

Gilliam Fellowships

for Advanced Study

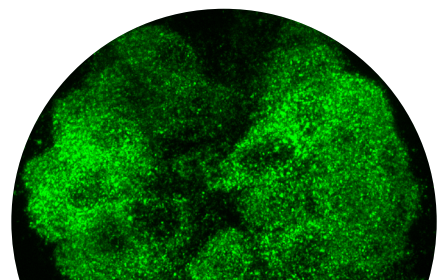
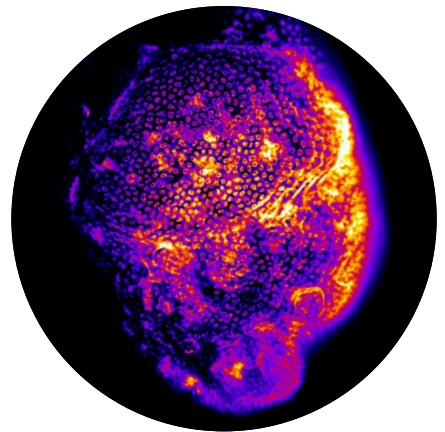
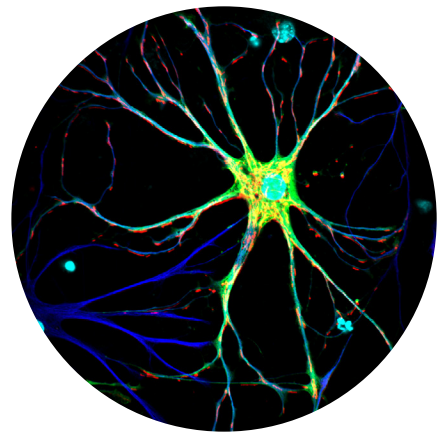
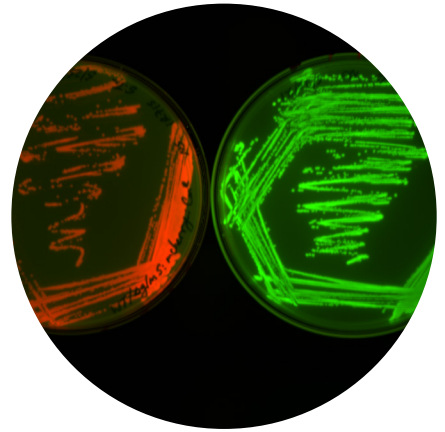
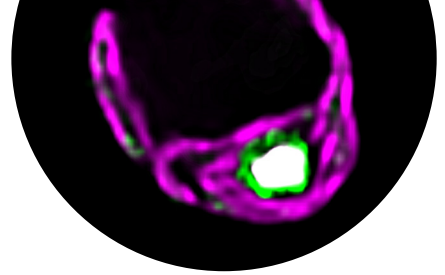
2023 Program Announcement

Nomination Opens **Nomination Deadline**
August 18, 2022 September 29, 2022

Application Opens **Application Deadline**
October 20, 2022 December 8, 2022

Award Notification
June 2023

Fellowship Term Begins
September 1, 2023



Howard Hughes Medical Institute

www.hhmi.org

The Howard Hughes Medical Institute (HHMI) plays a powerful role in advancing scientific research and education in the United States. HHMI's program in biomedical research rests on the conviction that scientists of exceptional potential, commitment, and imagination will make fundamental discoveries for the betterment of human health if they receive the resources, time, and freedom to pursue challenging questions.

The Institute's science education programs support initiatives with the power to transform education in the life sciences for all students, especially those who belong to groups currently underrepresented in science. Each of the initiatives in the HHMI portfolio of science education programs is grounded in our conviction that excellence in science depends on the continued development of a diverse population of scientists and students, and that the responsibility for creating an inclusive learning environment rests primarily on the faculty and administrators of the educational institution.

The James H. Gilliam, Jr. Fellowships for Advanced Study

www.hhmi.org/gilliam

The Gilliam Fellowships for Advanced Study program was created in 2004 in honor of the late James H. Gilliam, Jr., a charter Trustee of HHMI and chair of its Audit and Compensation Committee. Mr. Gilliam was a respected business and civic leader who spent his life nurturing excellence and diversity in science and education. The goals of the Gilliam program are to ensure that persons from populations historically excluded from and underrepresented in science are prepared to assume leadership roles in science, including as college and university faculty, and to foster the development of a healthy and inclusive academic scientific ecosystem.

