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The NIH Sex as a Biological Variable Policy



OFFICE OF RESEARCH
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Advancing the Health of
Women Through Science

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Director's Corner

Janine Austin Clayton, M.D.
Director, NIH Office of Research on Women's Health
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I write this in the midst of the coronavirus lockdown, and the associated news coverage provides daily reminders of the importance of the NIH Policy on Sex as a Biological Variable (SABV). Early observations of COVID-19 indicate that more men are dying from the disease but that women, who are more often on the front lines of caregiving, risk greater exposure.

The SABV policy articulates the expectation that NIH-supported research will account for sex as a biological variable in experimental designs, analyses, and reporting of vertebrate animal and human studies. Perhaps more importantly, the policy also affirms NIH's goal to "transform how science is done" by integrating SABV throughout the biomedical research enterprise. Our feature story discusses the history and rationale of the SABV policy and explores two ongoing research efforts that have rigorously addressed SABV and, in so doing, yielded robust results with the potential to improve the health of all. Other features, including an illuminating Q&A with sex differences researcher Arthur P. Arnold, Ph.D., explore additional aspects of the SABV policy. "Will the Coronavirus Pandemic Affect Workplace Gender Equity?" considers how the pandemic might have long-term effects on women and men in the workplace.

Please visit <https://www.nih.gov/coronavirus> and <https://www.coronavirus.gov> for up-to-date information on the coronavirus pandemic. Please share this publication with members of your network and encourage them to subscribe today. Stay safe!

*Janine Austin Clayton, M.D.
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Transforming How Science Is Done

Biomedical Research and the NIH Sex as a Biological Variable Policy

In 2014, ORWH Director Janine A. Clayton, M.D., and NIH Director Francis S. Collins, M.D., Ph.D., published a seminal article in *Nature* announcing the intention of NIH leadership to address sex as a biological variable through policies, programs, and processes. In the article, Drs. Clayton and Collins acknowledged improvements since the enactment of the NIH Revitalization Act of 1993 and the NIH policy requiring the inclusion of women in clinical studies. Now, slightly more than half of the participants in NIH-funded clinical research are women.¹ However, a similar change had not been realized in preclinical studies, which tended to rely on male animals and cells preferentially. With the SABV policy, NIH announced requirements for NIH grant applicants to consider both male and female vertebrate animals in preclinical studies, unless scientific justification for a single-sex study was provided.¹



ORWH Director Janine A. Clayton, M.D., and NIH Director Francis S. Collins, M.D., Ph.D., wrote the article announcing the NIH SABV policy.

Drs. Clayton and Collins stated that the failure to consider potential sex differences in experimental design and data analysis may well have contributed to the “troubling rise of irreproducibility in preclinical biomedical research.”¹ Further, the failure to study both male and female cells, tissues, or vertebrate animals may have obscured fundamental sex differences that could have informed clinical studies and practices. The authors provided several examples of clinically relevant sex differences, such as the response to low-dose aspirin treatment; dosing requirements for some medications, including the insomnia treatment zolpidem; rates of adverse drug reactions; and the onset, disease progression, and outcomes in multiple sclerosis, Parkinson’s disease, schizophrenia, and many other conditions.¹

The SABV Policy: Transforming How Science Is Done. Soon after publication of the *Nature* article, NIH released Consideration of Sex as a Biological Variable (SABV) in NIH-Funded Research ([NOT-OD-15-102](#)). This notice articulated NIH’s expectation that SABV “will be factored into research designs, analyses, and reporting in vertebrate animal and human studies.” It continued, “Strong justification from the scientific literature, preliminary data, or other relevant considerations must be provided for applications proposing to study only one sex.” The SABV policy went into effect in January 2016. In the *Nature* article, Drs. Clayton and Collins stated that the goal of the SABV policy was to “transform how science is done” and outlined plans to specify requirements for NIH grant applicants, modify peer review requirements, and

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create training materials and courses for researchers, reviewers, grantees, and NIH staff.¹

Now, more than 4 years after the implementation of the policy, NIH continues to take stock of how well SABV has been factored into research designs, data analyses, and reporting of federally supported preclinical research and whether the policy has improved the rigor and reproducibility of scientific results. ORWH staff recently published an SABV “progress report” in the *Journal of Women’s Health*.² This article describes many of the NIH initiatives, programs, research projects, resources, organizations, and funding opportunities designed to enhance SABV policy implementation and promote its ethos throughout the larger biomedical and biobehavioral research community. (See *Additional SABV Resources*.)

Resources Enhance SABV Policy

Understanding and Uptake. ORWH—working in partnership with the Food and Drug Administration Office of Women’s Health ([OWH](#)) and the National Institute of General Medical Sciences ([NIGMS](#))—has developed a series of [e-learning courses](#) on applying a sex and gender lens to clinical topic areas and across the biomedical research spectrum. NIH also promotes consideration of sex differences by funding [administrative supplements for research on sex and gender differences](#), the Specialized Centers of Research Excellence ([SCORE](#)) on Sex Differences research program, the NIH scientific interest group (SIG) called Sex and Gender in Health and Disease ([SGHD](#)), and a new R01 grant for studying the [intersection of sex and gender influences on health and disease](#), among many other efforts. According to the ORWH progress report, these initiatives—as well as those of individual scientists, journal editors, conference organizers, grant reviewers, policymakers, and other stakeholders—have realized considerable progress in identifying scientifically relevant differences between males and females and building a more robust

scientific foundation for translational and clinical research. However, more needs to be done.

SABV in Practice. Below, we discuss two research efforts that fully embrace the SABV policy. First, for over a decade, Aaron M. Cypess, M.D., Ph.D., M.M.Sc., of the National Institute of Diabetes and Digestive and Kidney Diseases ([NIDDK](#)) and colleagues have studied how brown adipose tissue, or brown fat, affects metabolism in humans.³ This research contributes to our understanding of metabolic and obesity-related diseases. Second, the Interventions Testing Program ([ITP](#)) of the National Institute on Aging ([NIA](#)) tests longevity interventions in a mouse model. Both Dr. Cypess’s thermogenesis research and the ITP fully incorporate sex differences into their experimental designs, data collection, analyses, and reporting, not only to comply with NIH policy, but also as an aspect of rigor to yield robust, reproducible scientific findings that could contribute to the advancement of health for all.

Sex Differences in Brown Fat and Metabolism.

For over a decade, Dr. Cypess and his colleagues at NIDDK have studied brown fat and its metabolic role in generating body heat, a process known as thermogenesis. Dr. Cypess says, “Thermogenesis is of interest for two reasons. First, it is the mechanism by which all mammals, including humans, can thrive in cold climates. Second, from an endocrinologist’s perspective, thermogenesis is the way excess calories can be removed in a safe, physiological manner. Understanding and controlling thermogenesis could lead to treatments for obesity-related diseases.” Dr. Cypess’s team first identified regions of functionally active brown fat in adult humans in 2009, and their findings linked this tissue to metabolic function.⁴ Dr. Cypess explains that prior to publication of his team’s results, “Most people in the field thought that there was no brown fat in adult humans—let alone thermogenic brown fat.”



Aaron M. Cypess,
M.D., Ph.D., M.M.Sc.

