

**CURRICULUM VITAE**  
**Teresa Kaye Woodruff, Ph.D. DSc. DSc.**  
**Dean, The Graduate School, Northwestern University**  
**The Thomas J. Watkins Professor of Obstetrics and Gynecology**  
[tkw@northwestern.edu](mailto:tkw@northwestern.edu); [tkw086@mac.com](mailto:tkw086@mac.com)

**PROFESSIONAL APPOINTMENTS**

Northwestern University, Chicago IL  
The Graduate School  
Dean of The Graduate School  
Associate Provost for Graduate Education  
Feinberg School of Medicine  
The Thomas J. Watkins Professor of Obstetrics and Gynecology  
Vice Chair for Research  
Chief, Division of Reproductive Science in Medicine  
Department of Obstetrics and Gynecology  
Professor, Department of Medical Social Sciences  
McCormick School of Engineering  
Professor, Department of Biomedical Engineering  
Weinberg College of Arts and Science  
Professor, Department of Molecular Biosciences

**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**

2017-present	Dean, Associate Provost for Graduate Education, The Graduate School, Northwestern University
2013-present	Professor, Department of Biomedical Engineering, Robert R. McCormick School of Engineering and Applied Science, Northwestern University
2012-present	Professor, Department of Medical Social Sciences, Feinberg School of Medicine, Northwestern University
2008-present	Collaborative Faculty Member, Oregon National Primate Research Center
2007-present	Thomas J. Watkins Memorial Professor of Obstetrics and Gynecology, Feinberg School of Medicine, Northwestern University
2006-present	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**

2016-2017	Faculty Director, Developmental Therapeutics Core, Northwestern University
2015-present	Director, Center for Reproductive Science, Northwestern University
2012-present	Vice Chair for Research, Department of Obstetrics and Gynecology, Feinberg School of Medicine, Northwestern University
2007-present	Founder and Director, The Oncofertility Consortium, Northwestern University
2006-present	Founder and Chief, Division of Fertility Preservation, Northwestern University
2006-present	Founder and Director, Women's Health Research Institute, Northwestern University
2006-2015	Associate Director, Center for Reproductive Science, Northwestern University

## Curriculum Vitae T.K. Woodruff

2002-2007 Associate Director of Basic Sciences, Robert H. Lurie Comprehensive Cancer Center, Northwestern University

### SCHOLARSHIP AND LEADERSHIP 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 is active in professional societies including as past president of the Endocrine Society and editor-in-chief of *Endocrinology* and is civically active, including the Economic Club of Chicago and as a former Chicago Public Schools Charter School board member.

### EXCEPTIONAL HONORS

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  
2013 Time Magazine 100 Most Influential People in the World (Voted 112<sup>th</sup>)  
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, Chicago, IL  
2010 Commencement Address, Bates College, Lewiston, Maine  
2006 Commencement Address Young Women's Leadership Charter School of Chicago

### AWARDS AND HONORS

2019 Delbert A. Fisher Scholar Award, Endocrine Society, New Orleans, LA  
2018 Inaugural "Heroes of Medicine", Halo, Chicago, IL  
2018 19<sup>th</sup> Royan International Research Award, Royan Institute, Tehran, Iran  
2018 Distinguished Research Award, American Society for Reproductive Medicine, Denver, CO  
2018 Trainee Mentoring Award, Society for the Study of Reproduction, Reston, VA  
2017 Fellow, John Simon Guggenheim Memorial Foundation  
2017 Outstanding Achievement in Women's Health Research, 25<sup>th</sup> Anniversary, Academy of Women's Health  
2017 Transatlantic Medal, Society for Endocrinology, UK  
2017 Outstanding Leadership in Endocrinology Laureate Award, Endocrine Society  
2016 Lay "O" Award, Alumni Board of Olivet Nazarene University, Kankakee IL  
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 for the Weizmann Institute of Science  
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 University  
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 University  
2007 Distinguished Service Award, Speaking of Women's Health

*Curriculum Vitae* T.K. Woodruff

- 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, Evanston IL
- 1989 Sigma Xi Biochemistry Honor Society
- 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, Evanston IL
- 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, Kankakee IL
- 1985 Elected Phi Delta Lambda Undergraduate Honor Society

LECTURES (SELECTED)

