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The NICHD Connection

November 2019

INSIDE THIS ISSUE

Creating Scientific Figures with Color in Mind	1
Letter from the Editor	2
How to Make Scientific Figures Colorblind Accessible	5
Meet Our New NICHD Postbac Rep	8
The Rep Report	9
Upcoming NIH-Wide OITE Events	10
November 2019 NIH Library Training and Events	11
November Announcements	12
November Events	15

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The Arts: Creating Scientific Figures with Color in Mind

By Katie Wendover

The pixelated pattern of a heat map is like a colorful work of art. But how would you make sense of a figure like this without its vibrant colors? Science publishing today exists in an array of hues used to convey a dataset's information. If the author of the paper is not careful to design figures with color in mind, the representation of data might be lost on those who are colorblind.

Approximately one in 12 males and one in 200 females have color blindness, making it likely that you know or work with someone who fails to see the full spectrum of color[1]. This means that a significant portion of people who read your paper may lack the ability to distinguish certain color contrasts. Accommodations for colorblindness fall under Section 508 of the United States Workforce Rehabilitation Act of 1973[2]. This amendment states that everything produced and used by the United States government on a digital platform must be accessible to people with disabilities[2]. But many NIH fellows might not know about this requirement, as private journals are not required to comply with Section 508 and many do not have guidelines for color blindness accommodations.

Fortunately, for fellows in the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD), the NICHD Biovisualization "Bioviz" group offers free graphic design help to create figures that look amazing and comply with Section 508. In particular, Bioviz member Nichole "Nicki" Swan has led efforts to design event posters, make figures, and create the NICHD Annual Report, all with Section 508 compliance in mind. Swan's skillset is honed for these tasks. She started at the NIH in 2007 as a tech IRTA, where she helped with research figures, website design, and *The NICHD Connection* after graduating from the University of Maryland, Baltimore County with a major in animation.

According to Swan, there are easy ways to make an image more color accessible. For example, avoiding certain color contrasts will allow a figure to be understood by a larger audience of colorblind individuals. The most

(continued on page 3)

Letter from the Editor

Deep into the Maryland autumn, trees become a canvas for rich shades of reds, oranges, and yellows surrounded by the last remnants of summer green. The warm hues scattered throughout fall foliage are easy to take for granted, as colorblindness yields this colorful display ineffective. But it's not just fall leaves that are difficult to see for those who are colorblind. The standard colors in scientific figures might yield data unreadable too.

In honor of our annual arts-themed issue, we focus on "**Creating Scientific Figures with Color in Mind**," a feature article by our new Postbac Rep, Katie Wendover. Katie interviews our very own graphic designer Nicki Swan to learn about color choices in data publishing and how those choices might affect the reader.

Joining Katie as a new NICHD Postbac Rep is Ariel Lucas Eraso, introduced on **page 8**. We are looking forward to having both Katie and Ariel represent our active postbac community. In addition to our new postbac reps, we are excited to welcome our new NICHD Basic Sciences Institutes and Centers Representative, **Dr. Anshika Jain**. Check back next month to learn more about Dr. Jain as she transitions into her new role.

While you're enjoying all of the autumn colors, don't forget to browse this month's many events hosted by the NICHD Office of Education, **OITE**, and **NIH Library** in the **November announcements** and **events**. With this extensive combination of resources available, you are sure to complete your NIH training with flying colors!

Your Editor in Chief,
Shana R. Spindler, PhD

Please send questions and comments to our editor at **shana.spindler@nih.gov**.

Creating Scientific Figures with Color in Mind

(continued from page 1)

common form of colorblindness is known as Deuteranopia, which makes it difficult for individuals to distinguish red and green—yet this is one of the most frequently used color combinations in science figures[1]. Swapping out the green/red combination for other effective two-tone color pairs, such as green/magenta or red/cyan can make an image vastly more accessible[1].

However, authors cannot rely solely on contrast to make a figure accessible to people with colorblindness. Swan suggests using different patterns within the image when possible. "If [a figure] works with zero color, it should work for all kinds of colorblindness," she said. If the message of a figure cannot be conveyed without color, Swan states that the message must be clearly detailed in the figure legend. To help determine if your figure requires color to relay the information, there are a number of websites that simulate how people with various types of colorblindness will see your image.

(continued on page 4)

SIMULATING COLORBLINDNESS

There are several ways to make sure your figures are accessible for people with color blindness.