In a recent NIDDK-supported study, Dr. Cypess and colleagues found that women treated with mirabegron, a drug approved by FDA for the treatment of overactive bladder, experienced metabolic benefits, including the activation of brown fat.³ This study involved 14 healthy women, ages 18–40 and of diverse races and ethnicities, who received a 100-milligram dose of mirabegron daily, which is double the maximum FDA-approved dose.³ “We found that treating women with mirabegron for 4 weeks led to many metabolic changes that could have long-term, far-reaching benefits for women’s health,” says Dr. Cypess. Mirabegron treatment more than doubled brown fat activity, increased resting energy expenditure, increased levels of high-density lipoprotein (HDL or “good cholesterol”), improved processing and regulation of blood sugar, and increased production of bile acids, which help digest fats and regulate cholesterol.³ Even with these metabolic changes, study participants treated with mirabegron maintained body weight and mass.³

This recent study complements an earlier investigation by Dr. Cypess and colleagues that showed that one dose of mirabegron increased brown fat activity and resting energy expenditure in healthy young men.⁵ However, because the study used only a one-time dose, it could not be determined whether the study participants would experience the other metabolic effects. One concern is that high-dose mirabegron is associated

with cardiovascular risk. Indeed, the men and women in both studies experienced increased blood pressure and heart rates, which returned to baseline after the cessation of mirabegron treatment. Additional research might determine whether other populations, such as people with obesity and older adults, might experience metabolic benefits or unwanted cardiovascular side effects with mirabegron treatment. Dr. Cypess's findings suggest a promising avenue of research toward a treatment for type 2 diabetes, other metabolic diseases, heart disease, infertility, and other conditions.

Dr. Cypess asserts that consideration of sex differences is essential to his research. "The SABV policy and ethos were and continue to be essential components of our long-term research plan," he says. "Our first paper on human brown fat⁴ identified a prominent sexual dimorphism in the prevalence of active brown fat in human adults. The study of sex differences is particularly relevant in thermogenesis research because there are sex-based differences in brown fat prevalence and anatomic distribution." Dr. Cypess explains that other large studies have confirmed these sex differences and that multiple sex-specific factors most likely affect the presence and function of brown fat in humans. Accordingly, his group has consistently

considered both sexes in designing experiments and analyzing data. "Focusing on these differences could help uncover many aspects of brown fat and thermogenic physiology," he says.

Dr. Cypess reports that he and other researchers plan to expand their consideration of brown fat in humans in future studies. He says, "As brown fat is involved in thermogenesis, some have proposed that populations with origins in warmer climates will have less brown fat than those from colder ones. However, our research has shown that this distinction is not so straightforward." Initial studies that included volunteers from equatorial Africa detected large amounts of functional brown fat, Dr. Cypess explains. His research group plans to study the genomic DNA of these volunteers to investigate brown fat function, prevalence, and distribution in terms of sex, race, and ethnicity. His group also intends to study whether mirabegron can reduce insulin resistance in women with polycystic ovary/ovarian syndrome (PCOS), a health problem affecting 1 in 10 women of childbearing age. (For more information on PCOS, read ORWH's [PCOS booklet](#).)

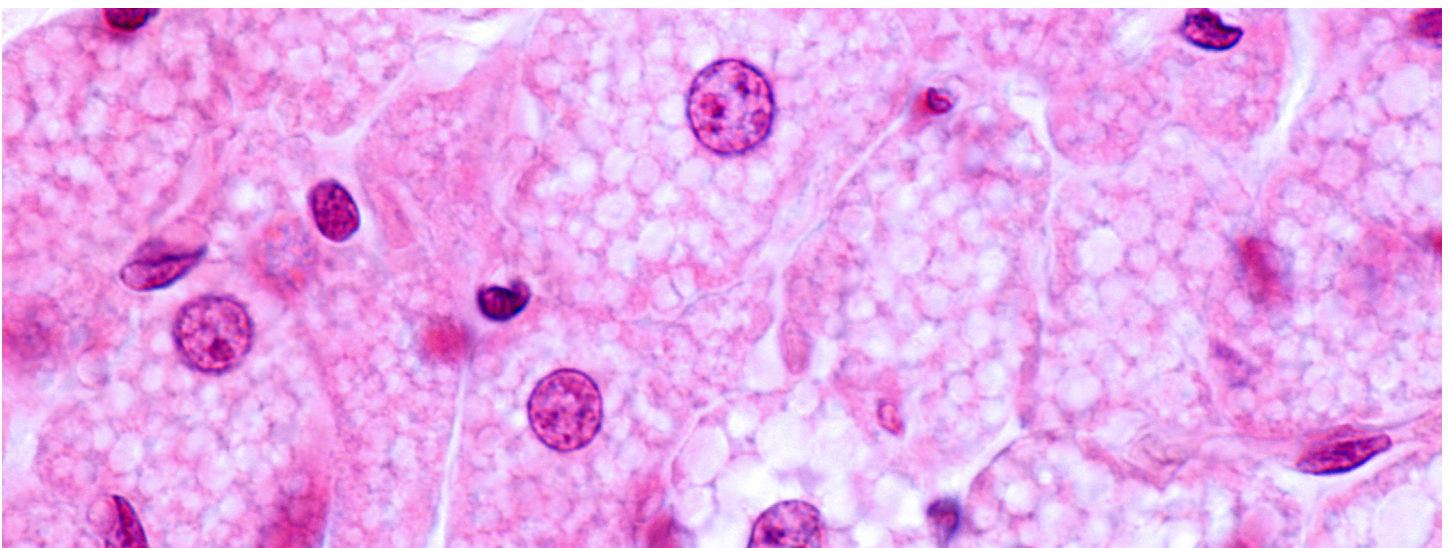
"The big steps on the horizon for the field as a whole are studies on how brown fat interacts with the rest of the body,"

Dr. Cypess says. "How does it work with the brain, liver, and muscle in managing thermogenesis, body weight, and glucose and cholesterol metabolism?"

Programmatic Consideration of Sex Differences: The Interventions Testing Program of the National Institute on Aging.

NIA leads a broad scientific effort to understand the nature of aging and to extend the healthy, active years of human life. NIA is also the primary Federal agency supporting and conducting Alzheimer's disease research. NIA's [ITP](#), established in 2003, is a multi-institutional study that tests the effects of medications, diets, and other interventions on longevity in mouse models.

ITP testing protocols are designed with sufficient statistical power to detect lifespan effects of the tested interventions and any sex-specific variances in those effects. Experiments are conducted at three research centers in the United States to test interventions proposed by scientists from any academic, Government, or commercial laboratory who partner with the ITP investigators in analyzing and publishing the resulting data. To date, interventions tested include pharmaceuticals, foods, dietary supplements, plant extracts, hormones, peptides, amino acids, and other agents and mixtures of agents.



High-magnification micrograph of brown fat cells



Francesca Macchiarini, Ph.D.

In addition to lifespan measures, studies have included consideration of effects on immune function, metabolism, hormonal profiles, and behavior.

