerstone Grant (Shweta Dipali and Emily Zaniker), an AE-PCOS Award from the Waterloo Foundation (Rosie Bauer), and appointment to the Carcinogenesis T32 Training Grant (Grace Foley). All ten of the students passed their qualifying exams. Our trainees have also presented 98 abstracts (poster and oral) at 30 unique major scientific professional meetings. Several **CRS** Training Program trainees have received prestigious research awards, including the Constance Campbell Research Award (Shweta Dipali, Rosie Bauer, Juhi Narula, Grace Foley), Outstanding Abstract Award from the Endocrine Society (Rosie Bauer), Women’s Health in Basic Science Research Award finalist at the Lewis Landsberg Research Day (Caroline Kratka), best poster at the International Conference on Biofabrication (Hannah McDowell), best poster from the American Society for Pharmacology and Experimental Therapeutics (Emily Zaniker), and best poster at PathVisions24, the national meeting of the Digital Pathology Association (Teresa Chou). Two trainees have received the Anita Payne Scholarship to attend Frontiers in Reproduction (Shweta Dipali and Emily Zaniker). Our trainees have all participated in our Academic Accelerator Partnerships (AAP) program and are active members of the **CRS** ecosystem. We submitted a competitive renewal application which has been recommended for funding to continue this important training program.

CRS Training Program Trainees (2019-2024)				
Name	Mentor	Department	Graduate program	Project title
Shweta Dipali	Francesca Duncan, PhD	Ob/Gyn	DGP	Ovarian Inflammaging as a Mechanism for Ovarian Cancer
Jennifer Zhu	Evan Scott, PhD	Biomedical Engineering	BME	Investigating nanoparticle-mediated costimulation blockade as a cell-selective immunotherapy for endometriosis

Grace Foley	Julie Kim, PhD	Ob/Gyn	DGP	Understanding Racial Disparities in Endometrial Cancer Through Cancer Genomics
Juhi Narula	Sadie Wignall, PhD	Molecular Biosciences	iBIS	Investigating the role of a conserved kinase in acentrosomal spindle organization using <i>C. elegans</i> oocytes
Rosemary Bauer	Margrit Urbanek, PhD	Medicine (Endocrinology)	DGP	The role of genetic variation in the insulin signaling pathway in PCOS etiology
Emily Zaniker	Francesca Duncan, PhD	Ob/Gyn	MSTP	Mapping the spatiotemporal determinants of ovulation
Caroline Kratka	Francesca Duncan, PhD	Ob/Gyn	MSTP	Harnessing age-driven transcriptomic and morphotemporal changes in ovulation for discovery of non-hormonal contraceptives
Hannah McDowell	Monica Laronda, PhD	Pediatrics	DGP	Determining the role of chemotherapy-induced neoangiogenesis in primordial follicle activation
Teresa Chou	Jeffrey Goldstein, MD, PhD	Pathology	MSTP	Leveraging machine learning to study spatial transcriptomic changes in COVID-19 placenta
Ilka Lorenzo	Sadie Wignall, PhD	Molecular Biosciences	iBIS	Unraveling the mechanisms of acentrosomal spindle stability in mammalian oocyte meiosis

Table 13: A list of all CRS Training Program trainees from 2019-2024. Table includes their name, mentor, department, graduate program, and their project title.

MS-RSM Program

Since its inception in 2016, we have welcomed 108 total students to the program. To date, the MS-RSM program has graduated 87 alumni from the program (**Figure 33**). We welcomed 14 students in Fall 2024 and there are currently 7 second-year students still in the program. In nine years since the start of the program, we now have program statistics to substantiate the value of master's programs to provide the field with a diverse and well-trained workforce.

Program Statistics and Tangible Outcomes: To date, the MS-RSM program has had 108 matriculants from 12 countries. 86 students are from the United States, and this includes 23 states and Puerto Rico (**Figure 34**). The average class size is 12 students with the class sizes ranging from 7-16 students.

Most MS-RSM students come to program with a bachelor's degree in the life sciences. Furthermore, 64% have been exposed to reproductive-related coursework before starting the program. Reproductive-related coursework broadly includes any courses in animal sciences, reproductive biology, health and medicine, reproductive endocrinology, gender and sexuality studies, history of reproductive and women's health, sociology and sociocultural perspectives, reproductive justice and ethics, and psychology and cognitive studies. Additionally, 73% of MS-RSM students come to the program with prior research



Figure 33: 2023 graduates of the MS-RSM program.

