

## CURRICULUM VITAE

**Teresa Kaye Woodruff, Ph.D. DSc. DSc.**

Provost and Executive Vice President for Academic Affairs

Michigan State University

*tkw@msu.edu*

### PROFESSIONAL APPOINTMENTS

***Northwestern University, Chicago IL***

*Feinberg School of Medicine*

The Thomas J. Watkins Professor of Obstetrics and Gynecology

*McCormick School of Engineering*

Professor, Department of Biomedical Engineering

*Weinberg College of Arts and Science*

Professor, Department of Molecular Biosciences

*Dean of The Graduate School and Associate Provost for Graduate Education*

### EDUCATION

*Genentech, Inc., South San Francisco CA*

Postdoctoral Fellow, Department of Cell Culture Research and Development (1989-1991)

*Northwestern University, Evanston, IL*

Ph.D., Sigma Xi, Department of Biochemistry, Molecular Biology and Cell Biology (1985-1989)

*Olivet Nazarene University, Kankakee, IL*

B.S. (Phi Delta Lambda) Zoology and Chemistry (1981-1985), summa cum laude

### ACADEMIC APPOINTMENTS

Aug. 2020 Provost and Executive Vice President for Academic Affairs, Michigan State University  
Aug. 2020 MSU Foundation Professor of Obstetrics Gynecology, Reproductive Biology, and Biomedical Engineering  
2017-2020 Dean, Associate Provost for Graduate Education, The Graduate School, Northwestern University  
2013-2020 Professor, Department of Biomedical Engineering, Robert R. McCormick School of Engineering and Applied Science, Northwestern University  
2012-2020 Professor, Department of Medical Social Sciences, Feinberg School of Medicine, Northwestern University  
2008-2020 Collaborative Faculty Member, Oregon National Primate Research Center  
2007-2020 Thomas J. Watkins Memorial Professor of Obstetrics and Gynecology, Feinberg School of Medicine, Northwestern University  
2006-2020 Professor, Department of Obstetrics and Gynecology, Feinberg School of Medicine, Northwestern University  
2004-2006 Professor, Department of Medicine and Department of Neurobiology and Physiology, Northwestern University  
1997-2004 Associate Professor, Department of Medicine and Department of Neurobiology and Physiology, Northwestern University (tenured)  
1995-1997 Research Associate Professor, Department of Medicine and Department of Neurobiology and Physiology, Northwestern University  
1993-1995 Research Scientist, Department of Discovery Research, Genentech  
1991-1993 Scientist, Department of Cell Culture Research and Development, Genentech

### ACADEMIC LEADERSHIP ROLES

2015-2020 Director, Center for Reproductive Science, Northwestern University  
2012-2020 Vice Chair for Research, Department of Obstetrics and Gynecology, Northwestern University  
2007- Founder and Director, The Oncofertility Consortium, Northwestern University  
2006-2020 Founder and Chief, Division of Fertility Preservation, Northwestern University  
2006-2020 Founder and Director, Women's Health Research Institute, Northwestern University  
2006-2015 Associate Director, Center for Reproductive Science, Northwestern University  
2002-2007 Associate Director of Basic Sciences, Robert H. Lurie Comprehensive Cancer Center, Northwestern

## CAREER CAPSULE

Dr. Woodruff leads efforts to provide fertility sparing or preservation options to young men and women with fertility-threatening conditions through the development of physician guidelines, patient awareness and education materials, and a comprehensive bench to bedside research portfolio that is advancing our understanding of ovarian follicle function. She is an advocate for women in science and a leader in federal policy changes that now include sex as a biological variable. She has current and past leadership roles spanning three decades including Dean of The Graduate School at Northwestern, and founder and director of the Oncofertility Consortium and the Women's Health Research Institute. She is active in professional societies including as past president of the Endocrine Society and current editor-in-chief of *Endocrinology* and is civically active, including serving on the Board of Trustees for the Adler Planetarium, as an elected member of the Economic Club of Chicago and The Chicago Network, and as a former Chicago Charter School board member.

## ACADEMIC ACCOMPLISHMENTS

Teresa K. Woodruff, Ph.D., Thomas J. Watkins Memorial Professor and Vice Chair for Research, Department of Obstetrics and Gynecology; Dean, The Graduate School; Professor, McCormick School of Engineering, Founder and Director, Women's Health Research Institute; Director, Center for Reproductive Science is an internationally recognized expert in ovarian biology. Woodruff graduated *summa cum laude* from Olivet Nazarene University and was named the Maggie Sloan Crawford Graduate, the highest award given to a matriculating senior. In 2015, she returned to deliver the Olivet graduation commencement address and in 2016 was awarded the highest honor to an alumni, the "O" Award. She completed graduate work at Northwestern University, where she cloned and characterized inhibin and activin, the two most powerful gonadal peptide hormones of the reproductive axis. She illuminated how these master hormones act at the molecular level, eventually solving the structure of activin along with its receptor and regulating proteins. This work was recognized by the Endocrine Society Weitzman Award, given to a scientist of exceptional promise under the age of 40. At the time of her graduate research, the inability to mature the ovarian follicle *in vitro* was a major gap in reproductive science. When she returned to Northwestern as a faculty member, Woodruff led a highly collaborative effort that resulted in the development of a hydrogel ovary, a 3-dimensional support system that provides the critical bio-integrity for the follicle and its enclosed oocyte. Live births in mice resulted from these studies. This accomplishment was named the most important breakthrough of the decade 1998-2008 by *Nature Medicine*. She coined the term "oncofertility" to describe the application of this work toward the fertility needs of young cancer patients and created the Oncofertility Consortium through a NIH Interdisciplinary Roadmap Grant. Oncofertility is now globally recognized as a medical discipline with insurance and reimbursement available to patients and providers in many stages and countries. For her scientific accomplishments that are translated to medical care, Woodruff was elected to the National Academy of Medicine (2018). She is also an innovator and holds more than 10 U.S. patents, for which she was elected to the National Academy of Inventors (2017). Widely recognized for her commitment to teaching and mentoring, Woodruff was presented the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring by Barack Obama in an Oval Office ceremony (2011) and the Beacon Award from Frontiers in Reproduction (2013). She received the Distinguished Alumnae Award (2008) and Alumni Association Merit Award (2012) from Northwestern University. She was invited as commencement speaker and has an honorary degree (D.Sc.) from Bates College, Lewiston, Maine (2010). She delivered the commencement remarks and received an honorary doctorate (D.Sc.) from the University of Birmingham, School of Medicine, Birmingham, UK (2016). Her work on behalf of women in science has been recognized by The Distinguished Woman in Medicine and Science Award (2009), the American Committee for the Weizmann Institute of Science Vision and Impact Award (2012), the American Women in Science (AWIS) Innovator Award (2008), the American Medical Women Association (AMWA) Gender Equity Award (2009), and the "Speaking of Women's Health" Distinguished Service Award (2007). In 2017, she was named a Guggenheim Fellow and in 2018 she was elected to the National Academy of Medicine. She currently serves as the Dean of the Graduate School and Associate Provost for Graduate Education at Northwestern University. She is civically active and is an elected member of The Economic Club of Chicago and The Chicago Network. Woodruff served on the school board of the Chicago-based Young Women's Leadership Charter School, served as president of the Endocrine Society and championed the new NIH policy that mandates the inclusion of females in fundamental research. In 2013 she was named to Time magazine's "Most Influential Persons" list (voted 112th).

**EXCEPTIONAL HONORS**

- 2020 Elected Fellow, American Academy of Arts and Sciences
- 2018 Elected Fellow, National Academy of Medicine
- 2017 Elected Fellow, National Academy of Inventors
- 2017 Elected Fellow, American Institute for Medical and Biological Engineering
- 2016 Honorary Scientiae Doctoris (D.Sc.) honoris causa; University of Birmingham, School of Medicine, Birmingham, UK
- 2011 Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring; Presented in the Oval Office by President Barack Obama
- 2010 Honorary Scientiae Doctoris (D.Sc.) honoris causa; Bates College, Lewiston, Maine

**NOTABLE LECTURES**

- 2018 Woman Pioneer in Health Sciences, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia
- 2016 Commencement Address, University of Birmingham, School of Medicine, Birmingham, UK
- 2012 Commencement Speaker, Olivet Nazarene University, Kankakee, IL
- 2011 Founders' Day White Coat Address, Feinberg School of Medicine, Northwestern University, Chicago IL
- 2010 Commencement Address, Bates College, Lewiston, Maine
- 2006 Commencement Address Young Women's Leadership Charter School of Chicago

**AWARDS AND HONORS**

- 2020 Elected Fellow, American Academy of Arts and Sciences
- 2019 Delbert A. Fisher Scholar Award, Endocrine Society
- 2018 Inaugural "Heroes of Medicine", Halo Award
- 2018 19th Royan International Research Award, Royan Institute, Tehran, Iran
- 2018 Distinguished Research Award, American Society for Reproductive Medicine
- 2018 Trainee Mentoring Award, Society for the Study of Reproduction
- 2017 Elected Fellow, John Simon Guggenheim Memorial Foundation
- 2017 Outstanding Achievement in Women's Health Research, 25th Anniversary, Academy of Women's Health
- 2017 Transatlantic Medal, Society for Endocrinology, UK
- 2017 Outstanding Leadership in Endocrinology Laureate Award, Endocrine Society
- 2016 Elected, American Institute for Medical and Biological Engineering, College of Fellows
- 2016 Lay "O" Award, Alumni Board of Olivet Nazarene University
- 2013 Visionary Leadership Award, University of San Francisco, California
- 2013 Beacon Award, Frontiers in Reproduction, Marine Biological Laboratories, Woods Hole MA
- 2012 Visionary Award, Fertile Action (National Advocacy Organization)
- 2012 Vision and Impact Award Honoring Women Who Change Lives, American Committee, Weizmann Institute
- 2012 Alumni Association Merit Award, Northwestern University
- 2010 Tripartite Legacy Award, Feinberg School of Medicine, Northwestern University
- 2010 First Annual Girl Power Award, Young Women's Leadership Charter School of Chicago
- 2009 Mentor of the Year, Women Faculty Organization, Northwestern University
- 2009 Gender Equity Award, American Medical Women's Association (AMWA)
- 2009 Distinguished Woman in Medicine and Science, Feinberg School of Medicine, Northwestern
- 2008 Innovator Award, Association of Women in Science (AWIS)
- 2008 Alumnae Award, The Alumnae Association of Northwestern University
- 2007 Thomas J. Watkins Endowed Professorship, Feinberg School of Medicine, Northwestern
- 2007 Distinguished Service Award, Speaking of Women's Health
- 2006 Elected Fellow, American Association for the Advancement of Science (AAAS)
- 2000 Richard E. Weitzman Memorial Award, The Endocrine Society
- 2000 Distinguished Teaching Award, Northwestern University

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- 1988 NRSA Training Award, National Institutes of Health
- 1988 Cornelia Post Channing Memorial Award, VII Ovarian Workshop, Seattle WA
- 1988 Elected Graduate Honor Society, Sigma Xi, Northwestern University
- 1987 Graduate Fellow Award, Abbott Laboratories, Chicago IL
- 1985 Outstanding Biochemistry Student Award, American Institute of Chemists
- 1985 Merit of Excellence Award, Associated Colleges of the Chicago Area
- 1985 Maggie Sloan Award (highest honor given to a graduating senior woman), Olivet Nazarene University
- 1985 Elected Phi Delta Lambda Undergraduate Honor Society