COBLIS (COLOR BLINDNESS SIMULATOR):
https://www.color-blindness.com/coblis-color-blindness-simulator

PHOTOSHOP
https://www.adobe.com/accessibility/products/photoshop.html#colorblind

1. With your image open, click on *View → Proof Setup → Color Blindness – Protanopia-type* or *Deuteranopia-type.*
2. You can turn this soft proof on and off by pressing *Ctrl+Y* (PC) or *Cmd+Y* (Mac).
3. Be sure to check your image in both views.

IMAGEJ:

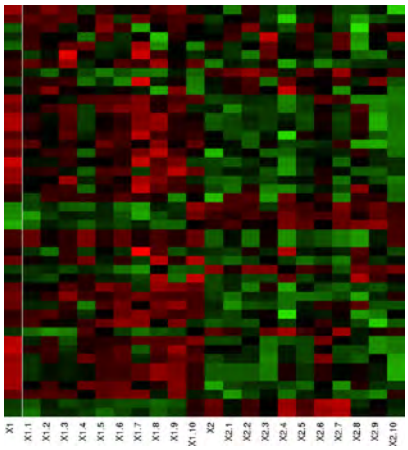
1. Go to *Image → Color → Simulate Colorblindness.*
2. Choose the type of colorblindness from the dropdown menu.

Creating Scientific Figures with Color in Mind

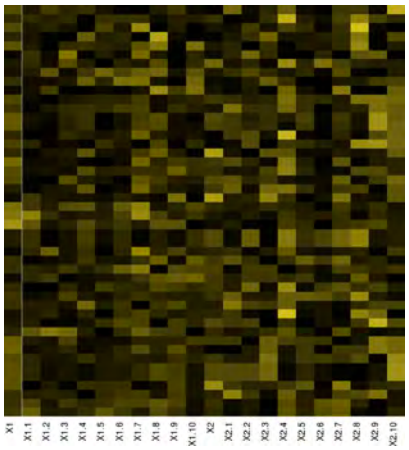
(continued from page 3)

In a field where interpretation is vital, ensuring that the figures of a paper accommodate those who are colorblind benefits the dissemination of information. For the number of hours put into compiling and creating a figure, the benefit is high to ensure that an image can be well understood by all those who look at it.

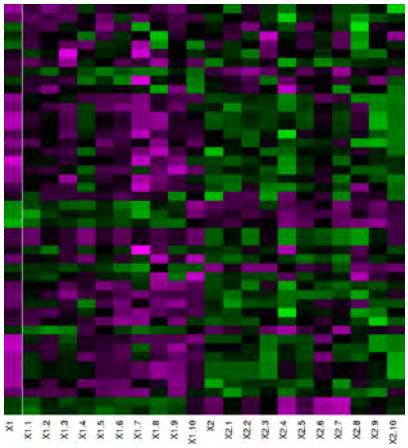
For more information about the BioViz group, contact Nichole Swan at **jonasnic@mail.nih.gov**.



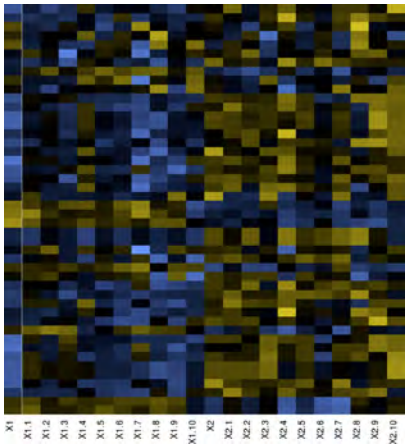
Heatmap with red-green palette



Heatmap with red-green palette, simulated deuteranopia



Heatmap with magenta-green palette



Heatmap with magenta-green palette, simulated deuteranopia

REFERENCES

1. Summerbell, E. (2019, September 6). How to make scientific figures accessible to readers with color-blindness. Retrieved from **https://www.ascb.org/science-news/how-to-make-scientific-figures-accessible-to-readers-with-color-blindness/**.
2. Fields, H. (2017, September 11). 508 Compliance: Making Your Website More Accessible. Retrieved from **https://www.webdevelopmentgroup.com/2017/09/508-compliance-making-websites-accessible-for-people-with-disabilities/**.

FURTHER READING

For more information, check out the following resources:

- **https://www.nature.com/articles/nmeth.1618**
- **https://jfly.uni-koeln.de/color/index.html**
- **https://twitter.com/Red_Green_Cow/status/1106367872882753536**
- **https://usabilla.com/blog/how-to-design-for-color-blindness**

How to Make Scientific Figures Colorblind Accessible

By Nichole Swan

Are your scientific figures difficult to interpret if you view them with the colorblind simulators presented in "Creating Scientific Figures with Color in Mind" on **page 3**? Try out the following tools in Photoshop or ImageJ to modify the colors and patterns. If you have any questions, please contact me at **jonasnic@mail.nih.gov**.