ITP researchers test all interventions on both male and female [UM-HET3 mice](#), a strain developed by Richard Miller, Ph.D., who heads the ITP testing center at the University of Michigan. Each UM-HET3 mouse is genetically unique and a full genetic sibling of all other mice used in the program. “ITP considers this genetic heterogeneity in the UM-HET3 mice analogous to the heterogeneity of the human population,” says Francesca Macchiarini, Ph.D., the ITP scientific officer at NIA. ITP’s use of both male and female mice came before widespread appreciation for the need to consider SABV. Over the ITP’s 17-year history, its leadership and researchers have embraced the scientific rationale behind the SABV policy and have supported dozens of studies that have integrated the consideration of the role of sex differences on the impact of interventions on health and longevity.

The ITP has generated a large number of [scientific articles](#) covering a wide variety of interventions and findings with the potential to lead to human clinical trials and applications. By rigorously incorporating SABV into experimental designs, ITP researchers have found important sex differences in the animals’ responses to interventions. “In longevity studies, it is important to study sex differences because of the long-standing observation and understanding that there are differences in aging between male and

female animals and humans,” says Dr. Macchiarini. “You need to look at both males and females if you’re going to test interventions to lengthen lifespan or healthspan.”*

Since its inception, ITP has identified seven interventions with high translational potential for human clinical studies. One of them is the female hormone 17 α -estradiol, which was found to increase the lifespan of male mice but not female mice.^{7,8} “This finding suggests an important research question. What is the impact of reproductive hormones on longevity and healthspan?” says Dr. Macchiarini. Another intriguing ITP discovery came from looking at the impact on longevity by rapamycin, a medication approved for preventing organ transplant rejection and treating cancer. Three separate studies showed that rapamycin administration lengthened the maximal lifespan of both male and female mice in a dose-dependent manner, whether treatment was initiated at 9 months (young) or at 20 months (old) of age.⁹⁻¹¹ The increase in lifespan was greater in females than in males at each rapamycin dose evaluated, perhaps reflecting sexual dimorphism in blood levels of this drug.¹¹

Dr. Macchiarini explains that researchers have shown that rapamycin can extend the lifespan of yeast, worms, and fruit flies and that it can improve the health of rodents, dogs, and non-human primates. Demonstrating the translational potential of the ITP findings, some pharmaceutical researchers have begun investigations into rapamycin analogs (or rapalogs), which are medications

**Healthspan* refers to the period of life from birth to the point when an individual animal or person is no longer in good health or experiencing diseases or disabilities associated with aging. Some ITP studies use body temperature, running ability, and grip strength as indicators of healthspan in experimental animals.

similar to rapamycin, for their potential to strengthen human immune responses to influenza vaccination, Dr. Macchiarini reports. “In spite of these results, people should not take rapamycin as an anti-aging drug. It’s not the fountain of youth. It would be dangerous to prescribe it off label,” she says. ITP also found other sex-specific effects on longevity in response to interventions involving aspirin, acarbose, nordihydroguaiaretic acid (NDGA), the dietary supplement Protandim, and glycine.

Some have criticized the SABV policy by pointing out that expecting researchers to include both male and female animals in their work necessitates larger experimental populations and thus more labor and expense. While Dr. Macchiarini understands this concern, she believes “the generation of robust and reproducible data is the bedrock of all scientific endeavors. Sample sizes must be large enough to achieve statistical power for both females and males. Yes, it’s more expensive, but the motivator should be good science and valid data that can be put into the translational pipeline to help treat human conditions and diseases.” As an example, she cites a recent ITP study that showed remarkable parallels in aging patterns between the mice and the human population.⁶ This phenomenon, known as the female survival advantage, is characterized by a spike in male mortality risk in early adulthood.⁶ In both mice and humans, the female survival advantage diminishes progressively thereafter, and the sexes’ mortality rates converge in old age.⁶ The analysis also confirmed the inverse relationship between body weight and longevity often observed in humans, as well as a tendency for male survival to vary more across studies and testing sites, suggesting females have greater resistance to environmental modulators of survival.⁶

These findings underscore the broad translational potential of the ITP experimental protocols, which could

be adopted by the biomedical research community to address scientific questions beyond the testing of longevity interventions. The ORWH SABV progress report identifies a “need to identify animal models that better reflect human diseases.”²² Dr. Macchiarini explains that the UM-HET3 mice or a similar genetically heterogenous mouse strain could provide the SABV community with just such an animal model. As the mice reflect the sex-specific differences in lifespan and healthspan of the human population, so too could the animals serve as a model for other human health concerns, she believes.

Implementation of SABV Is a Shared Responsibility. The investigators associated with the research efforts described here have done exemplary work consistent with the letter and spirit of NIH’s SABV policy. By integrating the consideration of sex into their studies, the investigators have produced robust scientific findings with the potential to improve the health of all. However, thorough application of the principles espoused in the SABV policy cannot be the responsibility of NIH alone. Consideration of sex influences must also involve other funding agencies, scientific and professional societies, extramural researchers, educators, reviewers, journal and peer editors, policymakers, clinicians, and other stakeholders. NIH expects that its grantees will adhere to the SABV policy as a requisite for funding. However, other contributors to biomedical research and its reporting, including scientific editors and members of other organizations, have no obligation to consider sex in preclinical research. NIH urges all people involved in biomedicine to integrate the rigorous consideration of sex influences thoroughly and appropriately in every aspect of their work. In short, the SABV policy constitutes an important step forward—but only a single step. Transforming how science is done requires the involvement of all sectors of the biomedical research enterprise.

Additional SABV Resources

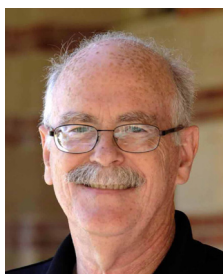
In addition to the references and resources cited throughout the feature story, other resources related to SABV have been developed, including those listed below.

- [FAQs on SABV](#) for NIH grant applicants
- [“Consideration of Relevant Biological Variables in NIH Grant Applications,”](#) an Open Mike blog post by Michael Lauer, M.D., NIH Deputy Director for Extramural Research
- A special section of the [June 2020 issue of the *Journal of Women’s Health*](#), which includes several articles on SABV, including a summary from a panel discussion from a meeting of the Building Interdisciplinary Research Careers in Women’s Health ([BIRCWH](#)) program
- The webpage [“Methods & Techniques for Integrating Sex into Research”](#) on the ORWH website
- A video lecture from Chloe Bird, Ph.D., on [advancing understanding of sex and gender influences on health and disease](#)
- An article titled “Considering Sex as a Biological Variable in Preclinical Research,” by ORWH staff and colleagues ([Miller et al. 2017. *FASEB J.* 31: 29–34.](#))
- Videos and summaries from the [2017 Sex as a Biological Variable Workshop](#)
- An article titled “Sex and Gender Equity in Research: Rationale for the SAGER Guidelines and Recommended Use,” which describes the guidelines for scientific reporting developed by the European Association of Science Editors ([Heidari et al. 2016. *Res. Integr. Peer Rev.* 1: 2.](#))
- An article by ORWH Director Janine A. Clayton, M.D., titled “Studying Both Sexes: A Guiding Principle for Biomedicine,” which describes the rationale behind the NIH SABV policy ([Clayton. 2016. *FASEB J.* 30: 519–524.](#))
- The [ORWH Reading Room](#), a collection of articles on SABV and related topics on the ORWH website
- An editorial by ORWH Associate Director for Basic and Translational Research Chyren Hunter, Ph.D., titled “More Scientific Journals Adopt Sex-Specific Reporting Guidelines” ([In Focus 1.1](#), page 5)
- The 2019–2023 [Trans-NIH Strategic Plan for Women’s Health Research](#), which articulates several SABV-related goals and distinguishes the scientific definitions of “sex” and “gender”

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Animal Models Illuminate Sex Differences in Human Physiology and Disease: An Interview with Researcher Arthur P. Arnold



Arthur P. Arnold, Ph.D.
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Chyren Hunter, Ph.D.
ORWH Associate
Director for Basic and
Translational Research

Chyren Hunter, Ph.D., Associate Director for Basic and Translational Research at ORWH and subject matter expert on the NIH sex as a biological variable (SABV) policy, asked sex differences researcher [Arthur P. Arnold, Ph.D.](#), some questions about his work, the animal models he and his collaborators have developed, and the future of research on sex differences.