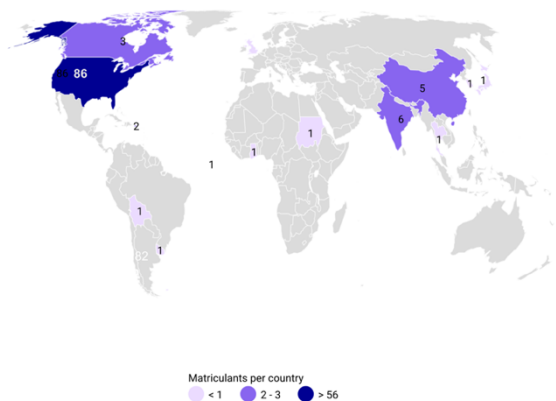


Figure 34: A world map of country of origin of all MS-RSM matriculants to date.

experience. Overall, this indicates that MS-RSM students join the program with some degree of repro-related exposure including both formal coursework and research experience.

Although it is not a formal requirement of the program, many students publish papers during and after their time in the MS-RSM program. This is likely due to the structure of the tracks, namely the thesis track, which are highly driven by deliverables. This structure lends itself to research that is publishable either while in the program or shortly upon completion. To date, there have been 130 publications by MS-RSM students. This includes peer-reviewed papers and articles, reviews, book chapters, and other scholarly works. Of these publications, 54 were published with their primary mentors and 76 were published with others. Collectively these publications have received 1,807 citations, with an average citation of 13.9 (Figure 35).

After graduation, alumni of the program are going onto careers in embryology, project coordinating, research, and advanced education like MD and PhD programs. Notably, alumni of the program are moving onto top tier institutions and embryology clinics and industry. A breakdown of career outcomes by track (thesis/non-thesis) reveals that more thesis students pursue advanced training while non-thesis students pursue industry and embryology careers (Figure 36). By 3-5 years post-graduation, 72% of thesis students have moved onto pursue advanced training like MD, PhD, MD/PhD, and PharmD programs. Conversely, 68% of non-thesis students have moved onto clinical careers including clinical research, embryology, and careers in industry. These statistics demonstrate that we are providing our students with important and practical training necessary to advance their careers and future studies, thus contributing to a strong pipeline of well-trained reproductive scientists in the field.

To keep the pipeline strong, it is important to nurture a strong and sustainable network of current and alumni students. We utilize a variety of ways to keep the alumni and current students engaged and active within the program. To this end, we developed a global alumni network with two programs designed to keep alumni engaged and foster community among alumni, current students, and prospective students. First, the mentorship program pairs one alumni member to each current student based on mutual interests and common career paths. To date, there have been 42 successful matches from 2020-2023. These individuals connect quarterly via email, Zoom, phone, or in-person. Participation in this program is optional but encouraged. Second, the ambassador program connects alumni of the program with prospective students so they can share their experience with the program. Other ways we stay connected with alumni is through ad hoc events like virtual meetings and events during the pandemic, and now reunions at the Society for the Study of Reproduction (SSR) annual meeting and other professional meetings throughout the year.

Keeping track of student accomplishment and career outcomes is an important part of the overall success and sustainability of our program. We employ strategies, including exit interviews after graduation, LinkedIn searches, annual publication reports, and the TGS career tracking system to collect this important data.

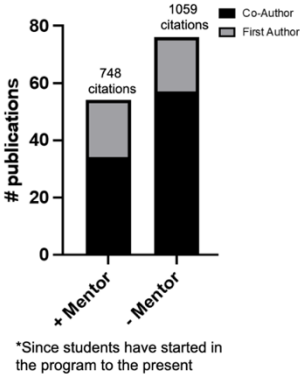


Figure 35: Publication data from all MS-RSM students from the start of the program to present. Students publish both with and without their primary faculty mentors and these publications are highly cited.

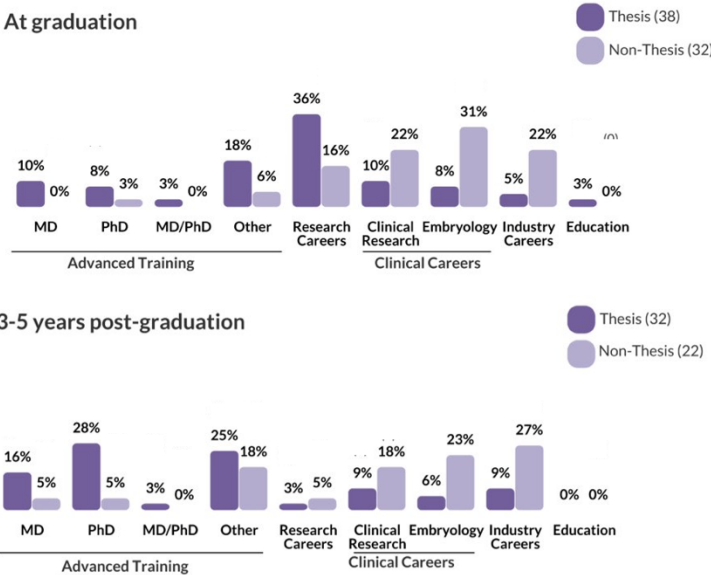


Figure 36: A breakdown of career outcomes at graduation then 3-5 years post-graduation by track. This data reveals that on average, more thesis students are pursuing advanced training like MDs and PhDs, while non-thesis students pursue industry and embryology careers.