- 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 and Gynaecological Endoscopy, Cape Town, South Africa
- 2019 Invited Speaker, Clark T. Sawin Memorial History of Endocrinology Lecture at ENDO 2019, Endocrine Society 2019 Meeting, 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 Annual International Conference and Exhibition, Washington, D.C.
- 2019 Invited Speaker, The Contemporary Club, Chicago, IL
- 2018 Plenary Lecture, European Society for Paediatric Endocrinology Meeting, Athens, Greece
- 2018 Invited Lecturer, NIEHS Council Meeting, Research Triangle Park, NC
- 2018 Invited Lecturer, Edwards, Steptoe and Kershaw Symposium: 40<sup>th</sup> 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
- 2017 Speaker, SSR 50<sup>th</sup> Anniversary Meeting, Washington, DC
- 2017 Guest Speaker, Korean Society for Fertility Preservation, Seoul National University Hospital
- 2017 "A Celebration of Life: A Lectureship Honoring Mothers" Keynote Speaker, 2017 Magee-Women's Research Day in Reproductive Biology and Women's Health, University of Pittsburgh, Pittsburgh, PA
- 2017 Vivian Pinn Research Keynote Speaker, The 25<sup>th</sup> 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

*Curriculum Vitae* T.K. Woodruff

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, 17<sup>th</sup> International Congress of Endocrinology in collaboration with the 15<sup>th</sup> 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

*Curriculum Vitae* T.K. Woodruff

- 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, 53<sup>rd</sup> 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 Guest Speaker, NIH/ORWH Methods and Techniques Workshop, Bethesda, MD  
2014 Guest Speaker, ACRWH Office of Research on Women's Health Meeting, Bethesda, MD  
2014 Guest Lecturer, Stanford University Gendered Innovation Workshop, Stanford, CA  
2014 Presidential Address and Plenary, Endocrine Society/International Congress of Endocrinology  
Annual Meeting, Chicago, IL  
2014 Invited Speaker, Gordon Research Conferences, Stonehill College, Easton, MA  
2014 Guest 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 Guest 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 50<sup>th</sup> 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 5<sup>th</sup> 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

*Curriculum Vitae* T.K. Woodruff

- 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 Association of Graduate Students in the Biological Sciences, York University, Montreal, Alberta, Canada
- 2010 Whitney Memorial Lecture, Arkansas University for Medicine, Little Rock, AR
- 2010 Deans' Grand Challenge Lecture, McCormick School of Engineering and Feinberg School of Medicine, 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
- 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. Nabandov 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

*Curriculum Vitae* T.K. Woodruff

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  
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

SERVICE/PROFESSIONAL SOCIETIES (SELECTED)

2017-present Editor-in-Chief, *Endocrinology*  
2016-present American Institute for Medical and Biological Engineering (AIMBE) College of Fellows  
2015-present Specialized Cooperative Centers Program in Reproduction and Infertility Research, Ovarian Focus Group Chair (and 2009-2011)  
  
2013-2014 Endocrine Society, President  
2012-2017 Council, The Office of Research on Women's Health, Office of the Director, NIH  
2012-2013 Endocrine Society, President-elect  
2011-present American Society for Reproductive Medicine  
2010-2011 Society for the Study of Reproduction, Public Affairs Committee, Board Liaison  
2009-2011 Specialized Cooperative Centers Program in Reproduction and Infertility Research, 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-present American Society for Biochemistry and Molecular Biology, Member  
2006-2009 Institute for Bionanotechnology in Medicine, Advisory Board  
2006-present 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-present American Association of University Women, Member  
2002 Ovarian Workshop, Meeting Organizer, 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



*Curriculum Vitae* T.K. Woodruff

1998-2003 Women in Endocrinology, Executive Committee 1994-  
1998 World Health Organization Designated Laboratory

UNIVERSITY COMMITTEES AND BOARDS (SELECTED)

*General University Service, Northwestern University*

2019-2020 One Book One Northwestern Faculty Co-Chair  
2016-present 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-present Center for Interdisciplinary Exploration and Research in Astrophysics Advisory Board  
2012-present Council of One Hundred (C100) - Northwestern University Mentoring and Diversity Board  
2009-2011 Northwestern University Strategic Plan Committee – Provost Committee  
2008-present Cardiovascular Research Institute Internal Advisory Council  
2007-2015 Executive Board, Center for Genetic Medicine  
2007-present Tenure Committee, Department of Obstetrics and Gynecology  
2007-present 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 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)  
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  
Continuous Ad hoc tenure committees; faculty and chair search committees

*Robert H. Lurie Comprehensive Cancer Center, Northwestern University*

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

COMMUNITY SERVICE AND PUBLIC OUTREACH (SELECTED)