Hunter: How did you become interested in sex differences research?

Arnold: In 1975, when I was a postdoc studying song learning in songbirds, my mentor, [Fernando Nottebohm, Ph.D.](#), and I discovered that the brain regions controlling courtship song in passerine songbirds are highly sexually dimorphic. Males sing to females, but females do not sing the male courtship song. The brain regions controlling song are as much as six times larger in males than in females. Ours was the first report of a very large sex difference, visible at the light microscopic level, in the brain of a vertebrate. I got hooked on figuring out what causes sex differences in the brain. My interest expanded to include sex differences in other vertebrate species—in tissues throughout the body and in models of disease.

Hunter: What are some of your laboratory's contributions to the study of sex differences?

Arnold: Our research has helped shape how clinicians and scientists think about the factors that cause sex differences in physiology and disease. The change in conceptual framework has led to the use of animal models to discover specific X and Y genes that protect against or exacerbate disease in a sex-biased manner. We have also contributed to the understanding of cellular actions of gonadal hormones that cause sex differences and to ideas about the evolution of sex differences in gene dosage.

We and our collaborators have developed several animal models for studying factors that make male and female tissues different. One model involves the sex differences in the birdsong circuit, still one of the largest sex differences known in the brain of any animal. Another involves the spinal nucleus of the bulbocavernosus (SNB), a group of spinal neurons innervating the penis of rats. The four core genotypes (FCG) mouse model allows comparison of XX and XY mice that have the same type of gonad.

Hunter: Could you explain the FCG model and its importance?

Arnold: This model was developed by our collaborators Paul Burgoyne, Ph.D., and Robin Lovell-Badge, Ph.D., in the 1990s, and we expanded the use of the model in the early 2000s. We have published about 35 papers on experiments with the FCG model. In FCG mice, the gene causing formation of testes is moved from the Y chromosome to a non-sex chromosome. This way, the type of gonad (testes or ovaries) is no longer determined by the genetic sex (XX versus XY) of the mouse. Thus, litters of FCG mice contain four “sexes” or four kinds of babies: XX and XY mice with ovaries as well as XX and XY mice with testes. (See [this article](#) and [this video](#) for more information about the FCG model.) By comparing the four types of mice, we can tell whether the sex chromosomes cause sex differences independently of the effects of gonadal hormones.

For instance, our collaborator Rhonda Voskuhl, M.D., at UCLA studied FCG mice in a mouse model of multiple sclerosis. (For more information, see [Voskuhl et al. 2018. *Mult. Scler.* 24: 22–31.](#)) Female mice are more susceptible to the disease than male mice, just as in humans. Is that sex difference caused by the hormones coming from the mouse's testes or ovaries or by the inherent XX versus XY difference in genes within cells of its body? The FCG model answers that question. Dr. Voskuhl compared XX and XY mice with the same kind of gonad, keeping hormones constant, to show that the disease progression is worse in XX than in XY mice. That outcome means that genes on the X and/or Y chromosomes contribute to the sex difference. The FCG model also compares XX mice that have testes or ovaries by keeping sex chromosomes constant but varying the hormones. A mouse with ovarian hormones has a more severe disease than a mouse with testicular hormones. That outcome points to a hormonal effect on the susceptibility to the disease. The study of FCG mice allows the conclusion that both sex chromosomes and sex hormones contribute to the sex difference in a multiple sclerosis-like disease in mice. New drugs to treat multiple sclerosis therefore might be developed to enhance the protective effects of hormones or sex chromosome genes.

Hunter: What are some other findings from studies with these animal models?

Arnold: Before 1975, sex differences in the brain of vertebrates were thought to be small and insignificant. Our discovery of dramatic sex differences in the songbird brain disproved that idea. Our finding stimulated the discovery of large sex differences in the brains and central nervous systems of mammals as well as investigations of the hormonal mechanisms causing sex differences in the brain. Our studies of a half-male, half-female gynandromorphic finch and of genetic female birds with testes suggested strongly that sex differences in the songbird song circuit were not caused by gonadal hormones only, as previously believed.

Our studies of the rat SNB model system established numerous cellular mechanisms of sexual differentiation in mammals, such as hormonal prevention of cell death in one sex but not the other. SNB motoneurons reside in the lumbar spinal cord, and SNB cells are much larger and more numerous in males than in females. (For more information on androgenic effects on SNB cells, see [Breedlove and Arnold. 1980. *Science* 210: 564–566.](#)) Other labs have also exploited the advantages of the SNB model system to learn about cellular mechanisms of hormonal action.

We used the FCG mouse model and other mouse models to demonstrate that sex differences in a wide variety of tissues and diseases in mice are caused in part by X or Y genes, which are unequally represented in XX and XY cells. These discoveries overturned the dominant theory that all sex differences are caused by sex hormones from the gonads. The FCG model has been used to demonstrate sex chromosome effects on autoimmune disease, body weight and adiposity, stroke, Alzheimer's and aging, cancer, cardiovascular diseases, pain, brain morphology, and numerous behaviors.

Hunter: What is on the horizon for sex differences research?

Arnold: SABV research is in its infancy or toddlerhood because of the long-standing attitude that most physiological and disease processes are similar in the two sexes. Sex differences have not yet been extensively studied in many disease models. We now realize that even when females and males are phenotypically equivalent, the underlying processes leading to the sexual equality of traits may be different in males and females. Studying the counterbalanced effects of hormones and sex chromosomes, for example, will uncover factors that exacerbate or reduce disease, just as when there are overt sex differences in the disease. Thus, hidden sex differences may be as important as those that are obvious. Future SABV research will involve the gradual uncovering of instances in which the sex of the cell or individual matters, followed by studies to find out the cellular and molecular mechanisms causing the difference, followed by attempts to provide therapies directed at sex-specific targets. Also, new animal models are being developed to study SABV. We are working to make a

new rat FCG model, for example, that will allow study of sex chromosome effects in rat models of disease.

Hunter: How might the study of sex differences influence our understanding of gender influences on health and disease?

Arnold: Sex and gender effects on health and disease are intertwined in humans, so it is often impossible to separate the effects of the two. Researchers can perform studies in which either biological or social variables are manipulated to study their effects, and both can have potent effects. Animal research offers a critically important perspective because human gendered environments do not occur in animals most of the time.