### SERVICE/PROFESSIONAL SOCIETIES (SELECTED)

- 2018-2019 American Association of University Women, Nomination Committee
- 2017- Editor-in-Chief, *Endocrinology*
- 2015-2017 Specialized Cooperative Centers Program in Reproduction and Infertility Research, Ovarian Focus Group Chair (and 2009-2011) 2013-2014 Endocrine Society, President Council, The Office of Research on Women's Health, Office of the Director, NIH
- 2012-2017 Endocrine Society, President-elect
- 2011- American Society for Reproductive Medicine, Member
- 2010-2011 Society for the Study of Reproduction, Public Affairs Committee, Board Liaison
- 2009-2011 Specialized Cooperative Centers Program in Reproduction and Infertility, Steering Committee Chair
- 2009-2011 Women in Endocrinology, Nominating Committee
- 2009-2010 Society for the Study of Reproduction, Outreach Committee, Board Liaison
- 2008-2011 Society for the Study of Reproduction, Board of Directors
- 2008-2011 American Chemical Society
- 2008-2011 Endocrine Society, Publications Core Committee Council Liaison
- 2008-2011 Endocrine Society, Endocrine Society Council
- 2007-2011 American Society for Reproductive Medicine, Research Committee
- 2007 Ovarian Workshop, Chair
- 2006-2014 American Society for Biochemistry and Molecular Biology, Member
- 2006-2009 Institute for Bionanotechnology in Medicine, Advisory Board
- 2006 Society for Gynecologic Investigation, Member
- 2006-2007 The Endocrine Society, Scientific and Educational Programs Core Committee
- 2006 The Endocrine Society, Basic Science Taskforce Chair
- 2005 The Endocrine Society, Basic Science Taskforce
- 2004 Ovarian Workshop, Meeting Organizer, Chairman
- 2003-2006 The Endocrine Society, Annual Steering Committee
- 2003-2005 Society for the Study of Reproduction, Program Committee
- 2003 Women in Endocrinology, Awards Committee
- 2002 American Association of University Women, Member
- 2002 Ovarian Workshop, Chairman
- 2002 Society for the Study of Reproduction, Clinical Outreach Committee Chair
- 2001-2009 Institute for Bionanotechnology in Medicine, Member
- 2001-2003 Society for the Study of Reproduction, Clinical Outreach Committee
- 2000-2006 Ovarian Workshop, Nominations Committee
- 2000-2002 The Endocrine Society, Membership Committee
- 2000 Society for the Study of Reproduction, Nominations Committee
- 1998-2003 Women in Endocrinology, Executive Committee
- 1994-1998 World Health Organization Designated Laboratory

**TEACHING ACTIVITIES**

*Undergraduate Advising and Teaching*

2008-2009	Medill School of Journalism: Reporting on Breakthroughs in Science
2008-2009	Global Health Studies 310 “Oncofertility: A Global Perspective”
2008	In Religion Course: Ethics and Oncofertility
2007	In Bioethics Course: Religion and Oncofertility
2006-2007	Global Health Studies 310: ‘Contraceptive Use and Need in the Developing World’
2005-2007	Systems Physiology (Biol Sci 210)
1999-2002	Women’s Residential College
1999-2002	Freshman Advising
1998-2003	Systems Physiology (Biol Sci 325)
1998	Freshman Seminar/Advising (Biol Sci A08): Implications of the Genetic Revolution to Human Endeavors

*Graduate Teaching*

2017	Created Masters in Reproductive Science and Medicine (MS-RSM)
2018	Created Assisted Reproductive Technologies tract in the MS-RSM
2019	Created the Oncofertility tract in the MS-RSM

*Non-Institutional teaching*

2015-	Introduction to Reproduction – an online curriculum leading to a certificate through Coursera introducing reproductive health content; geared to college age students
2007-	Myoncofertility.org in collaboration with Kemi Jona, Ph.D., School of Education and Social Policy, Northwestern University
2001-2003	Director, Frontiers in Reproduction, Marine Biological Laboratories, Woods Hole, MA
1999-2004	Lecturer, Frontiers in Reproduction, Marine Biological Laboratories, Woods Hole, MA

**UNIVERSITY COMMITTEES AND BOARDS (SELECTED)**

2019-2020	One Book One Northwestern Faculty Co-Chair
2016-2018	Institute for Sexual and Gender Minority Health and Wellbeing Steering Committee
2016-Present	Committee on Faculty Diversity and Excellence (Provost Committee)
2016-Present	Provost’s Advisory Council on Women Faculty
2015- Present	Chemistry of Life Processes Institute Faculty Executive Committee
2014- Present	Skin Disease Research Executive Committee
2014-2018	Center for Interdisciplinary Exploration and Research in Astrophysics Advisory Board
2012-	Council of One Hundred (C100) - Northwestern University Mentoring and Diversity Board
2009-2011	Northwestern University Strategic Plan Committee – Provost Committee
2008-2010	Cardiovascular Research Institute Internal Advisory Council
2007-2015	Executive Board, Center for Genetic Medicine
2007-	Tenure Committee, Department of Obstetrics and Gynecology
2007-2017	Executive Board, Cells to Society
2006-2010	Science Outreach Web Portal Committee, Office of Vice President for Research
2006-2008	Northwestern University Research Council, Feinberg School of Medicine
2006-2007	Highest Order of Excellence II Committee – Provost Strategic Planning Committee
2006-2007	Shared Facilities Advisory Committee, Office of Sponsored Research
2005-2008	Vice President for Research Advisory Committee
2005-2008	Life Science Council, Weinberg College of Arts and Sciences
2005-2007	Science and Engineering Committee on Multicultural Affairs
2004	Research Systems Planning Advisory Committee (Central Administration)
2002-2004	Committee on Women in the Academic Community (Provost Committee)

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2002-2004 Executive Committee, Medical Scientist Training Program  
2002 Northwestern University Biotechnology (NUBL) Steering Committee  
2001-2002 Chemical and Biological Safety Committee  
1996-1998 Animal Care and Use Committee  
2016-2017 Director, Developmental Therapeutics and PDX Core Facility  
2002-2008 Associate Director for Basic Research  
2002-2008 Cancer Center Executive Committee  
2000-2002 Director, Hormone Action and Signal Transduction in Cancer Program  
1998-2000 Co-Director, Immunoassay Facility  
Continuous Ad hoc tenure committees; faculty and chair search committees

### COMMUNITY SERVICE AND PUBLIC OUTREACH (SELECTED)

2018- Board of Trustees, Adler Planetarium  
2018 Science Panel, Nerddette Podcast, National Public Radio (NPR)  
2017-2018 Treasurer, Les Cheneaux Island Association (elected)  
2016-2018 Little Traverse Trail Steward and Monitor, Cedarville Nature Preserve  
2015- The Economic Club of Chicago – member: Reception Committee, Membership Committee  
2013-2015 FDA Cellular, Tissue and Gene Therapies, Advisory Committee Member  
2008-2012 Young Women’s Leadership Charter School, Board Member  
2009 Junior Science Café: Making Me! Eggs and Sperm, Oh My!  
2007- Oncofertility Saturday Academy, Mentor  
2007-2009 Illinois Math and Science Academy Mentor  
2006-2007 Beyond Media, Executive Board Member  
1996-1998 Partners in Education, Volunteer, Fourth Presbyterian Church  
1996 Prison Education Ministry, Volunteer

### EDITORIAL ACTIVITIES

2017- Editor-in-Chief, *Endocrinology*  
2010- Founding Editorial Board, *Journal of Adolescent and Young Adult Cancer*  
2008-2009 Associate Editor, *Fertility and Sterility*  
2006-2009 Editorial Board, *Endocrine Reviews*  
2004-2006 Review Editor, *Molecular and Cellular Endocrinology*  
2002-2004 Editorial Board, *Molecular Endocrinology*  
2000-2003 Editorial Board, *Journal of Clinical Endocrinology and Metabolism*  
1999-2003 Editorial Board, *Gynecologic Endocrinology*  
1998-2002 Editorial Board, *Endocrinology*

## RESEARCH SUPPORT

- Bill & Melinda Gates Foundation Woodruff (PI) 11/5/18-10/31/20  
**OPP1203053** \$1,000,000 (Total Costs)  
*High-throughput Ovulation Screening Assay for Contraception Discovery Applications*  
 This project aims to develop new technologies to address the current short-comings of contraceptive discovery. The toolkit available for development of new contraceptives does not meet the needs of the human population in the 21<sup>st</sup> century, specifically for those in developing countries. Through the development of a high-throughput screening assay and an advanced microfluidic culture platform we will transform the process of contraceptive discovery, increasing both its speed and throughput.
- Bill & Melinda Gates Foundation Woodruff (PI) 11/10/18-10/31/20  
**OPP1200269** \$500,216 (Total Costs)  
*Novel Genes Involved in Follicle Autonomous Activation and Ovulation*  
 The goal of this project is to study both the beginning and the end of the spectrum of folliculogenesis in order to identify new gene pathways relevant to of non-hormonal birth control.
- NIH/NICHD Woodruff (PI) 02/23/10 – 03/31/23  
**R13HD063248** \$178,000 (Total Costs)  
*Oncofertility Consortium Annual Conference*  
 The Oncofertility Consortium hosts the Oncofertility Consortium Annual Conference which attracts an international audience of the oncofertility community and is a place where new ideas for research projects develop, networks of clinical care converge, and the interdisciplinary community of oncologists, reproductive endocrinologists, research scientists, allied health professionals, humanities scholars, students, advocates, and patients participate in this cutting edge field.
- NIH/NIGMS O'Halloran (PI) 07/01/15-04/30/20  
**R01GM115848** \$155,333 (Total Costs)  
*Regulatory Roles of Zinc Fluxes in Metalloprotein Occupancy and Cell Cycle Progression*  
 These studies will identify metal trafficking pathways, mechanisms and zinc-receptor proteins that mediate these essential regulatory zinc fluxes and furthermore establish how and when key metalloregulatory proteins undergo changes in zinc occupancy in this emerging signal transduction pathway.  
 Role: **Co-PI** (through 10/5/18), **Other Significant Contributor** (since 10/5/18)
- NIH/NIEHS Woodruff (PI) 09/15/19-08/31/22  
**UH3ES029073** \$2,559,558 (Total Costs)  
*PCOS and androgen-related disease modeling and drug testing in Multi-organ Integrated Microfluidic Reproductive Platform*  
 For this UG3-UH3 transition we plan to maintain our original milestones as originally proposed. These proposed milestones will aim to develop next-generation technologies that will be used to create a transformative model of polycystic ovary syndrome as well as novel screening tool for identifying chemicals and compounds for endocrine disruption.
- NIH/NICHD Woodruff (PI) 05/15/19-04/30/24  
**T32HD094699** \$861,791 (Total Costs)  
*Northwestern Center for Reproductive Science Predoctoral Training Program in Reproductive Science, Medicine, and Technology*  
 The Northwestern Center for Reproductive Science Predoctoral Training Program in Reproductive Science, Medicine, and Technology (CRS Training Program) seeks to generate and grow a sophisticated workforce in reproductive science and medicine who will make the discoveries necessary to enable a healthy future for all people. It aims to do this by combining

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rigorous didactics and bench research with training opportunities in the technologies of the future, generating a new kind of scholar who can succeed in a fast-paced, competitive scientific environment.

**COMPLETED RESEARCH SUPPORT** (Selected - Complete list of prior funding can be found online.)

NIH/NCATS Lloyd-Jones(PI) 4/1/16-7/14/19

**UL1TR001422** \$242,090 (Total Costs)

*Northwestern University Clinical and Translational Science Institute (NUCATS)*

Role: **Module Director**

NIH/NIEHS/NCATS Woodruff (PI) 07/01/12–12/31/17

UH2ES022920/**UH3TR001207** \$4,756,222 (Total Costs)

*Ex Vivo Female Reproductive Tract Integration In a 3D Microphysiologic System*

Establish independent in vitro culture systems for human follicle, fallopian tube, uterus and vagina using the 3DKUBE platform (UH2), 2) Develop PK models for drug delivery and hormone diffusion in perfused in vitro 3DKUBE cultures of reproductive tract tissues (UH2), and 3) Link the OvaryKUBE, TubeKUBE, UteroKUBE, and VagiKUBE into an integrated system FemKUBE that recapitulates the physiologic function of the human reproductive tract (UH3) and responds to known agonists and antagonists.