The program awards grants to pairs of dissertation advisers and their graduate students and encourages the grantee institution and the adviser to hold themselves accountable for facilitating institutional change to create environments that advance diversity and inclusion.

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Eligibility

HHMI's Gilliam Fellowships for Advanced Study is open to eligible pairs of thesis advisers and PhD students ("adviser-student pairs"). **Application for the Gilliam award is by invitation only.**

- » Adviser-student pairs must be nominated by the HHMI-designated institutional representative.
- » Adviser-student pairs must be studying scientific problems in biomedical sciences, life sciences, or biological questions in related disciplines. This includes basic research on a variety of biological systems and at all scales including at the molecular, cellular, organismal, and ecological levels. This initiative does not support social science research.
- » Prospective Fellows must be (i) U.S. citizens, U.S. permanent residents, undocumented childhood arrivals, or undocumented individuals who have been granted temporary permission to stay in the US (DACA)¹, and (ii) from populations excluded from and underrepresented in science because of ethnicity, race, or disability status, or alumni of the HHMI EXROP program, and (iii) be at the appropriate stage of their PhD training. International students are not eligible.
- » For the purpose of this initiative, we define excluded ethnic or racial groups to be persons who identify as Black or African American, Latino/a or Hispanic American, American Indian, Native Hawaiian, Alaska Native, and from groups indigenous to the Pacific Island territories of the United States. Persons with disabilities—defined as those with a physical or mental impairment that substantially limits one or more major life activity—are also significantly underrepresented in U.S. science. The disability

must be officially recognized by the institution's disability office and the student must be receiving services and/or accommodations from the institution for the disability. It is recognized that underrepresentation can vary from setting to setting. As such, individuals from racial or ethnic groups other than the groups listed above who can be convincingly demonstrated by the nominator to be historically marginalized or underrepresented at the graduate level may be considered.

- » Nominations should be of students who (i) are in their second or third year of a PhD program, and/or (ii) have at least two full years of study remaining as of September 1, 2023.
- » Students who are enrolled in or affiliated with a funded MD/PhD or other dual-degree program are not eligible (e.g., MSTP or institutionally funded program).

Fellowship Term

The Gilliam Fellowships for Advanced Study will support students for up to three years of their dissertation research, typically in years 3–5 of their PhD studies. The term of the fellowship is for up to three consecutive years unless a deferment or leave of absence is granted by the fellowship institution and approved by HHMI. Advisers and Fellows are expected to participate fully in HHMI programming even if they defer activation of the award.

1. <https://www.uscis.gov/archive/consideration-deferred-action-childhood-arrivals-daca#guidelines>

Conditions of Appointment

Recipients of HHMI's Gilliam Fellowships for Advanced Study will begin the fellowship on September 1, 2023. Gilliam Fellows are required to be enrolled and in good academic standing in a program leading to a PhD in eligible disciplines. During the fellowship term, Fellows are not permitted to receive funds from another extramurally funded fellowship, scholarship, or similar award.

ADVISER-SPECIFIC CONDITIONS

The dissertation adviser plays a key role in the development of a more inclusive academic scientific environment.

As part of the Gilliam award, the adviser will successfully complete a year-long, culturally responsive mentorship skills development course. The adviser is required to participate in all activities, including monthly online interactive webinars October 2023–March 2024 and two in-person workshops—the first will be in spring 2024, and the second will be in the fall of 2024. The mentor development activities will be arranged and paid for by HHMI. If the adviser is unable to participate in the mentorship development course in 2023–24, they may request a one-year delay and take the course in 2024–25.

If the adviser has previously completed HHMI's mentorship skills development course (for example, through a previous Gilliam award) and requests to opt out of participating again, they are expected to select an approved faculty colleague from their institution to participate in their place.

The Gilliam award includes an annual diversity and inclusion (D&I) allowance which is intended to enable the adviser to address challenges to diversity and inclusion at the graduate level. Through the development of their diversity and inclusion project, the adviser can leverage their influence and implement activities that will foster a healthy scientific academic ecosystem.