2018-present Board of Trustees, Adler Planetarium  
2018-present Science Panel, Nerdette Podcast, National Public Radio (NPR)  
2017-present Treasurer, Les Cheneaux Island Association (elected)  
2016-present Little Traverse Trail Steward and Monitor, Cedarville Nature Preserve  
2015-present The Economic Club of Chicago  
Welcome Committee (2017-present)  
2013-2015 FDA Cellular, Tissue and Gene Therapies, Advisory Committee Member  
2012-present Council, Office of Research on Women's Health  
2011-2012 Young Women's Leadership Charter School, Board Member  
2009 Junior Science Café: Making Me! Eggs and Sperm, Oh My!  
2008-2011 School Board Member Young Women's Leadership Charter School, Chicago  
2007-present 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 1995-  
1996 Prison Education Ministry, Volunteer

EDITORIAL ACTIVITIES

## Curriculum Vitae T.K. Woodruff

2017-present	Editor-in-Chief, Endocrinology
2010-present	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

### 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>
- ✓ 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>
- ✓ ReproPedia: A lexicon of reproductive terms written for the public and API that can link our terms to your website: <https://www.reproPedia.org>
- ✓ REPROTOPIA: Reproductive health education resources across the entire life spectrum: <https://reprotopia.northwestern.edu>

### Blogs:

- ✓ <https://www.woodrufflab.org/blog>
- ✓ <http://oncofertility.northwestern.edu/blog>
- ✓ <https://www.womenshealth.northwestern.edu/blog>

### Social Media:

- ✓ Twitter: @teresakwoodruff
- ✓ 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 on the APP store)

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

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

### RESEARCH SUPPORT

11/01/16 - 04/30/18

OPP1161206

Woodruff (PI)

#### **Bill & Melinda Gates Foundation**

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.

Role: PI Total Award: \$100,000

04/01/13 - 03/31/18

P50 HD076188

Woodruff (PI)

#### **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: Center Director

Project I, Woodruff (PI) - Measuring and Modifying the Human Follicle Environment to Improve *In Vitro* Egg Quality

Project II, Kurita (PI)- Medically-based protection of the ovarian reserve against anti-cancer therapy (Co-I)

Curriculum Vitae T.K. Woodruff

Core A, Woodruff (PI) - Administrative Core  
Core B, Woodruff (PI) - Education Core  
Total Award: \$6,910,135

08/12/15 - 03/31/19 5UL1TR001422-02 Woodruff (Co-I)

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

National Center for Advancing Translational Sciences

Role: Optional Module Director Total Award: \$250,000

07/01/15 - 06/30/20

R01GM115848-01

O'Halloran, Woodruff (co-PIs)

**NIH/NIGMS**

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 Total Award: \$86,482

09/01/17 – 08/31/22 UG3ES029073/UH3ES029073 Woodruff (PI)

**NIH/NIEHS/NCATS**

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

PCOS is a highly prevalent human health crisis for women in their reproductive years but there are no good animal models of the disease. Using our expertise in microfluidic reproductive systems we have created a next generation technology that can be used in the general or high throughput tissue culture lab and will support human and mouse tissues (ovaries, fallopian tubes, uterus, cervix, adipose, liver, pancreas) under the influence of androgen. We will use this model to test drugs that target androgen production as well as existing insulin sensitizing drugs and a new class of drugs that is under development for PCOS by our pharmaceutical partner Astraeneca.

Role: PI Total Award: \$5,872,149

04/01/18 - 03/31/23 2R13HD063248 Woodruff (PI)

**NIH/NCATS**

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. This renewal will continue to the annual meeting of this field.

Role: PI Total Award: \$198,212

COMPLETED RESEARCH SUPPORT (Selected)

07/01/12 - 12/31/17 UH2ES022920/UH3TR001207 Woodruff (PI)

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.

Role: Director/PI Total Award: \$4,756,222

02/23/2010 – 03/31/2018 1R13 HD063248 Woodruff (PI)

Oncofertility Consortium National Conference

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

The goal of this grant is to fund the annual meeting of the Oncofertility Consortium.

Role: PI Total Award: \$81,000

02/02/16 - 02/02/18

Ferring Pharmaceuticals

Agmt 01/11/2016

Woodruff (PI)

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

*Curriculum Vitae* T.K. Woodruff

that are compatible with clinical IVF practices.