Bill & Melinda Gates Foundation Woodruff (PI) 11/01/16-04/30/18

**OPP1161206** \$100,000 (Total Costs)

An innovative in vitro ovulation assay has been invented that will be used to identify new contraceptive agents. The system is amenable to high throughput platforms that can be used in large drug screens. The goal is to identify non-steroidal agents and thereby reducing the need for daily contraceptive management.

NIH/NICHD Woodruff (PI) 04/01/16 – 03/31/19

**P50 HD076188** \$2,942,166 (Total Costs)

*Center for Reproductive Health After Disease*

The major goal of this application is to address the basic science need to understand human follicle and egg biology and pursue cutting-edge options for preserving reproductive health, while providing physicians, patients, their families, and the public with information about the risks posed by diseases and treatments to reproductive health that will lead to informed dialogue about options for preserving reproductive function.

Role: **Director (Admin Core, Education Core), PI (Project 1), Co-I (Project 2, Project 3)**

NIH/NIEHS  
**UG3ES029073** Woodruff (PI) 09/01/17-08/31/19

**3UG3ES029073-02S1** Woodruff (PI) 09/01/18-08/31/19

\$3,024,749 (Total Costs)

*PCOS and androgen-related disease modeling and drug testing in Multi-organ Integrated Microfluidic Reproductive Platform*

The goal of this project is to further our work by implementing a next generation microfluidic system that has been created for the express purpose of a high throughput robotics setting that will enable drug testing of integrated organ systems that mimic a variety of reproductive diseases.

Ferring Pharmaceuticals Woodruff (PI) 02/02/16 - 02/02/18

**Agmt 01/11/2016** \$400,000 (Total Costs)

*Non-invasive test of egg developmental potential*

These studies will test the hypothesis that the quantity of Zn released at fertilization can be used to predict embryo quality and develop methods for quantitative assessment of this Zn release using proprietary non-invasive methods that are compatible with clinical IVF practices.



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NIH/NIA Woodruff (PI) 07/06/11 – 07/05/15  
**F30AG040916** \$81,030 (Total Costs)  
*Mechanical Regulation of Luteal Cell Function in a Tissue-Engineered Model of Ovarian Aging*  
 The goal of this project is to understand how age-related ovarian fibrosis alters hormone production.

NIH/NICHD Mayo (PI) 09/30/09 - 08/31/14  
**P01 HD021921** \$6,830,650 (Total Costs)  
*Signaling Pathways Regulating Ovarian Follicle Formation*  
 The main goal of this program grant is to investigate signaling pathways by which hormones or other regulatory factors act on the ovary to promote steroidogenesis and the maturation of follicle and germ cells necessary to sustain female fertility. Project III Woodruff (PI) - Transition metal regulation of oocyte maturation Core B Woodruff (PI) - Ovarian Histology.

NIH/NICHD Woodruff (PI/Center Director) 04/23/03 - 3/31/13  
**5U54 HD041857** \$6,456,973 (Total Costs)  
*Center for Reproductive Research at Northwestern University*  
 The goal of this grant is to understand the structure-function relationships between molecules important to the reproductive axis. Administrative Core Woodruff (PI) - Structure-Function Relationship in Reproductive Biology Project I Woodruff (Co-PI) - Follicle Development in Aneuploidy and Aging: 3D Culture Model Project IV Woodruff (PI) - The In-vitro Models of Human Ovarian Follicle-Health and Disease.

NIH/NICHD Woodruff (PI/mentor) 04/01/11 - 03/31/13  
**3U54 HD041857-09S1** \$163,197 (Total Costs)  
*Center for Reproductive Research at Northwestern University – Diversity Supplement.*

NIH Woodruff (PI) 10/01/07 - 06/30/13  
**1U54 RR024347**  
**5UL1DE019587** \$6,512,494 (Total Costs)  
**5RL1HD058295**  
*U54: The Oncofertility Consortium: Fertility Preservation for Women; R01C: Preservation and Growth of Human Follicles*  
 The main goal of this grant is to focus on the fertility threat posed by cancer treatment and to serve as an authoritative voice for research, clinical practice, and training. **Role: Director/PI**

W.M. Keck Foundation O'Halloran and Woodruff (Co-PIs) 2013-2015  
 \$1,668,665 (Total Costs)  
*The Inorganic Structure of Life: Signaling Pathways in the Mammalian Oocyte*  
 The purpose of this grant is to develop new technologies that permit examination of inorganic metals in the regulation of oocyte dynamics. **Role: Co-Investigator**

Ferring Pharmaceuticals Woodruff (PI) 07/01/12 - 06/30/13  
**INF\_0088** \$84,000 (Total Costs)  
*Virtual Grand Rounds at the Oncofertility Consortium*  
 The goal of this award is to support virtual grand rounds, a live conference feed, and CME credits in conjunction with the Oncofertility Consortium's efforts.

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- NMF/Evergreen Invitational Woodruff (PI) 09/01/11 - 08/31/13  
**Agmt 8/29/12** \$39,161 (Total Costs)  
*Innovative Educational Approaches to Help Women Navigate the Menopause Management Maze*  
 The goal of this award is to develop a decision aid for women facing the complexity of health care options related to managing menopause.
- Univ. of Pennsylvania/NCI Woodruff (PI/mentor) 07/01/11 - 06/26/13  
**TL1CA133837** \$56,097 (Total Costs)  
*Fertility Preservation in Newly Diagnosed Female Cancer Patients*  
 The goal of this grant is to support fellow Sara Barnato, MD, in research related to preserving fertility options for newly diagnosed female cancer patients.
- NIH Dunaif (PI) 09/27/07 - 07/31/12  
**K12 HD055884** \$2,500,000 (Total Costs)  
*Career Development in Women's Health (CDWH)*  
 The goal of this grant is to establish a BIRCWH Program at Northwestern University. **Role: Co-Director**
- NIH/NICHD Woodruff (PI) 09/30/09 - 09/29/11  
**3U54 HD041857-07S1** \$220,679 (Total Costs)  
*Center for Reproductive Research at Northwestern University – ARRA Administrative Supplement*  
 The goal of this award was to provide resources to accelerate the pace of research of the Center for Reproductive Research at Northwestern University including additional staff assistance and equipment.
- Regional Offices of Women's Health Woodruff (PI) 01/01/11 - 06/30/11  
**DHHS** \$1,950 (Total Costs)  
*Fit Your Fitness to You: Interactive forum on selecting the right exercise for your personal needs*  
 The goal of this grant is to support an interactive forum on women's health.
- Alumnae of Northwestern University Woodruff (PI) 09/01/10 - 08/31/11  
**Alumnae Grant** \$12,900 (Total Costs)  
*Oncofertility Summer Academy*  
 The goal of this grant is to support the Oncofertility Summer Academy.
- Baxter Healthcare Corporation Shea (PI) 09/01/09 – 08/31/11  
 \$110,000 (Total Costs)  
*Biomaterials and Growth Factors Combination to Facilitate Ovarian Grafts Revascularization and Increase Follicle Survival.*  
 The goal of this grant was to use biomaterials and growth factor combinations to increase follicle survival. **Role: Co-PD/PI**
- NIH/NICHD Levine (PI) 05/01/04 – 04/30/10  
**5T32HD007068-30** \$1,481,389 (Total Costs)  
*Training Program in Reproductive Biology*  
 The purpose of this program is to train five predoctoral and three postdoctoral fellows in specific areas of reproductive biology, with the framework of an integrated, multidisciplinary program offering a uniquely broad perspective of the reproductive sciences. **Role: Co-Investigator**
- NIH/NICHD Woodruff (PI) 02/01/04 – 01/31/10  
**5R01HD044464** \$1,529,744 (Total Costs)  
*Regulation of Reproductive Function by Activin*  
 The objective of this research proposal is to understand the role of activin in the control of pituitary FSH synthesis.

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NIH/NICHD Woodruff (PI) 07/05/04 – 06/30/10  
**5R01HD037096-10** \$1,449,331 (Total Costs)

*Inhibin Actions on Reproductive Target Tissues*

The objective of this research proposal is to understand the biosynthetic pathways leading to inhibin secretion.

NIH/NIDCR Woodruff (PI) 07/01/09 – 06/30/10  
**3ULDE019587-03** \$40,000 (Total Costs)

*The Effects of GDF9 Levels on TZP Reorganization and Oocyte Competence in Growing Follicles Cultured Alginate*

The goals of this pilot study are 1) to evaluate the organization and maintenance of TZPs in growing follicles cultured in our 3D alginate system in mice, primates, and humans and 2) to determine if higher levels of secreted GDF9 correlate with well-organized somatic cell-oocyte interactions, successful follicle growth, and oocyte competency.

Northwestern Memorial Fund Woodruff (PI) 09/01/09 – 08/31/10  
**NMFF** \$27,809 (Total Costs)

*Developing an Infectious Disease Module for the Women's Health Science*

The goal of this grant is to support the Infectious Disease Summer Academy.

NIH/NICHD Jameson (PI) 09/27/02 – 06/30/07  
**U01HD043425** \$2,647,192 (Total Costs)

*Identify Sex Determination Genes by ENU Mutagenesis*

National Institutes of Health / National Institute of Child Health and Human Development

The main goal of this project was to identify key genes that regulate gonadal development and phenotypic sex.

**Role: Co-PI**

**INTELLECTUAL PROPERTY** (Issued U.S. or worldwide patents)

- 10,479,980** Artificial ovary. Monica M. Laronda, Alexandra L. Rutz, Ramille N. Shah, Teresa K. Woodruff
- 10,352,925** Composition and methods for the detection of zinc. Emily L. Que, Thomas V. O'Halloran, Teresa K. Woodruff
- 9,695,399** 3D Microphysiologic System. Teresa K. Woodruff; Joanna E. Burdette (UIC); Ji-Yong Julie Kim; Jie Zhu; Sevim Yildiz Arslan; Spiro Getsios; Shuo Xiao
- 9,427,161** Curved Passive Acoustic Driver for Magnetic Resonance Elastography. Samantha By; Timothy Carroll; Gaurav Gadodia; Sumeeth Jonathan; Frank Miller; Mayank Vijayvergia; Teresa K. Woodruff
- 8,772,029** Modulation of oocyte meiotic progression and oocyte activation. Miranda Bernhardt; Alison M. Kim; Betty Kong; Thomas V. O'Halloran; Emily Que; Teresa K. Woodruff.
- 8,580,231** Compositions and methods comprising magnetic resonance contrast agents. Jiyoun Lee; Thomas J. Meade; Preeti A. Sukerkar; Teresa K. Woodruff.
- 6,455,262** Receptor polypeptides and their production and uses. Edward T. Fox; Jennie P. Mather; Mary B. Sliwkowski; Teresa K. Woodruff
- 5,693,534** Enhancement of fertilization capability of oocytes. Baha M. Alak; Richard L. Stouffer; Don P. Wolf; Teresa K. Woodruff
- 5,563,059** Use of human inhibin and human activin to increase the number of mature primate oocytes.