FELLOW-SPECIFIC CONDITIONS

Current Fellows are required to participate in the Gilliam Annual Meeting, Gilliam Leadership Training course, and one HHMI Science Meeting per year in the second and third years of the fellowship award where there will be Gilliam-specific discussion sessions. Travel and meeting accommodations for these activities will be arranged and paid for by HHMI.

RESEARCH AND BEHAVIORAL CONDUCT CONDITIONS

Activities associated with this grant must be conducted in a responsible manner. The Fellow and the thesis adviser(s), and all other persons supported by the grant will be expected to conduct activities according to the highest scientific and ethical standards and in compliance with all applicable government laws and regulations and Grantee Institution policies, and the Institute's policies, including those regarding creating an inclusive and respectful workplace, protection of human research subjects, humane care and use of laboratory animals, and laboratory safety. This extends to activities away from campus, including, for example, participation at meetings and workshops.

At each stage of this competition—including the nomination, the application, and the acceptance of the award and Terms and Conditions—the institution and the principals of the application/award will be required to certify, to the best of their knowledge, that there is no formal complaint against or finding of misconduct by any of the principals including the student, adviser, and co-adviser.

The Award

For the 2023 cohort, the total amount awarded will be \$53,000 per year for up to three years. The grant will be paid to the institution, which in turn, will disburse funds to the adviser and Fellow.

1. The Fellow's annual stipend provided by the award is \$36,000.
2. In addition to the stipend, a \$4,000 Fellow's discretionary allowance is provided to primarily support the Fellow's professional development, such as attending scientific meetings, workshops, or courses. The discretionary allowance can also be used to pay for health insurance, non-elective medical, dental, and vision care costs, and for expenses associated with mental health services. Up to \$1,000 annually may be used to overcome food or housing insecurity. A portion of the discretionary allowance may be used to purchase electronic computing equipment, primarily for professional purposes.
3. HHMI also provides an annual institutional allowance of \$10,000 in lieu of tuition and other fees (including university-sponsored health insurance premiums/coverage). If the cost of tuition and fees exceeds \$10,000, the institution must agree to cover or waive any amount greater than \$10,000.
4. The remaining funds of the HHMI award (\$3,000 per year) are designated as the adviser's diversity and inclusion activities allowance. The allowance is to be used by the adviser to support activities aimed at addressing challenges to diversity and inclusion at the graduate level. While seeking student input is encouraged, the adviser and not the Fellow is responsible for managing the activities and administering these funds; the Fellow should not be expected to plan or carry out the activities. The diversity and

inclusion activities allowance may not be used to support additional personnel in the adviser's research group, student stipends, community outreach, or student recruitment.

Evaluation and Selection

Each Gilliam application will be evaluated for the (1) student's promise as a scientific investigator and leader in the scientific community; (2) commitment and/or demonstrated ability of the thesis adviser and institution to develop scientists, especially persons from populations historically excluded from and underrepresented in science; and (3) demonstrated commitment by the thesis adviser and institution to facilitate institutional change to create a healthy and inclusive academic scientific ecosystem for all members (e.g., graduate students, postdocs, early career faculty). Application materials will be assessed by a panel of scientists and scientist educators selected by HHMI.

Application Process

NOMINATION

All applicants must be nominated, including EXROP alumni (see Nomination of EXROP Alumni below). HHMI designates the nominator and the number of nominations allotted to each institution.

The nomination initiates the application process. Notifications will be sent to the nominator by late summer. The notification will include the number of slots and a link to an online form to submit the contact information for the adviser-student pairs that will be nominated and to provide information confirming the student's eligibility for this fellowship opportunity. The nominator will be asked to submit additional information after the nomination phase

(see Application sections on the next page).

In the nomination and eligibility form the nominator will:

- » Confirm the student is currently enrolled, in good academic standing, and has at least two years remaining in their PhD program as of September 1, 2023.
- » Indicate the student's year in their current degree program.
- » Provide the student's research project discipline, research project title, and research project abstract.
- » Indicate the applicable eligibility category(ies) (e.g., racial/ethnic underrepresented, disabled, other underrepresented) and comment on why the category(ies) was selected.

PLEASE NOTE: As part of the nomination process, the nominator must certify to the best of their knowledge that there is no formal complaint against or finding of misconduct by any of the principals including the student, adviser, and co-adviser.