PHOTOSHOP

Converting Red to Magenta (for two-color red-green images)

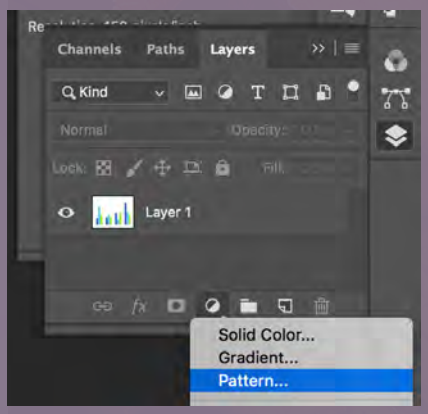
1. Open the *Channels* panel (*Window* → *Channels*).
2. Select the *Red* channel and *Select All* (*Ctrl/Cmd+A*).
3. Select the *Blue* channel and paste the contents into it (*Ctrl/Cmd+V*).
4. Reselect the RGB channel.

Adding Patterns to Graphs

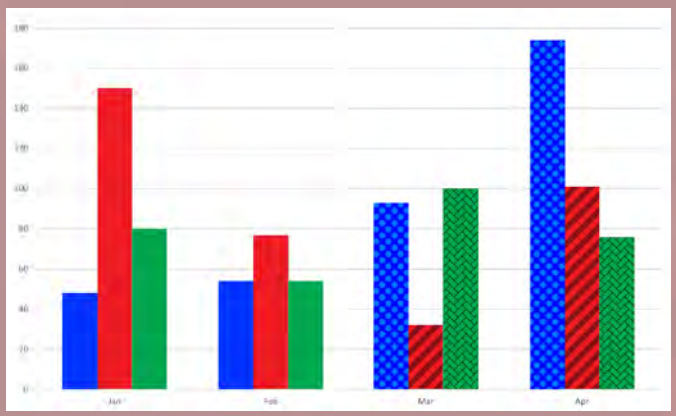
Graphs (such as bar graphs and pie charts) can be difficult for colorblind users to interpret. Patterns and textures can help users differentiate between sections of data. To add patterns or textures:

1. Select elements of the same color. You can use the *Magic Wand* tool (for more on the Magic Wand tool, click here: **https://helpx.adobe.com/photoshop/using/making-quick-selections.html#select_with_the_magic_wand_tool**). To select multiple objects, press *Shift* with each click.
2. With the same-colored objects selected, click on the adjustment layer button at the bottom of the Layers panel (image at right) or click *Layer* → *New Fill Layer* → *Pattern*.
3. Choose a pattern or texture from the menu. You can then use *Blending Modes* (where the "Normal" dropdown is in the image to the right) to blend the pattern with the color.
4. Repeat for the other colors in your graph. Don't forget to modify your chart legend, if you have one.

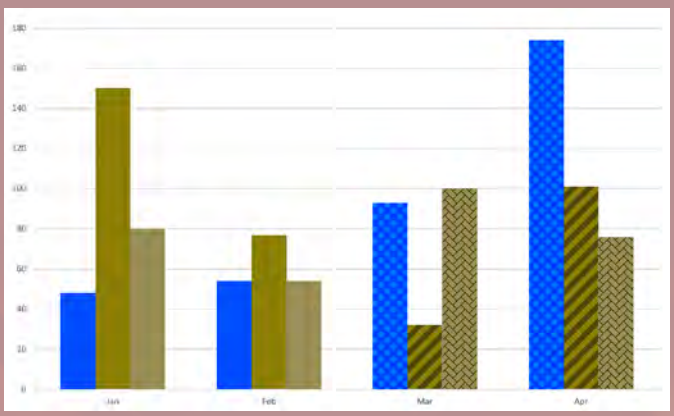
(continued on page 6)



Pattern Fill Layer



Bar graph without patterns (left); bar graph with patterns (right)



Simulated deuteranopia: Bar graph without patterns (left); bar graph with patterns (right)

How to Make Scientific Figures Colorblind Accessible

(continued from page 5)

ImageJ

Converting Red to Magenta (or Green to Cyan)

This method uses *Lookup Tables* to replace the red or green color channels. However, not every image opened with ImageJ (or Fiji) has the channels separated. To do this:

1. Go to *Image → Color → Channels Tool.*
2. Select *Color* from the dropdown menu in the dialog box.
3. Click *OK* when it asks to convert to multi-channel composite image.
4. You should now notice a bar above your image indicating which channel you're on, and a horizontal scroll bar below the image. The scroll bar moves you between red, green, and blue channels.
5. With the *red* channel selected, go to *Image → Lookup Table → Magenta.*
   - If you are converting green to *cyan* instead, make sure the *green* channel is selected and apply the *Cyan Lookup Table*.
   - Don't do both magenta and cyan; stick to either green/magenta or red/cyan.