## CURRICULUM VITAE T.K. WOODRUFF

Baha M. Alak; Richard L. Stouffer; Don P. Wolf; Teresa K. Woodruff

- 5,545,616** Method for predicting and/or preventing preterm labor. Teresa K. Woodruff.
- 5,286,654** Detection and purification of activin polypeptide. Edward T. Fox; Jennie P. Mather; Mary B. Sliwowski; Teresa K. Woodruff
- 5,216,126** Receptor polypeptides and their production and uses. Edward T. Fox; Jennie P. Mather; Mary B. Sliwowski; Teresa K. Woodruff
- 5,102,868** Method for inhibiting follicular maturation. Teresa K. Woodruff; Jennie P. Mather

### ACADEMIC AND RESEARCH ADVISING

#### *Research Assistant/Associate Professors (And Current Positions)*

- 2008-2018 So-Youn Kim, Ph.D., Assistant Professor, University of Nebraska Medical Center
- 2007-2017 Jie Zhu, M.D. Center Director, University of Michigan
- 2007-2012 Min Xu, MD. Ph.D., Assistant Professor, University of Michigan
- 2009-2014 Francesca Duncan, Ph.D. Assistant Professor, Dept OB/GYN, Northwestern University

#### *Postdoctoral Fellows (And Current Positions)*

- 2015-Present Hoi Chang Lee, Ph.D. Northwestern University
- 2018-2020 Hunter B. Rogers, Ph.D., Equity Research Associate, William Blair, Chicago
- 2016-2018 Yuriko Iwahata, M.D. Assistant Professor, St. Marianna University
- 2016-2018 Hideyuki Iwahata, Ph.D., Assistant Professor, St. Marianna University
- 2016-2018 Jaewang Lee, Ph.D., Assistant Prof, Depart of Biomedical Laboratory Sciences, Eulji University, S. Korea
- 2014-2016 Nan Zhang, Ph.D., Embryologist, REI Clinic, Northwestern Medicine
- 2013-2016 Shuo Xiao, Ph.D., Assistant Professor, University of South Carolina
- 2013-2015 Ru Ya, Ph.D., Research Associate, Marquette University
- 2013-2016 Monica Laronda, Ph.D., Assistant Professor, Northwestern University
- 2010-2011 Sarah Rodriguez, Ph.D. Lecturer, Northwestern University
- 2010-2013 Zexu Jiao, Ph.D. Embryologists, UT Austin
- 2010-2011 Miranda Bernhardt, Ph.D., Research Assistant Professor Washington State University
- 2009-2010 Lisa Campo-Engelstein, Ph.D., Associate Professor, Albany Medical College
- 2009-2014 Jessica Hornick, Ph.D., Research Associate, Northwestern University
- 2009-2011 Eugene Galdones, Ph.D. Eugene Galdones Photography
- 2007-2011 Ariella Shikanov, Ph.D., Associate Professor, University of Michigan
- 2010-2011 Alison M. Kim, Ph.D., Senior Director, Research and Innovation, American Gastroenterological Association
- 2008-2010 Jennifer Hirshfeld-Cytron, M.D., Fertility Centers of Illinois
- 2007-2010 Susan Barrett, Ph.D., Medical Liaison, Zeiss
- 2006-2009 Shiyin Jin, Ph.D., Assistant Professor, The Buck Institute
- 2006-2009 Lei Lei, Ph.D., Assistant Professor, The Buck Institute
- 2006-2008 Laxmi Kondapalli, M.D., Clinical Assistant Professor, Ob/Gyn, University of Colorado
- 2006-2007 Sarah Bristol-Gould, Ph.D., Medical Science Liaison, Novartis Oncology
- 2005-2008 Fujio Migishima, Ph.D., Kitasato University School of Medicine, Japan
- 2004-2008 Niti Jetly, Ph.D., Chembiotech, India
- 2004-2007 Thuy-Vy Do, Ph.D., Research Assistant Professor, University of Kansas Medical Center
- 2003-2009 Monica Antenos, Ph.D., Research Scientist/Lab Manager, University of Guelph
- 2003-2008 Joanna Burdette, Ph.D., Professor, Associate Dean for Research, University of Illinois at Chicago
- 2003-2005 Jaesook Roh, Ph.D., Professor, University of Hanyang, South Korea

## CURRICULUM VITAE T.K. WOODRUFF

2003 Suleena Kalra, M.D., Associate Professor, University of Pennsylvania  
2000-2005 Thomas Thompson, Ph.D., Professor, University of Cincinnati  
1999-2001 Daniel Bernard, Ph.D., Professor, McGill University, Ontario, Canada  
1997-2000 Eileen Wang, M.D., Associate Professor, University of Pennsylvania

### *Visiting Scholars*

2017-2018 Geum Joon Cho, Korea University, South Korea  
2016-2017 Eunjung Kim, Seoul National University, South Korea  
2011-2015 Yogesh Makanji, Ph.D., Monash University, Italy  
2013 Marie Lebbe, Ph.D., University of Birmingham, UK  
2011-2012 Shenming Zeng, Ph.D., College of Animal Science and Technology, China Agricultural University  
2005-2006 Fugio Migishima, Kitatsato University School of Medicine, Japan

### *Graduate Students (And Current Positions)*

2016-Present Yu-Ying Chen  
2016-2020 Emma Gargus (MSTP)  
2015-Present Jiyang Zhang  
2015-2020 Maxwell Edmonds (MSTP)  
2014-2018 Hunter B. Rogers, Ph.D., William Blair, Chicago  
2014-2018 Kelly McKinnon, Ph.D., Postdoctoral Fellow, Laronda Lab, Northwestern University  
2014-2016 Peter Rios, Ph.D., Research Assistant Professor, UIC (co-mentored with Lonnie Shea)  
2010-2014 Marilia Cordeiro, Ph.D., Postdoctoral Fellow Edinburgh  
2010-2013 Robin Skory, M.D. Ph.D., (MSTP) Fellow, University of Pennsylvania  
2009-2013 Betty Kong, M.D. Ph.D., (MSTP) Clinical Faculty, Northwestern University  
2008-2013 Anaar Eastoak-Siletz, Ph.D., General Surgery Resident, UCLA (co-mentored with Lonnie Shea)  
2009-2013 Beatriz Penalver Bernabé, Ph.D., Assistant Professor, UIC (co-mentored with Lonnie Shea)  
2008-2013 David Tagler, Ph.D., Biomedical Engineer, Veterans Health Administration  
2008-2011 Miranda Bernhardt, Ph.D., NIEHS, Raleigh-Durham, North Carolina  
2006-2008 Elizabeth Parrish, Ph.D., Regulatory Program Manager, Genentech, Inc.  
2006-2010 Alison Kim, Ph.D., Senior Director, Research and Innovation, American Gastroenterological Association  
2006-2010 Candace Tingen, Ph.D., Program Officer, NIH, Bethesda, Maryland  
2005-2010 Shou-Yen Jack Lin, Ph.D., Scientist, CytomX Therapeutics  
2003-2008 Erin West, Ph.D., Senior Scientist II, Abbott Laboratories (co-mentored with Lonnie Shea)  
2003-2007 Thomas Lerch, Ph.D., Principal Scientist, Pfizer  
2002-2008 Pamela Kreeger, Ph.D., Professor, University of Wisconsin (co-mentored with Lonnie Shea)  
2002-2005 Robert Cook, Ph.D., Kelsey-Seybold Clinic  
2001-2003 Jacqueline Jeruss, M.D. Ph.D., Associate Professor, University of Michigan  
1999-2002 Stephanie Pangas, Ph.D., Associate Professor, Baylor College of Medicine  
1999-2005 Hilary Kenny, Ph.D., Research Associate Professor, University of Chicago  
1999-2005 Magdalena Suszko, Ph.D., Principal Scientist, Abbott Laboratories  
1998-2003 Jose Santiago, Ph.D., Senior Director, Abbott Laboratories  
1998-2003 Stacey Chapman Tobin, Ph.D., Biomedical Writer and Editor, The Tobin Touch, Inc.

### *Masters Students*

2018-2020 Emily Hayes, MS-RSM  
2017-2019 Julia Balough, MS-RSM  
2016-2018 Megan Runge, MS-RSM  
2016-2018 Yi Luan, MS-RSM  
2016-2017 Yaqi Zhang, MS Biotechnology

2016-2017 Rhitwika Sensharma, MS Biotechnology  
 2016-2017 Mingjun Liu  
 2015-2016 Jiyang Zhang, MS Biotechnology  
 2014-2015 Kuan-Wei Chen  
 2013-2015 Mingyang Jiang, MS Biotechnology  
 2013-2015 Catherine Nguyen, MS Biotechnology  
 2012-2014 Yuanming Xu, MS Biotechnology  
 2011-2012 Lu Bai, MS Communication  
 1999-2003 Jolee Gitch, MS

*Undergraduate Students (\*Honors)*

2017-2019 Emily Zaniker\*  
 2012-2013 Chloe Harrington  
 2011-2013 Jared Cho  
 2011-2013 Raymond Lee  
 2009-2013 Jessina Thomas\*  
 2010-2011 Lidia Spaho\*  
 2010 Kiran Sreenivas  
 2009-2011 Cristina Thomas\*  
 2009 Andrew Russell\*  
 2009 Katarzyna Kadela\*  
 2008 Margaret Nevriy\*  
 2006-2008 Anna Banc \*  
 2006-2007 Cory Waxman\*  
 2006 Rachel Oliver  
 2005-2007 Victoria Ulyanov\*

2005-2007 Supreeti Behuria\*  
 2005-2007 Monica Gomberg\*  
 2005-2007 Nimarta Singh\*  
 2005 Quantez Freeman  
 2004-2006 Carrie Nieman\*  
 2004-2006 Anjali Malipatil\*  
 2003-2005 Sarah Kurley\*  
 2002-2004 Daniel Balkin\*  
 2002-2003 Sudhi Kurup\*  
 2000-2001 Jennifer Chuy\*  
 2000-2002 Cathy Randall\*  
 2000-2002 Denise Lo\*  
 1999-2001 Eva Ma\*  
 1999-2000 Wei-Woon\*  
 1997-1999 Diego Abdelnur  
 1995-1997 Elbert Lee

*Research Technicians*

2019-Present Camille Mulcahy  
 2017-Present Kristine Moss  
 2017-Present Sarah Wagner  
 2019-Present Leah Simon, MS  
 2018-2019 Allison Grover  
 2013-2019 Keisha Barreto  
 2016-2017 Christine Will  
 2016-2017 Nikolina Madjer  
 2014-2017 Danijela Dokic, MD  
 2014-2017 Alexandra Rashedi  
 2015-2017 Chanel Murray  
 2005-2010 Tyler Wellington  
 2007 Rika Migishima  
 2005-2006 Samantha Thaver  
 2001-2003 Jaroslav Jelen  
 1996-1999 Huiru Chong

2012-2017 Megan Romero  
 2013-2014 Alexander Gunn  
 2012-2016 Kelly Whelan  
 2011-2014 Katy Ebbert  
 2011-2014 Jennifer Pahnke  
 2010-2012 Lizbeth Gutierrez  
 2010-2012 Dragan Mackovic  
 2006-2011 Sarah Kieseewetter  
 2007-2010 Jennifer Jozefik  
 2005-2010 Lara Hildebrand  
 2008-2010 Erin Jackson  
 2005-2006 Michelle Harwerth  
 2003-2005 Andrew Lisowski  
 2002-2005 Christina Hutten  
 2001-2002 Maura Lane  
 1995-1999 Brad Draper