NOMINATION OF EXROP ALUMNI

Information for the Nominator

EXROP alumni must be nominated by the same HHMI-designated institutional representative at their institution. EXROP alumni do not count against the total number of nominations allocated to the invited institution.

Information for EXROP Alumni

EXROP alumni are queried via an "intent to apply" survey released in late summer. Alumni that have expressed an interest in applying will receive instructions from HHMI staff.

PLEASE NOTE: EXROP alumni are contacted using the last email address on record with HHMI. Alumni can update their contact information by emailing gilliam@hhmi.org.

Application

If eligibility is met, HHMI will send the adviser information to access the application form through the HHMI Pathway grants management system. The adviser is responsible for adding to the application the names and contact information of the student and the nominator. Once the student gains access to the system, they will be responsible for adding the name and contact information of a previous research adviser who will provide an additional letter of support.

Detailed information is available on the Pathway application form. Applicants are encouraged to log on to the system as soon as they have access to review the prompts. Materials submitted by the nominator, adviser, student, and previous research adviser will be critical elements in the evaluation of the application.

FROM THE NOMINATOR

To better understand the institution's efforts to foster a more inclusive academic scientific ecosystem for all members, including scientists and trainees from populations historically excluded from and underrepresented in science, the nominator will provide:

- » Program- or institution-level doctoral enrollment and degree attainment data and a narrative on how the data relate to the institution's commitment to advance diversity and inclusion in science and create a healthy academic scientific ecosystem for all constituencies, including graduate students, postdocs, and early career faculty.

- » A letter that provides evidence that the thesis adviser has the interest, demonstrated ability, and commitment to (1) successfully develop the talents of graduate students, including those from populations historically excluded from and underrepresented in science; and (2) facilitate change to foster a more inclusive academic scientific environment.
- » An explanation of how and why the adviser-student pair was selected for nomination.
- » Evidence that the graduate program values career and professional development in the sciences.
- » If the institution has previously been awarded a Gilliam award(s), a discussion of how past Gilliam awards have impacted the quality of the graduate program and helped foster a more inclusive environment. If the institution has not yet been awarded a Gilliam award, a discussion of how the Gilliam award will help to improve the quality of the graduate program and create an inclusive environment.

PLEASE NOTE: As part of the application process, the nominator must certify to the best of their knowledge that there is no formal complaint against or finding of misconduct by any of the principals including the student, adviser, and co-adviser.

FROM THE THESIS ADVISER

To learn about how the adviser will support the student applicant and other doctoral students in their academic and career trajectory, and to ascertain the adviser's demonstrated commitment to help create an inclusive academic scientific environment, the thesis adviser will be asked to provide:

- » A biosketch that includes applicant information, contributions to science, adviser-authored publications relevant to the student's research project, and a list of prior trainees and their career outcomes.
- » A list of current and pending research support, including the support that will fund the student's project for the duration of their degree program.
- » A letter of support for the student that details evidence of their:
 - Promise as a scientific investigator; and
 - Potential for leadership in science, including but not limited to academic science.
- » A mentoring plan that:
 - Is tailored to the student applicant including a discussion of strengths and areas to be further developed;
 - Reflects on the importance of diversity and inclusion in science and the adviser's role in helping to foster a healthy academic scientific ecosystem for all constituencies (e.g., students, postdocs, early career faculty);
 - Includes a description of the mental health/well-being resources on campus;
 - Includes a conflict resolution strategy; and
 - Includes a narrative on what the adviser hopes to get out of the HHMI mentorship course and how they will assess the effectiveness of the course.

- » Departmental doctoral enrollment and degree attainment data and a narrative on how the data could inform the department's efforts to advance diversity and inclusion in graduate science education.
- » A description of challenges to diversity and inclusion at the graduate level, how the adviser proposes to address the challenges using funds from the adviser's diversity and inclusion allowance, and how the effects of the activities will be evaluated.
- » A description of how the adviser has engaged in diversity and inclusion efforts during their career and ways they anticipate leveraging the mentorship course and diversity and inclusion allowance to improve diversity and inclusion within their department and institution.
- » A dissertation research plan that can be understood by a scientist that is a non-expert in the field with relevant literature cited;
- » A career statement that describes the applicant's professional and personal goals and how the Gilliam Fellowship will help the student explore or achieve those goals;
- » A leadership statement that describes the applicant's leadership approach, previous and current leadership experiences, and the significance/impact of this approach and these experiences on the science they do and their future scientific leadership plans;
- » A description of the mental health/well-being resources available to the student on campus; and

» A conflict resolution strategy.