(continued on page 7)

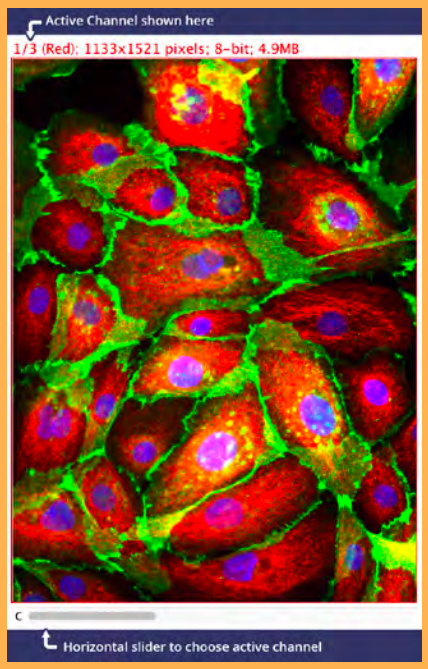


IMAGE USED

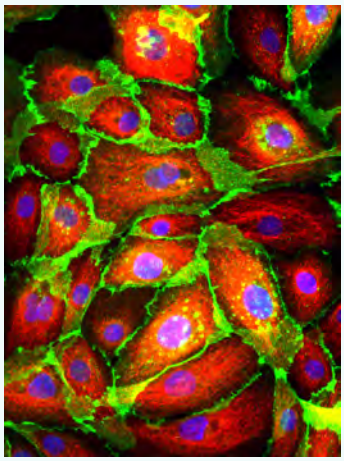
Natalie Prigozhina (2015) CIL:48102, Homo sapiens, mammary epithelial cell. CIL. Dataset. **https://doi.org/doi:10.7295/W9CIL48102**

How to Make Scientific Figures Colorblind Accessible

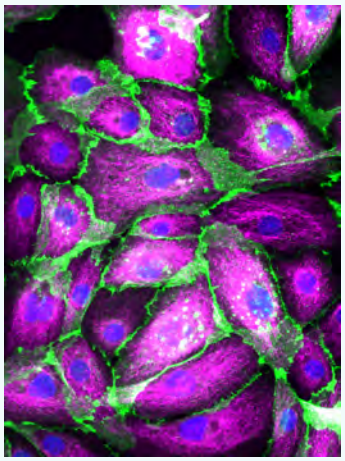
(continued from page 6)

ONE LAST NOTE

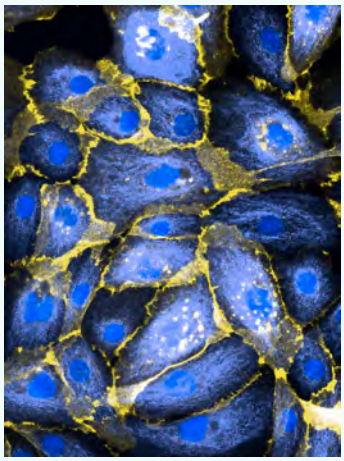
Even after all your hard work ensuring that your figures are accessible to colorblind readers, you still might run into a snag. For example, this fluorescence microscopy image has three colors, and a simple one-color replacement won't solve it perfectly.