Biologists are trained to recognize and study biological factors. Social scientists are trained to recognize and study social factors. Because of differences in training and interests, these two sets of investigators will not always agree on which of these totally confounded factors is the more important. It is not wise to study one of these classes of factors without also studying the other.

Social scientists sometimes view gender and race differences in a similar way because of the long-standing social subordination of some races and females. We have a long history of misattributing both racial and gender differences to biology. Thus, some people distrust discussion of inherent biological differences between the sexes. However, empirical observations of the biological differences between XX females and XY males are reliable and have important effects on physiology and disease. Study of SABV offers important advantages for understanding and treating disease in both sexes and for enhancing gender equity in the clinic.

Hunter: How has the NIH SABV policy affected the study of sex differences?

Arnold: The study of sex differences has been the main topic of my research for 45 years, and I have been thrilled by the support and attention resulting from the SABV policy and the efforts of ORWH. I see only good things coming from the SABV policy. It will result in numerous discoveries of new mechanisms controlling disease. Many investigators have turned in good faith to the study of sex differences for the first time. Many grant reviewers are more supportive of inclusion of both sexes after the announcement of the policy.

I cannot overstate how much the SABV policy has positively affected my research. I started as a biologist with an interest in the basic principles of biology. The SABV policy—and, prior to that, NIH priorities in general—shifted my research toward the use of animal models to study sex differences in disease mechanisms. Our animal models have a lot to offer SABV research, and the policy has opened doors to new collaborations leveraging these models. I am deeply grateful for the opportunity to make our models and research more relevant.

Researchers and ORWH Address the Need for Sex- and Gender-Based Biomedical Training Curricula

(Original articles by [Regensteiner et al. 2020. J. Womens Health \[Larchmt\]. doi: 10.1089/jwh.2019.8114](#) and [Regensteiner et al. 2019. Lancet Diabetes Endocrinol. 7: 248–250.](#))

Two recent articles by Judith Regensteiner, Ph.D., ORWH Director Janine A. Clayton, M.D., members of the ORWH staff, and others discuss the importance of developing curricula and other educational resources to help train researchers, medical and scientific educators, clinicians, funding and ethics reviewers, and scientific editors on the methods and scientific value of incorporating sex and gender into biomedicine. Both articles explain how major funding institutions have established policies and guidelines for addressing sex and gender in experimental design, analysis, and reporting. These include the NIH Policy on Sex as a Biological Variable ([SABV](#)) and the Sex and Gender-Based Analysis ([SGBA](#)) in Research Action Plan of the Canadian Institutes of Health Research ([CIHR](#)). Though the biomedical research community has developed some momentum toward a more systematic consideration of sex and gender as experimental variables, both articles point out that progress and policy implementation have been inconsistent.

The authors argue that evidence-based standardized curricula and training resources could constitute a big step toward helping journal editors, reviewers, clinicians, and researchers better integrate sex and gender considerations into their work. In *The Lancet—Diabetes & Endocrinology* article, Dr. Regensteiner, Dr. Clayton, and colleagues state, “Ideal sex-based and gender-based research curricula should be developed collaboratively by scientific and education experts; this collaboration should lead to international standards amenable to universal adoption, with an ongoing collaborative process and a sustainability plan for new content development, updates, and peer review. Curricula should be universally accessible, evidence-based, searchable, and available on demand.”

ORWH, its partners, CIHR, and others have begun the process of developing such evidence-based curricula. The ORWH website offers [online training resources](#) to the public at no charge. Modules on immunology, cardiovascular disease, and pulmonary disease are currently available under the course heading *Bench to Bedside: Integrating Sex and Gender to Improve Human Health*. Three more modules in this series—on neurology, endocrinology, and mental health—will be available soon. The *Bench to Bedside* course, developed in partnership with the Food and Drug Administration Office of Women’s Health ([OWH](#)), gives users a thorough and up-to-date understanding of sex and gender influences on health

and disease. Two more resources, *Sex as a Biological Variable: A Primer* and *Introduction to the Scientific Basis of Sex- and Gender-Related Differences*, are in development. CIHR has developed its own [series of online courses](#), with modules covering integrating sex and gender in health research, primary data collection with human participants, and analysis of secondary data from human participants.

A special section of the same issue of the [Journal of Women’s Health](#) provides additional ideas on approaching sex and gender as experimental variables for curriculum developers, researchers, biomedical educators, publishers, clinicians, and other stakeholders.

Neurologists Evaluate Their Consideration of Sex as a Biological Variable

(Original articles by [Mamlouk et al. 2020. Front. Neuroendocrinol. doi.org/10.1016/j.yfrne.2020.100835](#) and [Galea et al. 2020. Front. Neuroendocrinol. doi: 10.1016/j.yfrne.2019.100817.](#))

In a recent article published in *Frontiers in Neuroendocrinology*, Gabriella Mamlouk, John Meitzen, Ph.D., and colleagues characterize neurological research trends of including both male and female subjects (animals, humans, or cells) and considering sex as an experimental variable. The researchers state that historically, neuroscientists, like investigators from many scientific disciplines, have preferentially used male subjects over female subjects (sex bias) and not reported the sex of their test subjects (sex omission). The authors acknowledge that neuroscience has been slower than other fields to integrate the consideration of sex into its experimental designs, analyses, and reporting.

The researchers examined articles published in 2017 in four prominent neuroscience journals, as well as neuroscience-relevant articles published in the journals *Nature* and *Science*. The data showed that 16% of the articles did not specify the sex of the experimental cells, animals, or human participants; 52% of neuroscientific articles reported use of both sexes, but only 15% considered sex as an experimental variable; 26% of the articles reported using males only; and 5% reported using females only. Sex bias and omission varied widely depending on whether humans, cells, mice, rats, or other animals were used. NIH funding had no effect on sex bias or sex omission. Sex omission varied from journal to journal. Comparing their data with those of a study of articles published in neuroscientific literature from 2010 to 2014, the researchers found a decrease in sex omission over time. Overall, the findings characterize the complex picture of the persistence of sex bias and omission in the neuroscientific literature. The investigators conclude by calling for increased consideration of sex in neuroscience to improve experimental

reproducibility, to enhance the understanding of how sex influences the nervous system, and to represent ethically all segments of the population to improve the health of all.

In the same journal, Liisa A.M. Galea, Ph.D., and colleagues comment on the movement toward increased consideration of sex differences as articulated in the NIH Policy on Sex as a Biological Variable ([NOT-OD-15-102](#)) and a similar Canadian policy, Sex and Gender-Based Analysis ([SGBA](#)) in Research Action Plan of the Canadian Institutes of Health Research ([CIHR](#)). Acknowledging the benefits and improved scientific rigor of sex-specific analyses, the investigators question whether these policies could substantively affect our understanding of human health if they were to be implemented solely as written. The authors argue that a shortcoming of the SABV policy is that it does not require reporting of “data disaggregated by sex and analyzed for the effect of sex.” Dr. Galea and colleagues note that funding institutions that require inclusion of both sexes in research have not always increased funding commensurately to accommodate larger sample sizes and other expenses. The commentators raise other concerns about the policies and their implementation, including how these policies might affect research on drug candidates with the potential to be effective for only one sex as well as research on female-specific health issues (e.g., pregnancy, menopause, and use of hormonal contraceptives). The authors conclude by stating that the policies require thorough training for both researchers and reviewers to become “expert in the study of sex differences beyond simple incorporation of both sexes in research.”