The prospective Fellow will also identify a previous research adviser and ensure a letter of support is submitted directly by the previous research adviser. The letter should provide evidence of the student applicant's:

- » Promise as a scientific investigator; and
- » Potential for leadership in science, including but not limited to academic science.

PLEASE NOTE: As part of the application process, the adviser must certify to the best of their knowledge that there is no formal complaint against or finding of misconduct by any of the principals including the student, adviser, and co-adviser.

FROM THE PROSPECTIVE FELLOW

To get a sense of the student's potential for leadership in science, the prospective Fellow will be asked to provide:

- » Applicant information, including educational history (transcripts are not requested);
- » A list of publications authored or co-authored by the applicant including a brief annotation that describes findings and the student's contributions to the published research;

PLEASE NOTE: As part of the application process, the prospective Fellow must certify to the best of their knowledge that there is no formal complaint against or finding of misconduct by any of the principals including the student, adviser, and co-adviser.

Deadlines

NOMINATION

September 29, 2022

2 p.m. (Eastern Standard Time)

APPLICATION MATERIALS

(from the nominator, adviser, and student)

December 8, 2022

2 p.m. (Eastern Standard Time)

EXTERNAL LETTER OF SUPPORT

(from the student's previous research adviser)

December 8, 2022

2 p.m. (Eastern Standard Time)

All nomination, eligibility, application materials, and the previous research adviser's letter of support must be submitted via HHMI's online application system (HHMI Pathway) by the above deadlines.

For more information

www.hhmi.org/gilliam

All inquiries and other correspondence regarding HHMI's Gilliam Fellowships for Advanced Study should be directed to:

Gilliam Fellowships for Advanced Study
Department of Science Education
Howard Hughes Medical Institute
4000 Jones Bridge Road
Chevy Chase, MD 20815-6789

Email: gilliam@hhmi.org

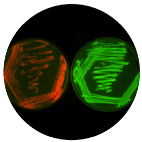
This announcement sets forth basic program information. All awardees are subject to the provisions outlined in the Terms and Conditions.

Cover Image Captions



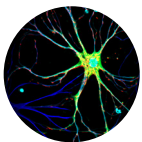
The world faces increased food insecurity due to a growing population. We are investigating a special structure called the pyrenoid, which enhances the uptake of CO₂ in algae and which we think could be engineered into crops to increase yields. Here we depict a transgenic *Chlamydomonas reinhardtii* algal cell showing the pyrenoid (white) inside the photosynthetic organelle, the chloroplast (magenta). Despite our recent breakthroughs in understanding how the pyrenoid matrix assembles, many questions remain such as how and why the cell selectively synthesizes starch (green) around the pyrenoid. Investigating how the pyrenoid operates will further our understanding of the components necessary to introduce a pyrenoid into crops and improve yields.

(Courtesy of Micab Burton, HHMI Gilliam Fellow, Princeton University. Mentor: Martin Jonikas, PhD)

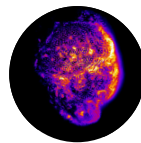


Salmonella enterica serovar Typhimurium (S. Tm) is one of the leading causes of food-borne gastroenteritis worldwide due to contaminated food and water sources. To succeed, this Gram-negative enteric bacterial pathogen must overcome colonization resistance by the resident collection of commensal bacteria known as the gut microbiota. It is known that S. Tm induces an inflammatory response by virtue of its two type-3 secretion systems, leading to disruption of host homeostatic processes and the commensal bacterial community (dysbiosis). However, it remains to be fully elucidated what nutrient sources enable the expansion of S. Tm and the source(s) of said nutrients during inflammation and dysbiosis. Utilizing a combination of gnotobiotic and conventional mouse models alongside bacterial genetics we aim to understand how S. Tm succeeds in the competitive gut environment. Additionally, we aim to understand the protective mechanisms employed by the gut microbiota against enteric pathogens. Depicted here are engineered fluorescent strains of S. Tm (mCherry) and commensal *E. coli* (GFP), a fellow Enterobacteriaceae family member that S. Tm often competes with for the limited sources of carbon and nitrogen in the GI tract to study the relationship of nutrient gradients and gene expression *in vitro* and *in vivo*.