**PUBLICATIONS**

1. Adam SA, Nakagawa T, Swanson MS, Woodruff TK, Dreyfuss G. mRNA polyadenylate-binding protein: gene isolation and sequencing and identification of a ribonucleoprotein consensus sequence. *Mol Cell Biol.* 1986;6(8):2932-43. PubMed PMID: 3537727; PMCID: PMC367862.
2. Woodruff TK, Meunier H, Jones PB, Hsueh AJ, Mayo KE. Rat inhibin: molecular cloning of alpha- and beta-subunit complementary deoxyribonucleic acids and expression in the ovary. *Mol Endocrinol.* 1987;1(8):561-8. doi: 10.1210/mend-1-8-561. PubMed PMID: 3153478.
3. Woodruff TK, D'Agostino J, Schwartz NB, Mayo KE. Dynamic changes in inhibin messenger RNAs in rat ovarian follicles during the reproductive cycle. *Science.* 1988;239(4845):1296-9. PubMed PMID: 3125611.
4. D'Agostino J, Woodruff TK, Mayo KE, Schwartz NB. Unilateral ovariectomy increases inhibin messenger ribonucleic acid levels in newly recruited follicles. *Endocrinology.* 1989;124(1):310-7. doi: 10.1210/endo-124-1-310. PubMed PMID: 2491806.
5. Woodruff TK, D'Agostino J, Schwartz NB, Mayo KE. Decreased inhibin gene expression in preovulatory follicles requires primary gonadotropin surges. *Endocrinology.* 1989;124(5):2193-9. doi: 10.1210/endo-124-5-2193. PubMed PMID: 2495926.
6. Woodruff TK, D'Agostino J, Schwartz NB, Mayo KE. Modulation of rat inhibin mRNAs in preovulatory and atretic follicles. In: Hirshfield AN, editor. *Growth Factors and the Ovary.* Boston, MA: Springer US; 1989. p. 291-5.
7. Mather JP, Attie KM, Woodruff TK, Rice GC, Phillips DM. Activin stimulates spermatogonial proliferation in germ-Sertoli cell cocultures from immature rat testis. *Endocrinology.* 1990;127(6):3206-14. doi: 10.1210/endo-127-6-3206. PubMed PMID: 2249646.
8. Woodruff TK, Lyon RJ, Hansen SE, Rice GC, Mather JP. Inhibin and activin locally regulate rat ovarian folliculogenesis. *Endocrinology.* 1990;127(6):3196-205. doi: 10.1210/endo-127-6-3196. PubMed PMID: 2123449.
9. Woodruff TK, Mayo KE. Regulation of inhibin synthesis in the rat ovary. *Annu Rev Physiol.* 1990;52:807-21. doi: 10.1146/annurev.ph.52.030190.004111. PubMed PMID: 2184777.
10. Woodruff TK, Mather JP. Inhibin and activin are follicular maturation regulators. In: Adashi EY, Mancuso S (eds). *Major Advances in Human Female Reproduction.* New York: Raven Press; 1990. v.73; p.123-129.
11. Woodruff TK, Ackland J, Rahal JO, Schwartz NB, Mayo KE. Expression of ovarian inhibin during pregnancy in the rat. *Endocrinology.* 1991;128(3):1647-54. doi: 10.1210/endo-128-3-1647. PubMed PMID: 1900234.
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13. Brannian JD, Woodruff TK, Mather JP, Stouffer RL. Activin-A inhibits progesterone production by macaque luteal cells in culture. *J Clin Endocrinol Metab.* 1992;75(3):756-61. doi: 10.1210/jcem.75.3.1517365. PubMed PMID: 1517365.
14. Mather JP, Woodruff TK, Krummen LA. Paracrine regulation of reproductive function by inhibin and activin. *Proc Soc Exp Biol Med.* 1992;201(1):1-15. PubMed PMID: 1326766.

15. Petraglia F, Woodruff TK, Botticelli G, Botticelli A, Genazzani AR, Mayo KE, Vale W. Gonadotropin-releasing hormone, inhibin, and activin in human placenta: evidence for a common cellular localization. *J Clin Endocrinol Metab.* 1992;74(5):1184-8. doi: 10.1210/jcem.74.5.1569165. PubMed PMID: 1569165.
16. Woodruff TK, Borree J, Attie KM, Cox ET, Rice GC, Mather JP. Stage-specific binding of inhibin and activin to subpopulations of rat germ cells. *Endocrinology.* 1992;130(2):871-81. doi: 10.1210/endo.130.2.1310280. PubMed PMID: 1310280.
17. Jakeman L, Mather J, Woodruff T. In vitro ligand binding of 125I-recombinant human activin A to the female rat brain. *Endocrinology.* 1992;131(6):3117-9. Epub 1992/12/01. doi: 10.1210/endo.131.6.1446646. PubMed PMID: 1446646.
18. Woodruff TK, Lyon R, Hansen S, Mather JP. 125I-recombinant human activin A accumulates in the ovary of the immature female rat following intravenous injection. In: Bouchard P, Caraty A, Bennink HJTC, and Pavlou SN (Eds). *GnRH, GnRH Analogs, Gonadotropins and Gonadal Peptides.* CRC Press; 1993. p. 529-534.
19. Woodruff TK, Battaglia J, Mather JP. Regulation of human granulosa cells by recombinant human activin A and recombinant human inhibin A. In: Mornex R, Jaffiol C, Leclere J (Eds). *Progress in Endocrinology: The Proceedings of the Ninth International Congress on Endocrinology, Nice 1992.* 1992. The Parthenon Publishing Group: p. 605-607.
20. Mather JP, Krummen LA, Woodruff TK. Activin, inhibin and follistatin: Paracrine regulators of testicular function. In: Mornex R, Jaffiol C, Leclere J (Eds). *Progress in Endocrinology: The Proceedings of the Ninth International Congress on Endocrinology, Nice 1992.* 1992. The Parthenon Publishing Group: p.1-5.
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38. Gallinelli A, DeVita D, Aguzzoli L, Forio P, Ferrari AR, Genazzani AD, Sgherzi MR, DiCarlo C, Woodruff TK, Petraglia F. Placental activin and inhibin: new hormones in human pregnancy. In: Cosmi EV, Di Renzo (Eds). *Current Progress in Perinatal Medicine; The Proceedings of the 2nd World Congress of Perinatal Medicine, Rome and Florence, 19-24 September, 1993*. 1994. The Parthenon Publishing Group: p.469-477.

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51. Lindheimer MD, Woodruff TK. Activin A, inhibin A, and pre-eclampsia. *Lancet.* 1997;349(9061):1266-7. doi: 10.1016/S0140-6736(05)62502-0. PubMed PMID: 9142057.

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**EDITED or AUTHORED BOOKS:**

## CURRICULUM VITAE T.K. WOODRUFF

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### LECTURES (Selected)

- 2020 Plenary Speaker, Universal Egyptian Assisted Reproductive Technology Summit
- 2020 Plenary Speaker, The International Embryo Technology Society, New York City, NY
- 2019 Invited Speaker, Society for the Study of Reproduction, San Jose, CA
- 2019 Invited Speaker, ESHRE, Vienna, Austria
- 2019 Invited Speaker, Endocrinology Division, Mayo Clinic, Rochester, MN
- 2019 Plenary Speaker, OSU Regional Oncofertility Conference, Columbus, OH
- 2019 Invited Speaker, Dr. Kelle H. Moley Lecture, Washington University, St. Louis, MO
- 2019 Keynote Speaker, Frontiers in Biomedical Sciences Seminar, Fort Collins, CO
- 2019 Invited Speaker, South African Society for Reproductive Medicine, Cape Town, South Africa
- 2019 Clark T. Sawin Memorial History of Endocrinology Lecture, Endocrine Society New Orleans, LA
- 2019 Invited Speaker, WIN Women's History Month, The Federal Reserve Board, Chicago, IL
- 2019 Grand Rounds, Department of Laboratory Medicine, Memorial Sloan Kettering, New York, NY
- 2019 Invited Speaker, Dittmar Dinner, Northwestern University, Evanston, IL
- 2019 Keynote Speaker, Society for Laboratory Automation and Screening International Conference, Washington, D.C.
- 2019 Invited Speaker, The Contemporary Club, Chicago, IL
- 2018 Plenary Lecture, European Society for Pediatric Endocrinology Meeting, Athens, Greece
- 2018 Invited Lecturer, NIEHS Council Meeting, Research Triangle Park, NC
- 2018 Invited Lecturer, Edwards, Steptoe and Kershaw Symposium: 40th Anniversary of IVF, Manchester, UK
- 2018 Grand Rounds, The Mayo Clinic, Rochester, MN
- 2018 Lipsett Lecturer, Endocrine Fellowship Graduation, National Institutes of Health, Bethesda, MD
- 2018 Trainee Mentoring Award Lecture, Society for the Study of Reproduction, New Orleans, LA
- 2017 Transatlantic Medal Lecture, Society for Endocrinology, Harrogate, UK
- 2017 Keynote Speaker, American Association for Laboratory Science National Meeting, Austin, TX
- 2017 Keynote Speaker, Drexel Discovery, Philadelphia, PA
- 2017 Speaker, Bill & Melinda Gates Grand Challenges Annual Meeting, Washington, DC
- 2017 Grand Rounds Speaker, Northwestern University Department of Obstetrics and Gynecology, Chicago, IL
- 2017 Keynote Speaker, American Society for Reproductive Immunology, Chicago, IL
- 2017 Speaker, 2017 AACC Annual Meeting & Clinical Laboratory Exposition, San Diego, CA

CURRICULUM VITAE T.K. WOODRUFF

- 2017 Speaker, SSR 50th Anniversary Meeting, Washington, DC
- 2017 Guest Speaker, Korean Society for Fertility Preservation, Seoul National University Hospital
- 2017 Keynote Speaker, "A Celebration of Life" Magee-Women's Research Day Pittsburgh, Pittsburgh, PA
- 2017 Vivian Pinn Research Keynote Speaker, The 25th Anniversary Women's Health Congress, Washington, DC
- 2017 Plenary, University of Michigan Contemporary Issues in Multidisciplinary Breast Cancer
- 2017 Keynote Address, University of Kentucky, Resident Research Day, Lexington, KY
- 2017 The Inaugural Brommel-Hahs Lectureship, Northeastern Illinois University, Chicago, IL
- 2017 Grand Rounds, University of Toronto, St. Michael's Hospital, Toronto, Ontario, Canada
- 2017 Grand Rounds, The University of Oklahoma College of Medicine, Norman, OK
- 2017 The MacLean Lecture, Reproductive Ethics, The University of Chicago, Chicago, IL
- 2016 Keynote Speaker, Japan Society for Fertility Preservation, Tokyo, Japan
- 2016 Honorary Doctor of Science Scientific Lecture, University of Birmingham, UK
- 2016 Speaker, American Society for Reproductive Medicine (ASRM) Salt Lake City, Utah
- 2016 Speaker, American College of Surgeons Clinical Congress 2016, Washington, D.C.
- 2016 Speaker, Molecular and Cellular Sciences Seminar Series, Rosalind Franklin University, IL
- 2016 Keynote Speaker, American Association of Medical Colleges (AAMC) GREAT/GRAND Lecture, Washington, DC
- 2016 Plenary Speaker, VI International Congress of Gynecologic Oncology, Lima, Peru
- 2016 Guest Speaker, Dermatology Grand Rounds, Feinberg School of Medicine, Northwestern University, Chicago, IL
- 2016 Plenary, National Conference: Hot Topics in Gynecologic Oncology, Krakow, Poland
- 2016 Speaker, 17th International Congress of Endocrinology/15th Annual Meeting of the Chinese Society of Endocrinology (ICE/CSE 2016), Beijing, China
- 2016 Keynote Speaker, Conference of the Indian Fertility Preservation Society, Bengaluru, India
- 2016 Guest Lecturer, West Region CME Committee Presentation, Central DuPage Hospital, IL
- 2016 Plenary, Biennial Cancer Survivorship Research Conference, Washington, DC
- 2016 Guest Lecturer, Canadian National Oncofertility Workshop, Toronto, Canada
- 2016 Guest Speaker, Skender Foundation Conversation with the Doctor, Chicago, IL
- 2016 Guest Speaker, UW School of Medicine Annual Pregnancy and Cancer Retreat, Seattle, WA
- 2016 Keynote Address, University of Illinois at Chicago Women's Health Research Day, Chicago, IL
- 2016 Plenary Lecturer, Endocrine Society, Boston, MA
- 2016 Keynote Address, Obstetrical Society of Philadelphia and The Philadelphia Perinatal Society,
- 2016 Keynote Speaker, 5th Annual Presidential Career Symposium (APCS) for the Texas Medical Center (TMC), Baylor College of Medicine, Houston, TX
- 2015 Keynote, 53rd Annual Meeting of Japan Society of Clinical Oncology, Kyoto, Japan
- 2015 Plenary Speaker, Queen's University, Kingston, ON, Canada
- 2015 Keynote, Puerto Rico Breast Cancer Conference, San Juan, Puerto Rico
- 2015 Keynote, National Institute Medical Sciences and Nutrition, Mexico City, Mexico
- 2015 Invited Speaker, Gordon Research Conferences, Holderness School, Holderness, NH
- 2015 Plenary Speaker, North American Society for Pediatric and Adolescent Society, Orlando, FL
- 2015 Donald C. Johnson Lecture in Reproduction, University of Kansas Medical Center, Lawrence, KS
- 2015 Speaker, Mini Symposium on Gonadal Peptides, Cochin Hospital, Paris, France
- 2015 "Sex in Three Cities" Lecture Series, Society for Reproduction and Fertility, Edinburgh Scotland; London, England; Nottingham, England
- 2015 Grand Rounds Speaker, Cincinnati Children's Hospital Medical Center, Cincinnati, OH
- 2014 Seminar Speaker, Texas A&M University, College Station, TX
- 2014 Luigi Mastroianni, Jr., M.D. Memorial Lecture Speaker, University of Pennsylvania, PA
- 2014 Speaker, NIH/ORWH Methods and Techniques Workshop, Bethesda, MD
- 2014 Speaker, ACRWH Office of Research on Women's Health Meeting, Bethesda, MD
- 2014 Lecturer, Stanford University Gendered Innovation Workshop, Stanford, CA
- 2014 Presidential Address and Plenary, Endocrine Society/International Congress of Endo Annual Meeting, Chicago, IL