Religiosity May Mitigate Psychosocial Effects of Stigma in African American Women Living with HIV

(Original article by [Lipira et al. 2019. J. Acquir. Immune Defic. Syndr. 81: 175–183.](#))

African American women living with HIV contend with racial, gender, and disease-related discrimination and experience high rates of depression. Data from 2015 show that African American women represent only 12% of the U.S. female population, but 61% of new HIV infections occur in this population. African American women living with HIV are less likely than other demographic groups to receive antiretroviral therapy, and they experience high rates of morbidity, mortality, and adverse effects associated with poor medical treatment.

A recent study by [Lauren Lipira, Ph.D., M.S.W.](#), and colleagues evaluates the efficacy of “resilience resources” on mitigating the impact of HIV-related stigma on depression in this population. Using validated assessments, questionnaires,

scales, and surveys, researchers collected data from 226 African American women living with HIV in Chicago, IL, and Birmingham, AL. Participants rated their levels of depression and experience with HIV-related stigma and completed measures of three potential “resilience resources”: social support, ethnic identity, and religiosity (i.e., participation in both formal and informal religious activities, such as attending services or private prayer, as well as indicators of personal spirituality). Using statistical methods, the researchers found that higher levels of HIV stigma were associated with greater depression. Notably, religiosity was the only tested resilience resource that moderated this association. Further investigation indicated that attending religious services, which can offer spiritual guidance and fulfillment as well as opportunities for social and community engagement, particularly mitigated the effects of stigma on depression.

The investigators conclude that interventions involving religiosity might improve psychosocial outcomes for African American women living with HIV and facing associated stigma. The researchers recommend that developers of potential interventions should consider the religious diversity of African Americans and design programs to suit specific communities and organizations.



FEATURED RESEARCH AND PERSPECTIVES

New Elsevier Report Shows Persistent but Narrowing Gender Gap in STEMM Research

(Original report by [Elsevier. 2020. The Researcher Journey Through a Gender Lens. Amsterdam: Elsevier.](#))

Scientific publisher Elsevier recently released its third report on gender as it pertains to research careers as part of an effort to provide an evidence base for promoting gender equity and diversity throughout the professional research community. Elsevier investigators analyzed gender data pertaining to participation in research, career trajectories, and the perceptions of academic professionals from European Union nations and 15 other countries, including the United States, and from 26 research disciplines (mostly STEMM subject areas but also business and the humanities). The resulting report indicates that gender inequities persist in most research disciplines but that these gender gaps have narrowed over the past decade. The report describes several key findings:

- Gender parity has improved in research authorship over the past 10 years.
- In disciplines such as nursing and psychology, the majority of authors are women.
- Men continue to have greater representation among researchers with a long publication history, whereas women have greater representation among researchers with a shorter publication history.
- Men who were first authors had a higher average citation impact than women who were first authors, suggestive of persistent gender bias in citation practices.
- Men receive more grant awards and apply for patents more often than women.

In addition, the report states that gender differences influence collaboration practices. For instance, men work with more co-authors and collaborators than women. Both women and men tend to collaborate with same-gender authors. Women and men outside of the European Union are comparably connected to second-order collaborators and international co-authors.

Attitudes varied on the fairness of the academic system and on the role of gender in research professions. While most agreed that women's careers often suffer as a result of family responsibilities, opinions differed on the causes of gender bias and on the interventions suggested by study respondents.

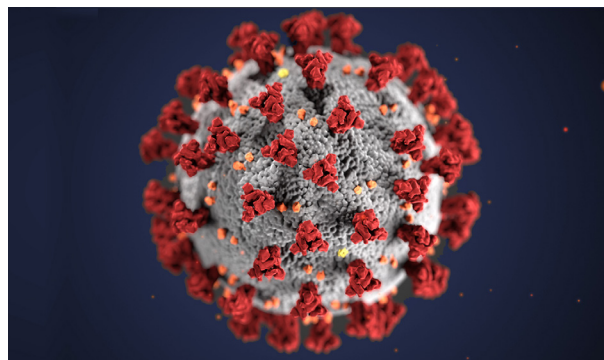
The full report is available as a [free download](#) from the Elsevier website.

Will the Coronavirus Pandemic Affect Workplace Gender Equity?

(Original article by [Agarwal. 2020. Forbes 31 March 2020.](#))

A recent *Forbes* article by behavioral and data scientist and journalist Pragma Agarwal, Ph.D., considers how the coronavirus pandemic could have profound effects—both short- and long-term—on workplace gender equity, including earning potential, career advancement, and employer flexibility. Dr. Agarwal and other researchers posit that during the pandemic, workplace inequities will most likely increase. United Nations Educational, Scientific, and Cultural Organization (UNESCO) global estimates show that 1.5 billion children were out of school in late March. Widespread closures of schools and day care centers will disproportionately affect working mothers, particularly single mothers. Further, more women than men are self-employed or work as freelancers and will therefore have fewer protections against loss of work. Thus, throughout the pandemic, women will most likely experience lost wages and career disruptions to a greater extent than men. However, Dr. Agarwal suggests that in the long run, some changes resulting from the pandemic might benefit women professionally. More women than men serve in front-line medical and caregiving positions, a fact that may reverse traditional domestic gender roles in many households throughout the pandemic and perhaps thereafter as well. Further, more employers may come to accept flexible work schedules, telecommuting, and the presence of children in the home workplace. Dr. Agarwal concludes by stating that though narrowing the gender pay gap may continue to prove elusive, she hopes that some positive changes will occur in the wake of the pandemic.

Editor's Note. Circumstances surrounding the COVID-19 pandemic change quickly, and associated research evolves at a similar pace. COVID-19-related information in this publication was correct as of May 4. (See [Vincent-Lamarre et al. 2020. Nat. Index](#) for additional information on the impact of COVID-19 on the work of women in biomedical careers.)



SCIENTIST SPOTLIGHT



Sabra Klein, Ph.D.

Sabra Klein, Ph.D., is a Professor of Molecular Microbiology and Immunology at the Johns Hopkins Bloomberg School of Public Health. She is an expert on sex and gender differences in immune responses and susceptibility to infection. Dr. Klein has published over 125 peer-reviewed articles, authored several book chapters, and edited two books on the broad topics of sex differences in response to infection and treatments for infectious diseases. She is the Immediate Past President of the Organization for the Study of Sex Differences (OSSD); a Principal Investigator of the Johns Hopkins Specialized Center for Research Excellence (SCORE) on Sex Differences program, where she focuses on sex and age differences in immunity to influenza; Co-Director of the Advisory Board for the Johns Hopkins Building Interdisciplinary Research Careers in Women's Health (BIRCWH) program; Co-Director of the Johns Hopkins Center for Women's Health, Sex, and Gender Differences; and a member of the NIH Advisory Committee on Research on Women's Health (ACRWH). (Dr. Klein responded to ORWH's questions on May 4, and some of her comments may not reflect recent developments associated with our rapidly evolving understanding of COVID-19.)

Who were your scientific mentors?