Creating a sense of community among all our students is vitally important to keeping individuals engaged and active within the field of reproductive science. Looking ahead, we hope we can continue to educate the next generation of scientific leaders and make sure they feel connected within the community before, during, and after their training is complete.

Global Perspectives: A Think Tank for MS Programs in Reproductive Science and Medicine

In June 2024, we hosted a two-day meeting entitled *Global Perspectives: A Think Tank for MS Programs in Reproductive Science and Medicine*. The purpose of this meeting was to convene four major MS programs in reproductive science and medicine to review the landscape of MS programs in reproduction, identify areas of growth and collaboration, and further coalesce leaders in the field to create a community of practice (**Figure 37** and **38**). Participating programs included:

- Master of Science in Reproductive Science and Medicine, Northwestern University, Chicago, IL, USA
- Master of Biology and Technology of Reproduction in Mammals, University of Murcia, Spain
- Master of Human Clinical Embryology and Assisted Conception, University of Dundee, United Kingdom
- Master of Assisted Reproductive Technologies, Colorado State University, Fort Collins, CO, USA

The meeting opened with a welcome from Kelly Mayo, PhD, Dean of The Graduate School, Serdar Bulun, MD, Chair, Department of Obstetrics and Gynecology, and Timothy Lane, PhD, Associate Dean for Graduate Studies. Following the welcome, each program presented on the following topics: program mission and history, program structure (institutional infrastructure, tuition, format, curriculum), and student profiles and outcomes. Collectively, we also discussed recruitment and admissions strategies and alumni networks and engagement within each program. Jared Robins, MD, CEO of ASRM also joined the meeting virtually to discuss partnerships with professional societies. The first day concluded with a presentation from MS-RSM alum, Leah Simon, who is currently a PhD student at Cornell. Leah shared her experiences with the program and discussed how it enabled her to move onto a top PhD program.

The second day of the meeting opened with a presentation from T. Rajendra Kumar, PhD, who presented on the importance of training the next generation of reproductive scientists. At the end of the meeting, the group identified key areas of opportunity and discussed some of the challenges we face. Some of the opportunities discussed included the establishment of a MS ReproSci Coalition, a MS level textbook in reproductive science and medicine, the possibility of standardizing tracking metrics of MS level programs in our field, and the development of other scholarly products like papers. We also discussed MS program support and advocacy in the form of scholarships and training programs. Lastly, the group discussed the possibility of a common alumni exchange program or network. In addition to identifying many exciting opportunities for growth, we assessed some challenges and barriers including scientific communication and literacy and the future applications of AI and ChatGPT. The group is writing a proceedings paper that will



Figure 37: Participating institutions at the Global Perspectives: A Think Tank for MS Programs in Reproductive Science and Medicine event.



Figure 38: A group photo from the meeting. Participants included CRS and MS-RSM support staff and faculty, Northwestern leadership, external program directors, and leaders in reproductive science

highlight the quantitative outputs and tangible impact these global master's programs have made in the field. This manuscript will be submitted to *Human Reproduction* in summer 2025.

Section 4: Where We Are Going

We learned in the 2020-2024 period that the **CRS** community is persistent, resilient, and dedicated. While the pandemic has come and gone, we are now confronted with unprecedented turbulence regarding how science is done and how it is valued. In **CRS**, we remain highly focused on our reproductive science and medicine research priorities which impact overall health by spanning bench to bedside and back again. While we maintain this laser focus on the research that matters most, we also have a close eye on the solidarity and integrity of our community which has a long history and stood the test of time.

We are committed to remaining the hub of reproductive science and medicine at Northwestern and beyond. Overall, our goal for the next five years is to position ourselves for sustained success. **CRS** will undoubtedly rise to the moment to re-define our strengths to ensure reproductive science remains visible, viable, and valuable. We will stay true to our principles and continue to conduct outstanding scientific research at the highest level. We will support and build our community. But now we will start to look at reproductive science through a new lens. A lens that will allow us to adapt to this new environment by looking at our research in new and meaningful contexts. We must communicate to all sectors with our loudest and most compelling voices that reproductive science and medicine is essential for overall human health across the entire lifespan. What we do matters! It is critical to the **CRS** research enterprise that faculty, staff, and trainees remain funded. We must define new and creative paths to support our research. We simply can not do the same thing and hope for the best. We will be nimble and leverage our existing expertise to develop new partnerships with foundations, industry, and philanthropy to ensure our collective futures. Finally, we will continue to provide unwavering support to our entire community, especially trainees, to ensure the pipeline of reproductive scientists remains strong. We have developed both the **CRS** Training Program and the MS-RSM program to train the next generation of reproductive scientists. Both programs have been immensely successful, but we will continue to look for additional ways to meet the needs of future scientists in the field - whether it be through the development of more specialized reproductive science curriculum or exposure to viable career paths that harness reproductive science expertise.

There is only one way we can go and that is forward!



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