*CURRICULUM VITAE T.K. WOODRUFF*

- 2014 Invited Speaker, Gordon Research Conferences, Stonehill College, Easton, MA
- 2014 Speaker, American Association for Clinical Oncology (ASCO): New Scientific Horizons in Fertility Preservation for Cancer Patients, Chicago, IL
- 2013 Scientific Writers Conference, Guest Lecturer, New York City, NY
- 2013 Sociedad Mexicana de Nutrición y Endocrinología (SMNE), Cancun, Mexico
- 2013 Speaker, Michigan Society for Reproductive Endocrinology and Infertility, Birmingham, MI
- 2013 Keynote Speaker: Sociedade Portuguesa de Medicina de Reprodução, Coimbra, Portugal
- 2013 Keynote Speaker, National Women's Survivors Convention, Nashville, TN
- 2013 Beacon Lecture, Frontiers in Reproduction, Woods Hole, MA
- 2013 Ob/Gyn-Endocrinology Grand Rounds, University of Colorado, Denver, CO
- 2013 Speaker, Banner MD Anderson Cancer Center Oncology Grand Rounds, Gilbert, AZ
- 2013 Speaker, Pró-Criar Annual Symposium, Belo Horizonte, Brazil
- 2013 Lecturer, Center for Reproductive Research, University of Virginia, Charlottesville, VA
- 2013 Barron Guest Lecturer, University of Florida, Gainesville, FL
- 2013 Speaker, Conference on Preservation of Fertility in Cancer Patients, Hong Kong
- 2012 Speaker, International Congress on Reproductive Medicine, Moscow, Russian Federation
- 2012 Invited Speaker, Koch Institute for Integrative Cancer Research at MIT, Boston, MA
- 2012 Plenary Speaker, NICHD 50th Anniversary, Bethesda, MD
- 2012 Speaker, National Academies Innovation Conference, Chicago, IL
- 2012 NUMATS Awards Ceremony, Keynote Speaker, Evanston, IL
- 2012 Best Practices Forum, Northwestern University, Chicago, IL
- 2012 Plenary Talk, Women in Science Symposium, Chicago, IL
- 2012 5th Annual Women's Cardiovascular Health Symposium Talk, Chicago, IL
- 2011 Keynote Address, Annual Paul Harding Research Day, London, Ontario, Canada
- 2011 Invited Speaker, 58th Annual Society for Gynecologic Investigation Meeting, Miami, FL
- 2011 Invited Speaker, Breast Cancer Survivorship Research Workshop, Chapel Hill, NC
- 2010 Inaugural Address of Amsterdam Reproductive Science Center, Amsterdam, The Netherlands
- 2010 Invited Speaker, International Symposium Female Fertility Preservation, Sao Paulo, Brazil
- 2010 Keynote Address, Fertility Society of Australia, Adelaide, Australia
- 2010 Invited Speaker, Women's Health Special Interest Group, Bethesda, MD
- 2010 Address to the Congressional Caucus on Women's Health and the NIH, US Congress, Washington, D.C.
- 2010 Session Speaker, Society for the Study of Reproduction: Annual Meeting, Milwaukee, WI
- 2010 Speaker, Conference des les Peptides Gonadiques, Paris, France
- 2010 Speaker, Gordon Research Conference, Les Diablerets, Switzerland
- 2010 Speaker, McGill Research Day, McGill University, Toronto, ON
- 2010 John I. Brewer Lecture, American Congress of Obstetricians and Gynecologists, San Francisco, CA
- 2010 Grand Rounds, Department of Physiology, University of Iowa, Iowa City, IA
- 2010 Grand Rounds, Department of Obstetrics and Gynecology, University of Iowa, Iowa City, IA
- 2010 Speaker, Praxis of Team Science, Chicago, IL
- 2010 Speaker, Michigan Registered Nurses Association Annual Meeting, Ypsilanti, MI
- 2010 Speaker, York University Assoc, of Graduate Students in the Biological Sciences, York University, Montreal, Canada
- 2010 Whitney Memorial Lecture, Arkansas University for Medicine, Little Rock, AR
- 2010 Deans Grand Challenge Lecture, McCormick School of Engineering, Northwestern University, Evanston IL
- 2009 Changing the Face of Medicine: Celebrating America's Women Physicians, Northwestern University, Chicago, IL
- 2009 Invited Speaker, Genentech, South San Francisco, CA
- 2009 Jacob Probstern Memorial Lecture, Washington University, St. Louis, MO
- 2009 Keynote Address, Northwestern Memorial Hospital Women's Leadership Group, Chicago, IL
- 2009 Annual American Gynecological Club Conference, Chicago, IL
- 2009 Speaker, Society for the Study of Reproduction: Annual Meeting, Pittsburgh, PA

CURRICULUM VITAE T.K. WOODRUFF

- 2009 Speaker, Endocrine Society Annual Meeting, Washington, DC
- 2009 Speaker, Chimisee Gordon Conference, Bavaria, Germany
- 2009 Plenary Speaker, 15th World Congress on IVG, Geneva, Switzerland
- 2009 Inaugural Seminar, Laura Bush Women's Health Center, Texas Tech University, Lubbock, TX
- 2009 Seminar Speaker, University of Texas-Southwest, Dallas, TX
- 2009 Invited Speaker, Pri-Med Midwest, Current Issues in Primary Care, Rosemont, IL
- 2009 Invited Speaker, Oregon National Primate Research Center, Portland, OR
- 2009 Speaker, Society of Gynecologic Oncologists Annual Meeting, San Antonio, TX
- 2009 Speaker, European Society of Human Reproduction and Embryology, Brussels, Belgium
- 2008 Plenary Lecture, First World Congress on Reproductive Biology, Kailua-Kona, HI
- 2008 Speaker, Realizing the Promise of Healthcare IT, Scottsdale Institute, Scottsdale, AZ
- 2008 Speaker, Second World Congress on Mild Approaches in Assisted Reproduction, London, UK
- 2008 Gabriel Bialy Lecture in Reproductive Biology, Southern Illinois University, Carbondale, IL
- 2007 9th Annual Lynn Sage Breast Cancer Symposium, Chicago, IL
- 2007 Distinguished Speaker Seminar Series, Abbott Laboratories, Abbott Park, IL
- 2007 Smithsonian National Zoo, Park, Conservation and Research Center, Front Royal, VA
- 2007 16th Ovarian Workshop, San Antonio, TX
- 2007 Plenary Endocrine Society 89th Annual Meeting, Toronto, Ontario, Canada
- 2007 15th Annual Medical Science Graduate Student's Association Symposium, Calgary, Canada
- 2007 Speaker, Summit on Hormones and the Environment, San Francisco, CA
- 2006 A.V. Nalbandov Lecture, University of Illinois, Chicago, IL
- 2006 Speaker, Oncology Nursing Conference, Chicago, IL
- 2006 Designated Fertile Hope Center of Excellence, Chicago, IL
- 2006 Speaker Conference on the Extracellular Matrix of the Female Reproductive Tract, Maui, HI
- 2006 Speaker, European Society for Human Reproduction and Embryology, Siena, Italy
- 2006 Speaker, Perinatal Research Society, Lake Arrowhead, CA
- 2006 Speaker, 2nd Annual Chicago Supporting Oncology Conference, Chicago, IL
- 2006 Speaker, The Economic Club of Chicago, Chicago, IL
- 2005 Speaker, 7th Annual Illinois Women's Health Conference, Rosemont, IL
- 2004 Speaker, Developments in Gonadotropin Control, Paris, France
- 2003 Speaker, Updates in Infertility Treatment, Marco Island, FL
- 2003 Speaker, 5th World Workshop on Inhibin, Activin and Follistatin, Siena, Italy
- 2003 Klotz Lecture, Société Française d'Endocrinologie, Paris, France
- 2003 Speaker, National Institute for Research in Reproductive Health (NIRRH), Mumbai, India
- 2003 Speaker, Mumbai Obstetrics and Gynecology Association, Mumbai, India
- 2003 Speaker, All India Institute for Medical Science, New Delhi, India
- 2002 Keynote, French Endocrine Society Meeting, Tours, France
- 2002 Speaker, XIVth Ovarian Workshop, Baltimore, MD
- 2002 Speaker, Conference on Mammalian Gametogenesis and Embryogenesis, New London, CT
- 2001 Speaker, Society for the Study of Reproduction, Ottawa, Ontario, Canada
- 2000 Speaker, Inhibin/Activin Meeting, Melbourne, Australia
- 2000 Speaker, Endocrine Society Meeting, Toronto, Ontario, Canada
- 2000 Speaker, Midwestern ADSA Annual Meeting, Des Moines, IA
- 1999 Speaker, The American College of Pathologists, Annual Meeting, Chicago, IL
- 1999 Endocrine Society: Hot Topic Talk, San Diego, CA
- 1999 Organizer, North American Inhibin and Activin Congress, Evanston, IL
- 1998 Speaker, Reproductive Tract Biology Gordon Conference, Plymouth, NH
- 1997 Speaker, Endocrine Society Meeting, Minneapolis, MN
- 1996 Speaker, Ovarian Workshop, London, Ontario, Canada

*CURRICULUM VITAE* T.K. WOODRUFF

- 1996 Speaker, American Society of Andrology, Minneapolis, MN
- 1994 Speaker, Symposium on Ovulation Induction, Siena, Italy
- 1993 Speaker, Montreal Fertility Meeting, Montreal, Canada
- 1993 Speaker, International Symposium of Inhibin and Inhibin-Related Proteins, Siena, Italy
- 1993 Speaker, Central Control of Gonadal Function, Rheingau, Germany
- 1992 Speaker, International Symposium of Inhibin and Inhibin-Related Proteins, Paris, France
- 1992 Speaker, Ninth International Congress on Endocrinology, Nice, France
- 1992 Speaker, Society of Gynecological Investigation, San Antonio, TX
- 1991 Speaker, The Weitzman Institute of Science, Rehovot, Israel
- 1991 Speaker, Israel Fertility Society Meeting, Tel Aviv, Israel
- 1991 Speaker and Instructor Chinese Academy of Sciences, Beijing, China