Role: PI Total Award: \$400,000

07/06/11 – 07/05/15 F30AG040916 Woodruff (PI)

Mechanical Regulation of Luteal Cell Function in a Tissue-Engineered Model of Ovarian Aging

National Institutes of Health / National Institute on Aging

The goal of this project is to understand how age-related ovarian fibrosis alters hormone production.

Role: PI Total Award: \$81,030

09/30/09 - 08/31/14 P01 HD021921 Mayo (PI)

Signaling Pathways Regulating Ovarian Follicle Formation

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

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

Role: Co-Investigator Total Award: \$6,830,650

04/23/03 - 3/31/13 5U54 HD041857 Woodruff (PI)

Center for Reproductive Research at Northwestern University

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

The goal of this grant is to understand the structure-function relationships between molecules important to the reproductive axis.

Role: PI/Center Director

Total Award: \$6,456,973

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

04/01/11 - 03/31/13 3U54 HD041857-09S1 Woodruff (PI)

Center for Reproductive Research at Northwestern University – Diversity Supplement

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

Role: Director Total Award: \$163,197

10/01/07 - 06/30/13 1U54 RR024347 Woodruff (PI)

The Oncofertility Consortium: Fertility Preservation for Women

National Institutes of Health

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.

5UL1DE019587 Woodruff PI U54: The Oncofertility Consortium: Fertility Preservation for Women (1of10)

5RL1HD058295 Woodruff PI R01C: Preservation and Growth of Human Follicles (4of10)

Role: Director/PI Total Award: \$6,512,494

07/01/08 - 6/30/13 W.M. Keck Foundation O'Halloran and Woodruff (coPIs)

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 Total Award: \$ 1,668,665

07/01/12 - 06/30/13 INF\_0088 Woodruff (PI)

Virtual Grand Rounds at the Oncofertility Consortium

Ferring Pharmaceuticals

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.

Role: PI Total Award: \$84,000

09/01/11 - 08/31/13 Agmt 8/29/12 Woodruff (PI)

Innovative Educational Approaches to Help Women Navigate the Menopause Management Maze

*Curriculum Vitae* T.K. Woodruff

Northwestern Memorial Foundation/Evergreen Invitational

The goal of this award is to develop a decision aid for women facing the complexity of health care options related to managing menopause.

Role: PI Total Award: \$39,161

07/01/11 - 06/26/13

TL1CA133837

Woodruff (PI)

Fertility Preservation in Newly Diagnosed Female Cancer Patients

University of Pennsylvania / National Cancer Institute

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.

Role: PI/Mentor Total Award: \$ 56,097

09/27/07 - 07/31/12

K12 HD055884

Dunaif (PI)

Career Development in Women's Health (CDWH)

National Institutes of Health

The goal of this grant is to establish a BIRCWH Program at Northwestern University

Role: Co-Director Total Award: \$2,500,00

09/30/09 - 09/29/11

3U54 HD041857-07S1

Woodruff (PI)

Center for Reproductive Research at Northwestern University – ARRA Administrative Supplement

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

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.

Role: Director Total Award: \$220,679

09/30/05 - 08/31/11

3U54CA119341-04S2

Mirkin (PI)

Nanomaterials for Cancer Diagnostics and Therapeutics

National Cancer Institute

The goal of this project is to upon the significant advances in cancer research and in nanotechnology - particularly in the detection arena - obtained at NU, and operating within the framework of a single university will permit this CCNE to optimize the intensive level of integration and collaboration required to create an accelerated pathway – from conception to clinical trial – for development of nanomaterials and nanodevices to overcome cancer.

Role: Co-PD/PI Total Award: \$15,306,405

01/01/11 - 06/30/11

DHHS

Woodruff (PI)

Regional Offices on Women's Health

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.

Role: PI Total Award: \$ 1,950

09/01/10 - 08/31/11

Alumnae Grant

Woodruff (PI)

Alumnae of Northwestern University

Oncofertility Summer Academy

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

Role: PI Total Award: \$12,900

09/01/09 – 08/31/11

Baxter Healthcare Corporation

Shea (PI)

Biomaterials and Growth Factors Combination to Facilitate Ovarian Grafts Revascularization and Increase Follicle Survival

Baxter Healthcare Corporation

Role: Co-PD/PI Total Award: \$ 110,000

05/01/04 – 04/30/10

5T32HD007068-30

Levine (PI)

Training Program in Reproductive Biology

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

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 Total Award: \$1,481,389

02/01/04 – 01/31/10 5R01HD044464 Woodruff (PI)  
 Regulation of Reproductive Function by Activin  
 National Institutes of Health / National Institute of Child Health and Human Development  
 The objective of this research proposal is to understand the role of activin in the control of pituitary FSH synthesis.  
 Role: PI Total Award: \$1,529,744