I have had many mentors, role models, and advocates who helped shape my research and how I approach my professional endeavors. [Randy Nelson, Ph.D.](#), of the West Virginia University School of Medicine was my Ph.D. advisor when he worked at Johns Hopkins. He taught me how to write and communicate ideas. [Gregory Glass, Ph.D.](#), now at the University of Florida, was my postdoctoral advisor at the Bloomberg School of Public Health. Greg gave me the freedom to explore my ideas, fall down, and get back up. Greg was always in the background supporting and even promoting me (often without my knowledge). Sometimes, women in science assume that other women will serve as our mentors and sponsors, but men can also do so very well.

Which of your achievements will have the greatest impact on others' lives?

I think I'm now doing some of my most influential work with the COVID-19 pandemic and the observation of a strong male bias in disease severity. I am now making a significant impact on studying and trying to understand this health disparity, which I intend to translate into animal models and studies of the vaccine, once it is available. It took a pandemic to bring sex differences into the forefront of public health discourse.

What has 2020 taught you in terms of personal and professional development?

Louis Pasteur said, "Chance favors the prepared mind." This year, my work quickly focused on the pandemic of a lifetime, and I was prepared. When I saw the data from two studies from Wuhan, China, published in a major clinical journal, I noted the sex differences in hospitalization and death. I wrote a letter to that journal and an op-ed for a major newspaper. Both got rejected, and I was told that publishing my observations would be "premature." I ignored that and kept working. I started tweeting and joined other women in a gender and COVID-19 working group. We met, shared ideas and data, and wrote. I was interviewed on television. Then major newspapers, magazines, and podcasts wanted my opinion about why men were dying from COVID-19. Next, the major journals came back to ask if I would write commentaries about sex differences in COVID-19. I was prepared. Because I had studied sex differences in immunity and viral pathogenesis, I was able to read and write in real time—all while giving interviews and being home with my teenage daughters. Be prepared. You never know when opportunity will strike.

Tell us about a hard lesson you had to learn and how you grew from it.

I've learned patience—not a little patience, I mean long-term patience that requires perseverance. After graduate school, family commitments limited my opportunities to relocate for postdoctoral fellowships. Eventually, thanks in part to Dr. Glass's sponsorship, I was promoted to a non-tenure-track and then a tenure-track position at Johns Hopkins. I got the job and funding I wanted. Then the recession of the late 2000s hit, and many researchers were having trouble getting grants. Few thought the study of sex differences in infectious disease pathogenesis was a priority. I kept my lab funded with smaller grants and then switched my focus to vaccines. I learned that patience and perseverance really pay off. By then, the public health significance of sex differences was not questioned, and I was in demand for speeches, publications, and other invitations—but it took 20 years to get here.

What is the most important trait for women scientists to cultivate in themselves?

Forgiveness. Intelligent, successful women can put a lot of pressure on themselves to be the best, to know everything, and to have it all. You can have it all, but you might have to be flexible about when and how it happens. Sometimes, you will fail. Some people, particularly women, find it difficult to accept repeated failure. It's easy to interpret failure as saying something about you, your ideas, and the quality of your work. Be easy on yourself. Learn to forgive yourself.

INSTITUTIONAL SPOTLIGHT

National Center for Women & Information Technology



JeffriAnne Wilder, Ph.D.

“Diversity and inclusion in computing are essential because they enhance outcomes for everyone. Broadening participation in computing should not be framed as a women’s issue, and women should not be forced to take ownership of the solution. Inclusion requires cultural and organizational change. We are all responsible for mastering the skills to lead change and reveal the potential in everyone.”

The National Center for Women & Information Technology ([NCWIT](#)) is a nonprofit organization established to increase the participation of girls and women in the field of computing. Chartered by the National Science Foundation ([NSF](#)) in 2004, NCWIT gathers the collective wisdom, best practices, resources, and influence of over 1,240 educational, business, and nonprofit organizations focused on women in information technology (IT). Acknowledging the ubiquity of computing in education, business, governance, the social realm, and virtually every aspect of society, NCWIT recognizes women and other underrepresented groups as untapped resources that could help to meet the increasing demand for trained IT personnel. The U.S. Department of Labor estimates that by 2024, over two-thirds of 1.1 million computing job openings could remain unfilled because of an insufficient number of trained IT professionals. Given this need and the evidence-based value of diversity within STEMM teams, NCWIT strives to increase and diversify the pool of qualified computer personnel.

NCWIT has adopted a three-pronged strategy to realize its mission. First, the organization convenes leaders from universities, companies, nonprofit organizations, and Government institutions into mission-area “alliances,” such as the K-12 Alliance, which supports primary and secondary

educational initiatives, and the Workforce Alliance, which assists small businesses and large corporations with strategies for making workplace cultures more inclusive of women in IT. NCWIT also hosts an annual conference for all of its alliance leaders. Second, NCWIT maintains an online library of free research-based resources to help educators, business leaders, and others to reach out to groups underrepresented in computing, raise awareness, and effect change. Third, NCWIT creates programs to reform policies, change misperceptions, and involve underrepresented populations in the IT field.

Sociologist [JeffriAnne Wilder, Ph.D.](#), is a Senior Research Scientist at NCWIT and a member of the organization’s Research Team. In addition to developing research-based materials and resources to increase the participation of women and girls in IT and related fields, she co-leads efforts related to advancing women and girls of color in computing.

She states, “Diversity and inclusion in computing are essential because they enhance outcomes for everyone. Broadening participation in computing should not be framed as a women’s issue, and women should not be forced to take ownership of the solution. Inclusion requires cultural and organizational change. We are *all* responsible for mastering the skills to lead change and reveal the potential in everyone.”

IN CASE YOU MISSED IT

NIH Intramural Scientists Discuss Gender Bias in Immunology

In a recent article ([Pierce et al. 2020. *Nat. Immunol.* 21: 254–258](#)), four NIH immunologists discuss the challenges women face in immunology and STEMM careers in general. Women have made many significant contributions to immunology—notably the characterization of immune cell differentiation and function—and are well represented in immunology and other disciplines at the doctoral and postdoctoral levels. However, women in STEMM remain underrepresented in tenured,

professorial, and leadership positions, and disparities remain in pay, funding, publication, representation at professional symposia, and other forms of professional recognition. The authors draw from their collective experience to recommend mitigating gender bias by “(1) equalizing resource allocation, (2) optimizing mentorship and providing advocacy, and (3) challenging stereotypes and beliefs emerging from a patriarchal culture.” The authors highlight the [NIH Equity Committee](#), the [Women Scientist Advisors Committee](#), the [Distinguished Scholars Program](#), and the [NIH Office of Scientific Workforce Diversity](#) as examples of progress.

Academic Journal Editors Share Their Career Journeys and Challenges as Women Scientists

Six women academic editors of the *Journal of Experimental Medicine* tell their stories and describe the challenges they faced as they worked toward successful careers in the sciences (O'Garra et al. 2020. *J. Exp. Med.* 217: e20200254). These narratives speak of persistence, overcoming gender barriers and other obstacles, and great enthusiasm for learning and scientific discovery. Anne O'Garra, Ph.D., relates her story of growing up in Gibraltar, where limited opportunities for secondary science education for girls found her briefly attending an all-boys school. [Yasmine Belkaid, Ph.D.](#), of the National Institute of Allergy and Infectious Diseases (NIAID), an [NIH Distinguished Scholar](#), relates completing her doctoral and postdoctoral training as a single mother. The scientist–editors conclude their personal stories by calling for greater institutional support of researchers with young children and for strategies for cultural changes to enable more women to advance to leadership positions in STEM.