(Courtesy of Nicolas G. Shealy, HHMI Gilliam Fellow, Vanderbilt University. Mentor: Mariana X. Byndloss, DVM, PhD, Vanderbilt University Medical Center)



The brain consumes more than half of the human body's energy during early childhood, underscoring a critical dependency on mitochondria to build and maintain a healthy brain. Mitochondrial dynamics (transport, fission, and fusion), govern the function and localization of mitochondria within cells. Astrocytes are the most abundant glial cell in the brain and have many ramified branches that simultaneously ensheath hundreds of thousands of synapses to control synapse formation and function. In fact, a single astrocyte can contact up to 2 million synapses in the human brain. Our lab has shown that astrocyte morphogenesis and synaptogenesis are interdependent, as astrocytes regulate synapse formation through secreted and contact-mediated signals. Importantly, astrocyte perisynaptic branches are laden with mitochondria at higher densities than the surrounding neuropil, intercalating astrocytic mitochondria near developing synapses.

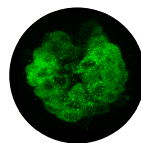


Dysfunctional mitochondrial dynamics are emerging as hallmark neurodevelopmental disorders, but how astrocyte mitochondria regulate proper synapse and brain development is not well understood. Our goal is to identify the molecular mechanisms of mitochondrial regulation in astrocyte development and synaptogenic function, potentially elucidating a novel link between astrocyte mitochondria and proper synapse development. Here, we show an arborized rat astrocyte (green) co-cultured on neurons. Nuclei are labeled with DAPI (cyan). Astrocyte mitochondria (red) are present throughout fine astrocyte processes.

(Courtesy of Maria Pia Rodriguez Salazar, HHMI Gilliam Fellow, Duke University. Mentor: Cagla Eroglu, PhD)

The giant amoeba *Chaos carolinensis* is an excellent model system for studying uropod involvement in cytoplasmic mixing thanks to its large size, which makes it highly amenable to micro-surgery and microinjection. The cytoplasm is a dynamic fluid where intracellular components and cellular building blocks are continuously mixing. While diffusion is sufficient for cytoplasmic mixing in relatively small cells, large cells rely on active mechanisms to facilitate cytoplasmic mixing. In neutrophil and amoeboid cell types, cytoplasmic flow is coupled to cellular membrane deformations formed in motility. In these cells, motility is managed by a polarized, actin based, contractile structure called the uropod. Although the uropod's involvement in migration has been extensively explored, nothing is known about the uropod's involvement in cytoplasmic mixing. By surgically removing the uropod then microinjecting fluorescent beads into amoeba we are observing cytoplasmic mixing using time lapse microscopy. Combined with automated image analysis and computational methods, we are describing microinjected bead trajectories with mean squared displacements, Lyapunov exponents, and baker transformations to show how the uropod influences cytoplasmic mixing.

(Courtesy of Ulises Diaz, HHMI Gilliam Fellow, University of California, San Francisco. Mentor: Wallace Marshall, PhD)



Cells can communicate through fluid flows to sense and respond to changes in their environment. Fluid flows are critical for embryonic left-right (L-R) patterning, organ development, tissue homeostasis and contribute to host-microbe interactions and cancer metastasis. Yet how flow signals are sensed and transduced is not understood. We study how embryos break L-R symmetry using flow signals in zebrafish to understand the basis of cell communication via flow. During L-R patterning, beating cilia within an organizer, called Kupffer's vesicle in zebrafish, generate an asymmetric flow that ultimately drives asymmetries in gene expression. Depicted is a whole-mount image of Kupffer's vesicle stained for *dand5* mRNA using Hybridization Chain Reaction-Fluorescent In Situ Hybridization (HCR-FISH). *dand5* is a key target of the flow signal and becomes repressed on the left side resulting in a right > left expression bias. We hypothesize that Pkd111, a cilia-localized membrane protein, is the key "receptor" which transduces flow signals to repress left-sided *dand5* and ultimately control embryonic asymmetry.

(Courtesy of Gabriel Luna-Arvizu, HHMI Gilliam Fellow, University of Oregon. Mentor: Dan Grimes, PhD)