07/05/04 – 06/30/10 5R01HD037096-10 Woodruff (PI)  
 Inhibin Actions on Reproductive Target Tissues  
 National Institutes of Health / National Institute of Child Health and Human Development  
 The objective of this research proposal is to understand the biosynthetic pathways leading to inhibin secretion.  
 Role: PI Total Award: \$1,449,331

07/01/09 – 06/30/10 3ULDE019587-03 Woodruff (PI)  
 The Effects of GDF9 Levels on TZP Reorganization and Oocyte Competence in Growing Follicles Cultured  
 Alginate  
 National Institutes of Health / National Institute of Dental and Craniofacial Research  
 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.  
 Role: PI Total Award: \$40,000

09/01/09 – 08/31/10 NMFF Woodruff (PI)  
 Developing an Infectious Disease Module for the Women's Health Science Academy for High School Girls  
 Northwestern Memorial Foundation  
 The goal of this grant is to support the Infectious Disease Summer Academy.  
 Role: PI Total Award: \$27,809

09/27/02 – 06/30/07 U01HD043425 Jameson (PI)  
 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 Total Award: \$2,647,192

*Prior funding can be found online.*

#### INTELLECTUAL PROPERTY

##### *Patents:*

15,545,175	Artificial ovary. Monica M. Laronda, Alexandra L. Rutz, Ramille N. Shah, <b>Teresa K. Woodruff</b>
9,897,595	Composition and methods for the detection of zinc. Emily L. Que, Thomas V. O'Halloran, <b>Teresa K. Woodruff</b>
9,695,399	3D Microphysiologic System. <b>Teresa K. Woodruff</b> ; 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; <b>Teresa K. Woodruff</b>
8,772,029	Modulation of oocyte meiotic progression and oocyte activation. Miranda Bernhardt; Alison M. Kim; Betty Kong; Thomas V. O'Halloran; Emily Que; <b>Teresa K. Woodruff</b> .
8,580,231	Compositions and methods comprising magnetic resonance contrast agents. Jiyoun Lee; Thomas J. Meade; Preeti A. Sukerkar; <b>Teresa K. Woodruff</b> .
6,455,262	Receptor polypeptides and their production and uses. Edward T. Fox; Jennie P. Mather; Mary B. Sliwkowski; <b>Teresa K. Woodruff</b>
5,693,534	Enhancement of fertilization capability of oocytes. Baha M. Alak; Richard L. Stouffer; Don P. Wolf; <b>Teresa K. Woodruff</b>
5,563,059	Use of human inhibin and human activin to increase the number of mature primate oocytes. Baha M. Alak; Richard L. Stouffer; Don P. Wolf; <b>Teresa K. Woodruff</b>
5,545,616	Method for predicting and/or preventing preterm labor. <b>Teresa K. Woodruff</b> .

- 5,286,654 Detection and purification of activin polypeptide. Edward T. Fox; Jennie P. Mather; Mary B. Sliwkowski; **Teresa K. Woodruff**
- 5,216,126 Receptor polypeptides and their production and uses. Edward T. Fox; Jennie P. Mather; Mary B. Sliwkowski; **Teresa K. Woodruff**
- 5,102,868 Method for inhibiting follicular maturation. **Teresa K. Woodruff**; Jennie P.

#### Mather TEACHING ACTIVITIES

- 2016-present Founder and Director, Master of Science in Reproductive Science and Medicine
- 2007-2010 M1 medical students: Female Reproductive Physiology Units
- 2005 Special Topics (Biol Sci 455): *Special Topics in Stem Cell Biology*
- 2002-2004 Special Topics (Biol Sci 455): *Special Topics in Cancer Biology*
- 2001 Special Topics (Biol Sci 455): *The TGF $\beta$  Superfamily of Signaling Proteins in Development*
- 1999 Graduate Core Class (Biol Sci D02): *Molecular Biology and Development: Mammalian Hormones*
- 1997 Special Topics (Biol Sci D55): *Molecular Aspects of Gametogenesis*

#### *Undergraduate student 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) (Teaching awards)
- 1998 Freshman Seminar (Biol Sci A08): *Implications of the Genetic Revolution to Human Endeavors*, (with advising)

#### *Non-Institutional teaching*

- 2015-present Introduction to Reproduction – an online curriculum leading to a certificate through Coursera introducing reproductive health content; geared to college age students
- 2007-present 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