## CAREER METRICS

### *Major Scientific Discoveries (h-index: 90)*

1. Cloning of inhibin and establishment of the peptide hormone control of reproduction Science. 1988 Mar 11;239(4845):1296-9.
2. Structural basis of activin interaction with its receptor and binding ligand EMBO J. 2003 Apr 1;22(7):1555-66; Dev Cell. 2005 Oct;9(4):535-43; Proc Natl Acad Sci U S A. 2011 Mar 29;108(13):5232-6
3. First human MII egg from in vitro grown ovarian follicle Sci Rep. 2015 Nov 27;5:17323; Tiss Eng 2006 12;10:2739-2746 (Named top paper in reproductive science by Nature Medicine and is in the top 1% of all Engineering articles of the same age – Scopus).
4. First demonstration of inorganic zinc signal that controls maturation of the oocyte and transition from meiosis to mitosis at fertilization; discovery of the ‘zinc spark’ at fertilization in mouse and human Nat Chem. 2015 Feb;7(2):130-9; Nat Chem Biol. 2010 Sep;6(9):674-81; Sci Rep. 2016 6:24737 (Named top 100 discoveries of 2016 by Discover Magazine).
5. Founding of oncofertility as a new medical discipline NEJM. 2009;360:902-911 (in top 2% of all Medicine articles of same age – Scopus); Lancet. 2014 Oct 4;384(9950):1302-10.
6. Creation of a microfluidic ovarian reproductive tract ‘menstrual cycle in a dish’ and the first functional soft organ bioprosthesis, and ovarian bioprosthesis (Altmetric for each paper is >1000) Nat. Commun. 2017;8:14584; Nat Commun. 2017. (Both discoveries named top 100 discoveries of 2017 by Discover Magazine; The ovarian bioprosthesis was named to the top 5 medical discoveries of 2017 by the Chinese Academy of Medicine).
7. Advocate for inclusion of females in basic and clinical research; Nature. 2010;465:688-689; Proc Natl Acad Sci USA. 2014;111:5063-5064; Science. 2010;330:453

### *Evidence of Mentorship*

1. Trained >24 Graduate Students, >27 Postdoctoral Fellows
2. Founded the Oncofertility Saturday Academy (now taught in four states) and the Women’s Health Science Academy for minority women
3. Co-directed Frontiers in Reproduction; Woods Hole, MA
4. Founded the Masters in Reproductive Science and Medicine Program, Northwestern University

### *Evidence of Academic Leadership*

1. President, Endocrine Society
2. Associate Director, Robert H. Lurie Comprehensive Cancer Center Basic Science Program
3. Founder and director, Women’s Health Research Institute
4. Founder and director, Oncofertility Consortium (98 centers nationally, 19 pediatric centers, 15 global centers)
5. Director, Center for Reproductive Science
6. Vice Chair for Research, Dept OB/GYN
7. Founding Editorial Board, Journal Adolescent Young Adult Oncology
8. Dean, The Graduate School and Associate Provost for Graduate Education, Northwestern University
9. Advocated for inclusion of females in basic science (leading to new NIH policy, 2015)
10. Member, Office Research Women’s Health Council, NIH/OD
11. Coined the term ‘oncofertility’ which is now a medical specialty

### *Evidence of National/Global Recognition*

- 2017 The Society for Endocrinology Transatlantic Medal
- 2016 Leadership Award, Endocrine Society
- 2013 Named to Time Magazine Most Influential People List (listed 112th)
- 2012 American Committee for the Weizmann Institute of Science
- 2011 Presidential Award for Math Science Engineering Mentoring Awarded by President Obama in an Oval Office Ceremony

*Honorary Degree recipient and Commencement Addresses*

- 2020 Elected Fellow, American Academy of Arts and Sciences
- 2018 Elected Fellow, National Academy of Medicine
- 2017 Elected Fellow, National Academy of Inventors
- 2016 University of Birmingham (D.Sc.)
- 2012 Olivet Nazarene University (Alma Mater)
- 2010 Bates College, Lewiston Maine (D.Sc.)
- 2006 Young Women’s Leadership Charter School

*Evidence of Civic Engagement*

- 2019 Elected member, The Chicago Network
- 2018-2020 Board of Trustees, Adler Planetarium
- 2015 Elected member, Economic Club of Chicago
- 2008-2011 School Board Young Women’s Leadership Charter School, Chicago Public Schools

**SUMMARY OF RESEARCH, EDUCATION, AND POLICY ACCOMPLISHMENTS**

**Research:** Cloned and structurally characterized the peptide hormones controlling mammalian reproduction. Dr. Woodruff’s scientific successes started early in her career—in 1986, as a graduate student in the laboratory of Dr. Kelly Mayo at Northwestern University, she cloned the subunits that form the peptide hormones inhibin and activin, placing her at the forefront of modern reproductive molecular biology (*Mol Endocrinol.* 1987;1:561-568). She thrived within the strong collaborative environment of the Mayo and Schwartz labs—Neena B. Schwartz discovered inhibin in 1977 at Northwestern—allowing her to rapidly describe inhibin subunit regulation during the rat estrus cycle, publishing her results in *Science* in 1988 (239:1296-1299). These peptide hormones are powerful, without which individuals are sterile. After completing her doctorate in 1989, Dr. Woodruff continued her work on inhibin at Genentech in South San Francisco, where she applied her expertise to the development of inhibin and activin assays (*Hum Reprod.* 1993;8:133-137; *Endocrinology.* 1993;132:2099-2108), technologies that are still in use today for the diagnosis of Down’s syndrome pregnancies and assessing the ovarian reserve. She is named as inventor on five patents based on her work at Genentech. Dr. Woodruff continued her research into the physiology of inhibin and activin in pituitary and ovarian function in rodents (*Endocrinology.* 1993;132:2332-2341) and was the first to evaluate the effects of recombinant human ligands as drugs in primate models (*J Clin Endocrinol Metab.* 1993;77:241-248). Dr. Woodruff returned to Northwestern University in 1995 and focused her lab’s efforts on understanding inhibin and activin actions and interactions within the pituitary-gonadal axis, specifically characterizing the regulation of subunit assembly and ligand processing in the ovary, the ligands’ role in paracrine regulation of folliculogenesis, and their signal transduction pathways in the regulation of follicle-stimulating hormone. More recently, she detailed the structure of activin in a productive collaboration with Theodore Jardetzky, now at Stanford University. Together they solved the crystal structures of activin with its receptor (*EMBO J.*, 22:1555, 2003) and with its bionutralizing binding protein follistatin (*Dev. Cell*, 9:535, 2005). These structures not only revealed important clues about ligand function, but have also provided invaluable tools for designing therapeutics and diagnostics that are being applied to inhibin/activin- dependent diseases. Recent work includes the use of in silico designed activin antagonists based on the structure of activin bound to its receptor, with potential applications in treatment of cancer-related cachexia (*J. Med Chem* 58:5637; 2015). Dr. Woodruff’s lab continues to dissect the mechanisms controlling inhibin biosynthesis, assembly, and secretion, and to characterize the activin signal transduction pathways.

Co-discovered inorganic signals controlling oocyte maturation and fertilization. One of the key questions in reproductive science is “what makes a good egg?” With inorganic chemist Dr. Tom O’Halloran, Dr. Woodruff discovered a novel role of inorganic metals, specifically zinc, in the regulation of oocyte maturation (*Nature Chem Biol.* 2010;6:674-681, 2010) and at the moment of fertilization (*ACS Chem Biol.* 2011;6:716-723). These studies led to an entirely new area of biology that provides an extracellular clue (‘zinc spark’) about the health of the oocyte that may be useful for IVF clinics. The first indication that zinc might directly regulate mammalian oocyte maturation used single-cell elemental analytical methods at the Argonne National Laboratory and allowed a precise determination of changes in total zinc concentrations in

individual eggs across the last 12-14 hours of oocyte maturation. The studies established that zinc is the most abundant transition metal in the fully-grown mouse oocyte, egg and early embryo, and that its concentration is nearly ten-fold higher than that of iron or copper. Next, they showed that the oocyte accumulates zinc by over 50% during the 12-16 hours required for the maturation to the terminal stage of development before fertilization (MII stage). Second, they showed that this massive increase in the zinc quota during meiotic maturation is necessary to drive meiosis I exit and to establish MII arrest in the mouse egg. Woodruff and O'Halloran demonstrated this in a number of ways, including induction of zinc insufficiency in maturing oocytes via small molecule chelators. This treatment prevents maturation and results in premature meiotic arrest at telophase I. They next showed the zinc transporters Zip6 and Zip10 were key in the zinc uptake phase and that transcriptional control of the normal zinc homeostasis pathways by the zinc-specific metalloregulatory protein MTF-1 is down regulated as the oocyte matures. These mechanistic studies explain how the influx of over 20 billion zinc ions was accomplished in a short period of time. Third, Woodruff and O'Halloran discovered the phenomenon of the 'zinc spark' and established the molecular origin and physiological mechanism of these zinc release events. Using single cell x-ray fluorescence, they showed that 10 billion zinc ions are released from the egg during these 'zinc spark' events. In experiments published in 2015 in *Nature Chemistry*, Woodruff and O'Halloran developed a series of novel chemical probes, four-dimensional confocal fluorescence microscopy experiments, Scanning Transmission Electron Microscope, and synchrotron-based x-ray bionanoprobe measurements to create quantitative maps of zinc distribution at the subcellular level. These results reveal that the zinc sparks arise from vesicular fusion of thousands of compartments. In an imaging tour de force, they published an image of the 'zinc spark' at the precise moment that the sperm enters the egg. This unprecedented real-time imaging demonstrated that the zinc spark occurs within seconds of sperm entry, and thus represents one of the earliest markers of embryo quality (Sci Rep. 2016;6:24737). The discoveries have led to a testable new concept in biology, namely the idea that zinc fluxes in the egg function as a master switch in early mammalian development.

Developed the field of oncofertility, changing medical practice to preserve fertility before lifesaving but sterilizing therapeutic intervention. Dr. Woodruff's interdisciplinary research efforts in three-dimensional ovarian follicle culture led her to think about potential applications of the technology—specifically, how it could be used to help young women with fertility-threatening conditions or undergoing gonadotoxic treatments (NEJM. 2009;360:902-911; Nature Rev Clin Oncol. 2010;7:466-475; Lancet. 2014;384(9950):1302-10.). Advances in cancer treatment have significantly increased the rate of survival among pediatric cancer patients, which has brought issues of survivorship—including the ability to have a family—to the forefront. In the early 2000s, options for preserving fertility for young women diagnosed with cancer were limited to emergency IVF, which requires a delay in cancer treatment for hormone stimulation and egg retrieval. Yet many young cancer patients may not have a partner or may have moral objections that preclude embryo creation, and very young patients are unable to undergo hormone stimulation to produce eggs for freezing. Other women may have aggressive disease that requires immediate treatment for hormone-responsive cancers. Around 2005, other groups were reporting the retrieval and heterotopic transplantation of ovarian tissue as treatment for infertility—Dr. Woodruff asked whether ovarian follicle or tissue culture methods being developed in her lab might fill an unmet need in fertility preservation for young women with cancer. She recognized a significant gap in knowledge and communication between patients and providers with regard to fertility preservation for cancer patients. In 2007, Dr. Woodruff was awarded a prestigious NIH Roadmap Grant to form the Oncofertility Consortium, an interdisciplinary team of oncologists, fertility specialists, social scientists, educators and policy makers dedicated to the clinical care of women at risk of losing their fertility because of cancer treatment. To describe this effort, she coined the term oncofertility, a word that is now officially recognized in the English language. Since the formation of the Consortium, Dr. Woodruff and her colleagues have literally written the book on oncofertility, with six volumes describing the progress in basic science research, medical practice considerations, perspectives from the humanities and the law, and communication methods that impact the care of cancer patients facing iatrogenic infertility. True to her collaborative style, with the Oncofertility Consortium, Dr. Woodruff extended her work beyond the disciplinary borders of reproductive biology to work with a range of experts to effectively translate bench research to bedside patient care. As part of the Oncofertility Consortium, Dr. Woodruff helped form the National Physicians Cooperative (NPC) to facilitate sharing of fertility preservation protocols and techniques between reproductive endocrinology practices and ensure that clinicians and patients receive the most accurate and up-to-date information