Immunologist Shares Perspectives on Eastern and Western Stereotypes

In a recent editorial in *Nature Immunology* ([Hu. 2020. *Nat. Immunol.* 21: 234](#)), Xiaoyu Hu, Ph.D., describes how stereotypes have affected her career as a woman immunologist working in both the United States and China. She explains that though overt sexism in professional contexts is rare in both countries, subtle and disturbing gender and racial discrimination persists. Dr. Hu describes incidents in the United States stemming from the stereotype of Asian women as “submissive, gentle, and obedient.” Similarly, in China, she repeatedly faced the assumption that she was a wife and mother and was viewed with suspicion whenever she deviated from stereotypical family roles. Dr. Hu concludes with an inspirational word to young women by acknowledging the difficulties of working as women scientists and assuring them that they will succeed “because of untamed ambitions and maximum devotion.”

NOTEWORTHY

ORWH Hosts 50th Meeting of NIH Advisory Committee on Research on Women's Health

ORWH hosted a virtual meeting of the NIH Advisory Committee on Research on Women's Health (ACRWH) on April 21. ORWH Director Janine A. Clayton, M.D., provided opening comments on initial sex-specific findings on the COVID-19 pandemic as well as NIH's efforts to mitigate the problem of maternal morbidity and mortality. The meeting also featured updates from ORWH's new Careers Section; the introduction of Xenia Tigno, Ph.D., as ORWH's first Associate Director for Careers (see page 16); a panel discussion covering NIH career-oriented programs; a keynote address on the challenges to and possible solutions for women in the sciences by [National Academy of Sciences](#) President Marcia McNutt, Ph.D.; and an update on [NIH efforts to mitigate sexual harassment](#), given by Carrie D. Wolinetz, Ph.D., Acting Chief of Staff to the NIH Director and Associate Director for Science Policy. The meeting concluded with a lively discussion among committee members. More

information on the meeting is available on the [ORWH website](#), and a [videocast](#) is also available.

NIH Holds Workshop on Pregnancy and Maternal Conditions That Increase Risk of Morbidity and Mortality

The Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD); ORWH; the National Heart, Lung, and Blood Institute (NHLBI); and the Office of Disease Prevention (ODP) co-sponsored the Pregnancy and Maternal Conditions That Increase Risk of Morbidity and Mortality Workshop on May 19–20. The workshop was part of NIH's response to a public health crisis that finds women in the United States experiencing rates of severe maternal morbidity and maternal mortality much higher than those of our peer nations. At the workshop, an interdisciplinary team of experts explored why women die from certain conditions (e.g., postpartum hemorrhage, hypertension, cardiovascular disease, and infection), what can be done to identify patients at risk, and what interventions are

required to reduce maternal morbidity and mortality (MMM). Workshop participants identified research gaps targeted at the clinical causes of MMM. Videos of [day 1](#) and [day 2](#) of the meeting are available.

NIH to Host Workshop on Inclusion Across the Lifespan, September 2

NIH will host a workshop, the second in a series exploring the [Inclusion Across the Lifespan Policy](#), on September 2, 2020. The workshop will discuss lessons learned regarding the inclusion of pediatric and older-adult populations in clinical studies and evidence-based practical advice for the scientific community. The workshop will bring together individuals with a variety of backgrounds in clinical study development and execution and will give consideration to special populations across the life course. Currently, because of the COVID-19 pandemic, the workshop has been planned as a virtual meeting. As Federal guidelines continue to evolve, the planning committee will consider adding an option for in-person attendance at a later date. For more details and up-to-date information, please visit [the workshop webpage on the ORWH website](#).



Xenia Tigno, Ph.D., recently joined ORWH as its first Associate Director for Careers. Prior to joining ORWH, Dr. Tigno managed a large research portfolio at the National Institute of Nursing Research ([NINR](#)), which included grants on women's health, such as the Study of Women's Health Across the Nation ([SWAN](#)). Subsequently, Dr. Tigno handled the training portfolio for the Airway Biology and Disease Branch of the National Heart, Lung, and Blood Institute ([NHLBI](#)). Her research career has included investigations in physics, microcirculation, epidemiology, obesity, diabetes, and aging. Dr. Tigno taught physiology, wrote a textbook on integrative physiology, and is currently editing a book on sex differences in lung physiology. She received her doctorate in physiology from the University of Würzburg and master's degrees in physiology and epidemiology from the University of the Philippines.

Damiya E. Whitaker, Psy.D., M.A., joined ORWH's Clinical Research Section in January as a Health Scientist Administrator and Program Officer and brings her expertise in cognitive behavioral therapy and environmental influences on health and disease among underserved populations to the Office. Prior to joining ORWH, Dr. Whitaker served as a Health Scientist Administrator at the Center to Reduce Cancer Health Disparities within the National Cancer Institute ([NCI](#)). As a social scientist, she is passionate about spatial analysis of health problems, investigations of disparities in the built environment, and the advancement of integrated health equity solutions. A forthcoming article in *Cancer Epidemiology, Biomarkers & Prevention* will feature her research on multilingual community health educators disseminating evidence-based, culturally tailored information on cancer prevention, early detection, and treatment in diverse and rural underserved communities.

UPCOMING EVENTS

NIH Inclusion Across the Lifespan Workshop II
September 2, 2020

51st Meeting of the NIH Advisory Committee on Research on Women's Health (ACRWH)
October 20, 2020

Building Interdisciplinary Research Careers in Women's Health (BIRCWH) Annual Meeting
20th Anniversary Program
December 14, 2020

ORWH 30th Anniversary Scientific Symposium
December 15, 2020

For up-to-date information, visit the [ORWH events page](#).

FUNDING OPPORTUNITIES

ORWH and NIH Institutes Support Research on COVID-19

NIH has dedicated numerous resources to support research on the COVID-19 pandemic, and ORWH has cosponsored several funding opportunities for research on the social, economic, behavioral, and health consequences of COVID-19, particularly as they pertain to the health of women, health disparity populations, and other vulnerable groups, including pregnant and postpartum women. Here, we highlight a few funding opportunities available through the Rapid Acceleration of Diagnostics—Underserved Populations initiative ([RADx-UP](#)). A more complete list of ORWH-cosponsored funding opportunities for COVID-19 research is available [here](#).

Emergency Competitive Revisions for Social, Ethical, and Behavioral Implications (SEBI) Research on COVID-19 Testing Among Underserved and/or Vulnerable Populations ([NOT-OD-20-119](#))

Emergency Competitive Revisions for Community-Engaged Research on COVID-19 Testing Among Underserved and/or Vulnerable Populations ([NOT-OD-20-120](#))

Limited Competition for Emergency Competitive Revisions for Community-Engaged Research on COVID-19 Testing Among Underserved and/or Vulnerable Populations ([NOT-OD-20-121](#))

Emergency Awards: RADx-UP Coordination and Data Collection Center (CDCC) (U24 Clinical Trial Optional) ([RFA-OD-20-013](#))

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