#### ACADEMIC AND RESEARCH ADVISING

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

- So-Youn Kim, Ph.D. (2008-2018), Assistant Professor, University of Nebraska Medical Center
- Jie Zhu, M.D. (2007-2017)
- Ekaterina Kniazeva, Ph.D. (2011-2017) (co-mentored with Lonnie Shea)
- Francesca Duncan, Ph.D. (2009-2014 postdoc; 2016-present) Executive Director, Center for Reproductive Science and Research Associate Professor, Northwestern University
- Min Xu, MD. PhD (2007-2012) Assistant Professor, University of Michigan

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

- Yuriko Iwahata, Ph.D. (2016-2018)
- Hideyuki Iwahata, Ph.D. (2016-2018), Postdoctoral Fellow, Department of Obstetrics and Gynecology, Northwestern University
- Jaewang Lee, Ph.D. (2016-2018) Assistant Professor, Department of Biomedical Laboratory Sciences, Eulji University, South Korea
- Nan Zhang, Ph.D. (2014-2016) Embryologist, REI Clinic, Northwestern Medicine
- Shuo Xiao, Ph.D. (2013-2016) Assistant Professor, University of South Carolina
- Ru Ya, Ph.D. (2013-2015) Marquette University
- Monica Laronda, Ph.D. (2013-2016) Assistant Professor, Northwestern University



### *Curriculum Vitae* T.K. Woodruff

- Sarah Rodriguez, Ph.D. (2010-2011) Lecturer, Northwestern University
- Zexu Jiao, Ph.D. (2010-2013) China
- Miranda Bernhardt, Ph.D. (2010-2011) Research Fellow, National Institute of Environmental Health Sciences (NIEHS)
- Lisa Campo-Engelstein, Ph.D. (2009-2010) Associate Professor, Albany Medical College
- Jessica Hornick, Ph.D. (2009-2014) Research Associate, Northwestern University
- Eugene Galdones, Ph.D. (2009-2011) Eugene Galdones Photography
- Ariella Shikanov, Ph.D. (2007-2011) Assistant Professor, University of Michigan
- Alison M. Kim, Ph.D. (2010-2011) Senior Director, Research and Innovation, American Gastroenterological Association
- Jennifer Hirshfeld-Cytron, M.D. (2008-2010) Fertility Centers of Illinois
- Shiyong Jin, Ph.D. (2006-2009) Research Investigator, University of Michigan
- Susan Barrett, Ph.D. (2007-2010) Medical Liaison, Zeiss
- Lei Lei, Ph.D. (2006-2009) Assistant Professor, University of Michigan
- Laxmi Kondapalli, M.D. (2006-2008) Clinical Assistant Professor, Ob/Gyn, University of Colorado
- Sarah Bristol-Gould, Ph.D. (2006-2007) Medical Science Liaison, Novartis Oncology
- Fujio Migishima, Ph.D. (2005-2008) Kitasato University School of Medicine, Japan
- Niti Jetly, Ph.D. (2004-2008) Chembiotech, India
- Thuy-Vy Do, Ph.D. (2004-2007) Research Assistant Professor, University of Kansas Medical Center
- Monica Antenos, Ph.D. (2003-2009) Research Scientist/Lab Manager, University of Guelph
- Joanna Burdette, Ph.D. (2003-2008) Associate Professor, Associate Dean for Research, University of Illinois at Chicago
- Jaesook Roh, Ph.D. (2003-2005) Professor, University of Hanyang, South Korea
- Suleena Kalra, M.D. (2003) Associate Professor, University of Pennsylvania
- Thomas Thompson, Ph.D. (2000-2005) Professor, University of Cincinnati
- Daniel Bernard, Ph.D. (1999-2001) Professor, McGill University, Ontario, Canada
- Eileen Wang, M.D. (1997-2000) Associate Professor, University of Pennsylvania

#### *Current Postdoctoral Fellows:*

- Hoi Chang Lee, Ph.D. (2015-present)