about available treatment options, even as the technologies continue to evolve. She also established a patient navigation system to help connect oncologists to fertility specialists, providing a more efficient system for referring cancer patients who are interested in fertility preservation. She worked with humanities scholars to better understand patient and provider perspectives and challenges, to identify gaps in knowledge about the available fertility preservation options for cancer patients, and to develop new tools to improve communication between providers and patients. Dr. Woodruff examined the ethical considerations of fertility management paradigms for young cancer patients with Professor Laurie Zoloth (*Am J Bioeth.* 2008;8:W3 & 21) as well as legal perspectives of oncofertility with Professor Dorothy Roberts (*Santa Clara Law Review.* 2009;49:673). Her collaboration with education scientist Kemi Jona led to the creation of the patient-directed website [myoncofertility.org](http://myoncofertility.org). The global, transdisciplinary Oncofertility Consortium has been upheld as an example of successful inter-institutional team science in practice, and has been used as a test case for research and education in the science of team science field (*J Assist Reprod Genet.* 2010;27:227-231). Dr. Woodruff designed the Oncofertility Consortium logo, a trademarked advocacy ribbon that reflects the growing concern for the reproductive future of cancer patients. The intertwining spring green and hearty purple represents blossoming hope and uncompromised dedication to improving fertility preservation options for cancer patients. The lower tip of the ribbon emerges showing an emergence of eggs or embryos, as well as sperm, welcoming the translation of current research to the improvement of fertility options for all cancer patients. The ribbon has a slightly bowed shape, providing subliminal imagery of a fertile state. Oncofertility is now a recognized medical discipline around the globe.

**Engineering Reproductive Solutions.** A hallmark of the work done by Woodruff is the inclusion of bioengineering to solve specific biological problems. Many of the biological questions are also linked to unmet human need. The structure-function relationships between inhibins, activins and their receptor/binding proteins and the use of hydrogels to support individual follicle growth are two examples described above. More recently, she has used the encapsulated in vitro follicle growth assay (eIVFG) to invent and test a microfluidic system that supports 28 day reproductive cycles in an ex vivo setting. The ovarian follicles or intact ovaries (mouse) are interconnected to human explants from fallopian tubes, uterus and cervix with liver organoids to provide a metabolic management tissue (*Nat. Commun.* 2017;8:14584). This “menstrual cycle in a dish” is described as an EVATAR and male versions of the system are under development. Further, Woodruff and team have created decellularized and 3D printed ovarian bioprosthesis that are the first-generation replacement organs for women who lose gonadal function (*Nat. Commun.* 2017, e-pub. May 16).

**Advocacy and Policy:** Dr. Woodruff is a national advocate for women’s health research and mentor in science education. In 2006, Dr. Woodruff was named director of the newly formed Women’s Health Research Institute at Northwestern University. In this role, she was able to spearhead a number of initiatives that would address challenges in women’s health research—including the lack of sex equity in biomedical research, the attrition of women from STEM fields, and the need for greater knowledge of basic science concepts among patients—all of which impact women’s health and well-being (*Biol Reprod.* 2016;95(1):29). A large part of Dr. Woodruff’s work within the Institute has been to raise awareness of the need for sex-based clinical research in order to improve healthcare for women. Treatment guidelines are largely based on evidence from trials conducted in large populations of male patients, and drug development programs often exclude female participants from clinical trials, even if a treatment will be offered to both men and women. Investigators may not routinely examine clinical outcomes by sex, age or stage of menstrual cycle due to the cost of duplicating the study in both sexes, the ‘complication’ introduced by the menstrual cycle, or the presumption that males are a reasonable model for females. Dr. Woodruff’s passion for improving women’s health research led to a number of high-profile editorials on the need for sex-based equity science and medicine (*Nature.* 2010;465:688-689; *Proc Natl Acad Sci USA.* 2014;111:5063-5064; *Endocrinology.* 2014;155:1181-1183) and the need to relieve restrictions on work with human eggs (*Science.* 2010;330:453). Dr. Woodruff’s efforts to highlight the issue of sex-based clinical research received greater exposure when Leslie Stahl recently interviewed her on a 60 Minutes report (<http://www.cbsnews.com/news/sex-matters-drugs-can-affect-sexes-differently/>). Most importantly, on January 25, 2016, the NIH announced their new sex inclusion policy that mandates males and females be considered as part of basic science research. This is a fundamental change that was led, in part, by the efforts of Dr. Woodruff to provide evidence that the absence of sex as a biological variable is harmful to science and ultimately to men and women.

**Education:** Dr. Woodruff has worked to find novel ways to reduce attrition of women from the STEM fields. She created the Women's Health Science Program (WHSP) for High School Girls & Beyond to provide science education programs to 9th -12th grade female students in Chicago Public Schools (Cancer Treat Res. 2010;16:321-344). WHSP intervenes earlier in the educational pipeline, targeting young women who are considering careers in science and medicine and preparing them with valuable knowledge and skills to successfully become the next generation of women science leaders. WHSP also provides personal and social support during a time when girls make important decisions about their future educational and career trajectories. WHSP runs four academies: the Oncofertility Saturday Academy (OSA), Cardiology Summer Academy (CSA), Infectious Disease Summer Academy (IDSA), and Physical Science Weekend Academy (PSWA). Underscoring her understanding of the importance of building connections, Dr. Woodruff designed the program such that the students build relationships amongst each other that persist beyond their time in the program, which they call the 'science sisterhood,' as well as with the scientists, clinicians, and other professionals associated with WHSP. In addition, parents are encouraged to play an active role in WHSP to support their daughters' interests and pursuits in science. In this way, parents, as members of the general public, are educated along with their daughters about the scientific process and how it translates to human health. The WHSP program has been disseminated nationally, and four additional universities now offer the Oncofertility Saturday Academy curriculum (Biol Reprod. 2016;95(1):28.). For this work, Dr. Woodruff was awarded the Presidential Award for Excellence in Science Mentoring in an Oval Office ceremony in 2011. Dr. Woodruff has been widely recognized for her extensive work on behalf of women in science and research, receiving The Distinguished Woman in Medicine and Science Award (2009), the Distinguished Alumnae Award (2008) and Alumni Association Merit Award (2012) from Northwestern University. She has also been honored nationally with awards from the Weizmann Institute and Women in Science (2012), and has received the American Women in Science (AWIS) Innovator Award (2008), the American Medical Women Association (AMWA) Gender Equity Award (2009), and the "Speaking of Women's Health" Distinguished Service Award (2007) and the 25th anniversary Academy of Women's Health Research Award (2017).

**Leadership:** As dean of The Graduate School (TGS) and the associate provost for graduate education at Northwestern, Woodruff developed and implemented a strategic plan (Vision 2025) including evaluation of the organizational model for graduate support. She streamlines the organizational chart to fit mission and created buy in from stakeholders to ensure smooth transitions and operational transparency. She created a new communication unit to coordinate external and internal communications and is the co-lead on a public-private partnership to develop a campus-wide master plan for graduate housing, graduate student wrap-around services, and graduate administrative offices. Recognizing the need for better coordination between faculty and TGS, she created the first ever venue for the graduate faculty assembly (via Northwestern's Faculty Senate) and updated nomenclature for graduate faculty within the Faculty Handbook. To ensure a broad and equitable environment for the pursuit of advanced degrees, Dr. Woodruff and team instituted the first Diversity and Inclusion Advisory Council and created the first Graduate Alumni Homecoming Gathering, an annual alumni engagement event. Under Woodruff's leadership, TGS has achieved all major fundraising milestones for graduate education. Woodruff holds fiduciary responsibility for TGS in excess of \$170M. She has partnered with graduate deans across the Association of American Universities (AAU), the Council of Graduate Schools (CGS), and Big Ten universities and associated organizations. Her role on equity matters (Title IX), conflict of interest, and research integrity involves partnership across the University to enable faculty, student, and staff success. Woodruff has served on strategic planning councils under two Northwestern presidents. She currently services on the President's Program Review Council that evaluates all academic and administrative units within the University to enable continuous improvement and a culture of self-assessment, transparency, vertical integration, and change management opportunity. Woodruff is frequently asked to service on search committees, most recently the Executive Vice President for Research. She served on the Weinberg College of Arts and Sciences Undergraduate Curriculum Review Committee and holds undergraduate teaching awards. She was a steering committee member for the precursor organization to the program in Biological Sciences, which instituted common curricular requirements across biological sciences. As the associate director for the Lurie Cancer Center, she directed a philanthropic gift portfolio of \$10M and created cross-campus programs in engineering, chemistry, and general life sciences. As vice chair for research in Obstetrics and Gynecology, Woodruff sets the scientific agenda for



a \$15M award portfolio. In her time as vice chair, the Obstetrics and Gynecology department has risen in the NIH funding to number two in the nation, and it is ranked number seven in US News and World Report. As founding director of multiple centers, institutes, and global organizations, Woodruff has been at the forefront of academic science and institutional leadership. Her leadership roles include the director for the Center of Reproductive Science, founder and director of the Women's Health Research Institute, founder and director of the Oncofertility Consortium, and president of the Endocrine Society. She is well known in the city of Chicago for her civic leadership and served as a board member of the Young Women's Leadership Charter School from 2008-2011. Woodruff is currently an active member of the Adler Planetarium Board of Trustees, the Economic Club of Chicago, and The Chicago Network.

#### **WEB PROPERTIES**

*Lab Website:* <https://www.woodrufflab.org>

*Oncofertility Website:* <http://oncofertility.northwestern.edu>

*Oncofertility Patient Websites (English and Spanish):* [myoncofertility.org](http://myoncofertility.org) and [es.myoncofertility.org](http://es.myoncofertility.org)

*Oncofertility Microsite for Providers:* <http://www.savemyfertility.org/save>

*Women's Health Research Institute Website:* <http://www.womenshealth.northwestern.edu>

*Sex Inclusion Policy and Implementation Toolbox:* <http://www.womenshealth.northwestern.edu/sex-inclusion>

*Illinois Women's Health Registry:*

<http://www.womenshealth.northwestern.edu/programs/illinois-womens-health-registry>

*Illinois Men's Health Registry:* <http://www.womenshealth.northwestern.edu/programs/illinois-mens-health-registry>

*Women's Health Science Programs (Oncofertility Saturday Academy, Cardiovascular Summer Academy, Infectious Diseases Summer Academy, Physical Science Weekend Academy):*

<http://www.womenshealth.northwestern.edu/programs/womens-health-science-program>

*Center for Reproductive Science Website:* <http://www.crs.northwestern.edu>

*Reproedia: A lexicon of reproductive terms written for the public and API that can link our terms to your website:*  
<https://www.reproedia.org>

*REPROTOPIA: Reproductive health education resources across the entire life spectrum:*

<https://reprotopia.northwestern.edu>

*Hidden No More: Women in Higher Education at Northwestern:* <https://www.northwestern.edu/hidden-no-more/>

#### **Blogs and Social Media:**

*Woodruff Lab Blog:* <https://www.woodrufflab.org/blog>

*Oncofertility Blog:* <http://oncofertility.northwestern.edu/blog>

*Women's Health Blog:* <https://www.womenshealth.northwestern.edu/blog>

*LinkedIn:* <https://www.linkedin.com/in/teresa-woodruff/>

*Woodruff Lab Facebook:* <https://www.facebook.com/woodrufflab/>

*Center for Reproductive Science Facebook:* <https://www.facebook.com/NUCenterforReproSci/>

**Apps:** iSaveFertility App for iPhone (Download at the App Store)

**Curriculum (Massive Open Online Course: MOOC):**

Introduction to Reproduction: <https://www.coursera.org/learn/reproductive-health>