#### *Visiting Scholars:*

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

#### *Past Graduate Students:*

- Peter Rios, Ph.D. (2014-2016) Research Assistant Professor, UIC (co-mentored with Lonnie Shea)
- Marilia Cordeiro, Ph.D. (2010-2014) Postdoctoral Fellow Edinburgh
- Robin Skory, M.D. Ph.D. (2010-2013) Resident Physician, University of California, San Francisco
- Betty Kong, M.D. Ph.D. (2009-2013) Dermatology Resident, Northwestern University
- Anaar Eastoak-Siletz, Ph.D. (2008-2013) General Surgery Resident, UCLA
- Beatriz Penalver Bernabé, Ph.D. (2009-2014) Postdoctoral Fellow, Amaral Lab
- David Tagler, Ph.D. (2008-2013) Biomedical Engineer, Veterans Health Administration
- Miranda Bernhardt, Ph.D. (2008-2011) NIEHS, Raleigh-Durham, North Carolina
- Elizabeth Parrish, Ph.D. (2006-2008) Regulatory Program Manager, Genentech, Inc.
- Alison Kim, Ph.D. (2006-2010) Senior Director, Research and Innovation, American Gastroenterological Association
- Candace Tingen, Ph.D. (2006-2010) Program Officer, NIH, Bethesda, Maryland
- Shou-Yen Jack Lin, Ph.D. (2005-2010), Scientist, CytomX Therapeutics
- Erin West, Ph.D. (2003-2008) Senior Scientist II, Abbott Laboratories (co-mentored with Lonnie Shea)
- Thomas Lerch, Ph.D. (2003-2007) Principal Scientist, Pfizer

## Curriculum Vitae T.K. Woodruff

- Pamela Kreeger, Ph.D. (2002-2008) Associate Professor, University of Wisconsin (co-mentored with Lonnie Shea)
- Robert Cook, Ph.D. (2002-2006) Kelsey-Seybold Clinic
- Jacqueline Jeruss, M.D. Ph.D. (2001-2003) Associate Professor, University of Michigan
- Stephanie Pangas, Ph.D. (1999-2002) Associate Professor, Baylor College of Medicine
- Hilary Kenny, Ph.D. (1999-2005) Research Associate Professor, University of Chicago
- Magdalena Suszko, Ph.D. (1999-2005) Principal Scientist, Abbott Laboratories
- Jose Santiago, Ph.D. (1998-2003) Senior Director, Abbott Laboratories
- Stacey Chapman Tobin, Ph.D. (1998-2003) Biomedical Writer and Editor, The Tobin Touch, Inc.
- Kelly McKinnon, Ph.D. (2014-2018) Postdoctoral Fellow, Laronda Lab, Northwestern University

### *Current Doctoral Candidates:*

- Yu-Ying Chen (2016-present)
- Emma Gargus (2016-present)
- Jiyang Zhang (2015-present)
- Maxwell Edmonds (2015-present)
- Hunter Rogers (2014-present)

### *Past Masters Students:*

- Jolee Gitch, M.S. (1999-2003) Public School Teacher, Los Angeles Public School District
- Lu Bai (2011-2012) MS Communication
- Yuanming Xu (2012-2014) MS Biotechnology
- Catherine Nguyen (2013-2015) MS Biotechnology
- Mingyang Jiang (2013-2015) MS Biotechnology
- Kuan-Wei Chen (2014-2015) Production Associate, Moderna Therapeutics
- Jiyang Zhang (2015-2016) MS Biotechnology
- Mingjun Liu (2016-2017) University of South Carolina
- Rhitwika Sensharma (2016-2017) MS Biotechnology
- Yaqi Zhang (2016-2017) MS Biotechnology
- Yi Luan (2016-2018) MS-RSM
- Megan Runge (2016-2018) MS-RSM

### *Current Masters Students:*

- Julia Balough (2017-present) MS-RSM
- Emily Hayes (2018-present) MS-RSM

### *Current Research Technicians:*

- Allison Grover (2018-present)
- Kristine Moss (2017-present)
- Sarah Wagner (2017-present)
- Keisha Barreto (2013-present)

### *Undergraduate Students (\*Honors):*

Emily Zaniker (2017-2019)  
Chloe Harrington (2012-2013)  
Jared Cho (2011-2013)  
Raymond Lee (2011-2013)  
Jessina Thomas (2009-2013)\*  
Lidia Spaho (2010-2011)\*  
Kiran Sreenivas (2010)  
Cristina Thomas (2009-2011)\*  
Andrew Russell (2009)\*  
Katarzyna Kadela (2009)\*  
Margaret Nevriy (2008)\*

Anna Banc (2006-2008)  
Cory Waxman (2006-2007)\*  
Rachel Oliver (2006)  
Victoria Ulyanov (2005-2007)\*  
Supreeti Behuria (2005-2007)\*  
Monica Gomberg (2005-2007)\*  
Nimarta Singh (2005-2007)\*  
Quantez Freeman (2005)  
Carrie Nieman (2004-2006)\*  
Anjali Malipatil (2004-2006)

Sarah Kurley (2003-2005)\*  
Daniel Balkin (2002-2004)\*  
Sudhi Kurup (2002-2003)\*  
Jennifer Chuy (2000-2001)\*  
Catherine Randall (2000-2002)\*  
Denise Lo (2000-2002)\*  
Eva Ma (1999-2001)\*  
Wei-Woon (1999-2000)\*  
Diego Abdelnur (1997-1999)  
Elbert Lee (1995-1997)

*Past Research Technicians:*

Christine Will (2016-2017)  
Nikolina Madjer (2016-2017)  
Danijela Dokic, MD (2014-2017)  
Alexandra Rashedi (2014-2017)  
Chanel Arnold-Murray (2015-2017)  
Megan Romero (2012-2017)  
Alexander Gunn (2013-2014)  
Kelly Whelan (2012-2016)  
Katy Ebbert (2011-2014)

Jennifer Pahnke (2011-2014)  
Lizbeth Gutierrez (2010-2012)  
Dragan Mackovic (2010-2012)  
Sarah Kiesewetter (2006-2011)  
Jennifer Jozefik (2007-2010)  
Lara Hildebrand (2005-2010)  
Erin Jackson (2008-2010)  
Tyler Wellington (2005-2010)  
Rika Migishima (2007)

Samantha Thaver (2005-2006)  
Michelle Harwerth (2005-2006)  
Andrew Lisowski (2003-2005)  
Christina Hutten (2002-2005)  
Jaroslav Jelen (2001-2003)  
Maura Lane (2001-2002)  
Huiru Chong (1996-1999)  
Brad Draper (1995-1999)

CAREER CAPSULE

**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 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 maturing oocyte. Live births in mice resulted from these studies. This result 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 <http://oncofertility.northwestern.edu>. Widely recognized for her work, Woodruff holds 10 U.S. Patents and 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, 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 Womens' Health" Distinguished Service Award (2007). In 2017, she received a Guggenheim Award and a National Academy of Inventors Fellowship. She is civically active and is an elected member of The Economic Club of Chicago and an elected Fellow of the American Association for the Advancement of Science as well as the American Institute for Medical and Biological Engineering. 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.

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(<https://scholar.google.com/citations?user=7BhhkQYAAAAJ&hl=en>; h-index = 78; ORCID: 0000-0002-1197-3399)

Dr. Woodruff's publications have significant impact as measured by academic bibliometrics and metrics gauging public interest, media attention, and policy influence ("alternative metrics"). Half of her publications are cited more than expected for their fields of research; 25% of her publications are in the top 10% of publications (by citation count) in their fields. Dr. Woodruff's research has captured the attention of the public as well: over 100 of her publications have received positive mentions by news outlets, scientific blogs, social media, or policy documents.

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## **CAREER CAPSULE**

### **Major Scientific Discoveries (h-index: 82)**

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 Scholarly Leadership**

1. President, Endocrine Society
2. 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, 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**

- Presidential Award for Math Science Engineering Mentoring Awarded by President Obama in an Oval Office Ceremony (2011)
- Named to Time Magazine Most Influential People List (2013; listed 112<sup>th</sup>)
- American Committee for the Weizmann Institute of Science (2012) and Leadership Award (2016), Endocrine Society
- The Society for Endocrinology Transatlantic Medal (2017)
- Honorary Degree recipient and Commencement Addresses:
  - Young Women's Leadership Charter School (2006),
  - Bates College, Lewiston Maine (D.Sc.) (2010)
  - Olivet Nazarene University (Alma Mater) (2012)
  - University of Birmingham (D.Sc.) (2016)
- Elected Fellow, National Academy of Inventors (2017)
- Elected Fellow, National Academy of Medicine (2018)

### **Evidence of Civic Engagement**

- Board of Trustees, Adler Planetarium (2018)
- Elected to the Economic Club of Chicago (2015)
- School Board Young Women's Leadership Charter School (2008-2011), Chicago Public Schools

## **Summary of Research and Educational 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 rodent (*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? This time 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.<sup>8</sup> 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 lost 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 a 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 including human (*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 as a new term 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).

#### **Education:**

**National advocate for women’s health research and mentor in science education** In 2006, Dr. Woodruff was named director of the newly formed Institute for Women’s Health Research 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, 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.

Dr. Woodruff has also worked tirelessly 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 expected 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 25<sup>th</sup> anniversary Academy of Women's Health Research Award (2017).