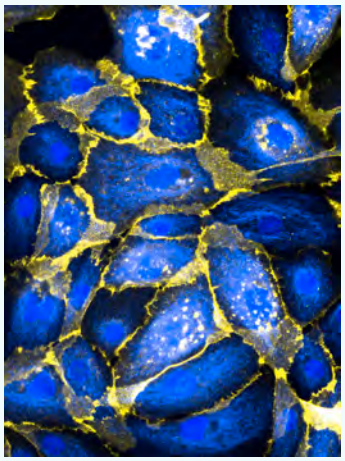
Original



Green/magenta

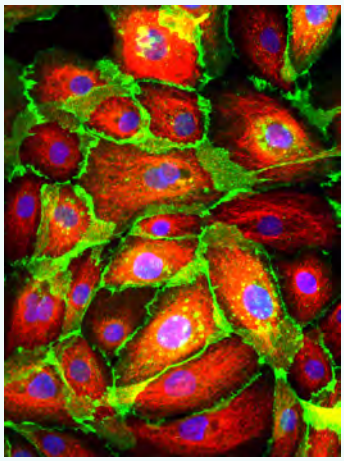


Deuteranopia-simulated

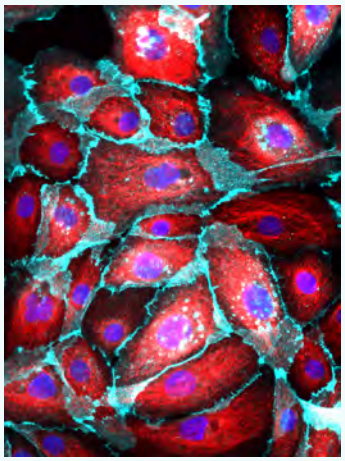


Protanopia-simulated

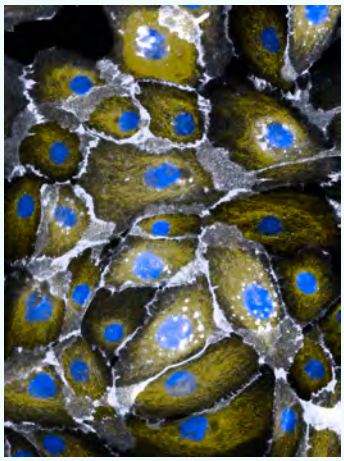
As you can see above, differentiation would be difficult for those with deuteranopia, and even worse for those with protanopia. In this case, it's worth investigating whether red/cyan would yield better results...



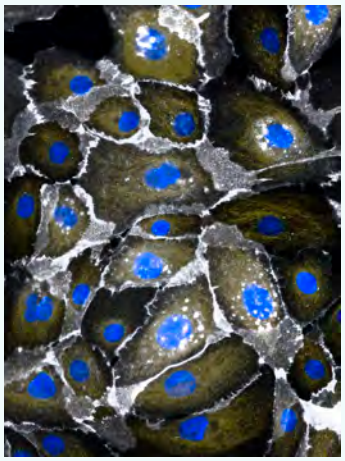
Original



Red/cyan



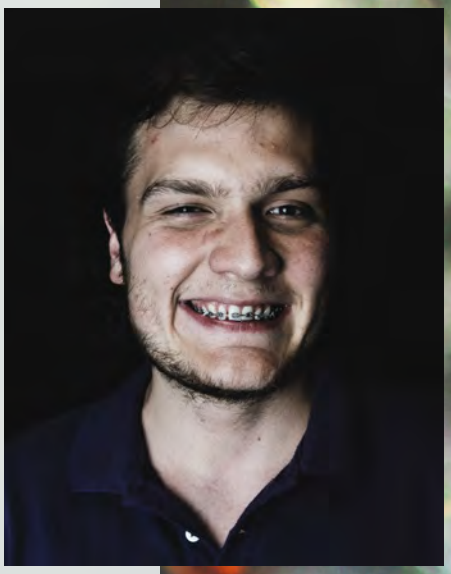
Deuteranopia-simulated



Protanopia-simulated

You can see here that for this particular three-color image, the red/cyan combination is easier to understand for colorblind readers.

Meet Our New NICHD Postbac Rep



The NICHD Connection would like to introduce NICHD's new Post-baccalaureate (Postbac) Institutes and Centers (IC) Representative, Ariel Lucas Eraso. Postbac IC reps serve on the NIH-wide Pre-IRTA Committee on behalf of the institute's postbac fellow population. They also work closely with the NICHD Office of Education to plan events of interest to the postbacs, whether academic or social. NICHD currently has approximately 100 postbacs who are conducting both clinical and basic science research.

My name is Ariel Lucas Eraso! I was born in Argentina and moved to the United States when I was five. I graduated from Franklin & Marshall College (F&M) in 2018 with a major in biology and a minor in theatre. My love for sciences developed first in high school when I took chemistry. My unique upbringing as a first-generation immigrant in a primarily Spanish-speaking neighborhood has pushed me to study health disparities. My ultimate goal is to combine these passions, with my love for theatre and performance, to research the molecular epidemiology of disease.

I spent the bulk of my undergraduate experience working with Dr. Peter Fields on projects involving the biochemical mechanisms that marine organisms undergo in order to compensate for heat stress. One of the two main projects I was involved with focused on characterizing seasonal variation in the transcriptome of *Geukensia demissa* (an intertidal mussel). The other project focused on using homology-modeled protein structures, for coral and their symbionts, to conduct *in silico* molecular dynamics experiments. This attempted to recreate how metabolic proteins, endogenous to these organisms, react to heat stress *in vivo*. Currently, I work under Dr. Pedro Rocha in Building 6B, using mouse models to gain a better understanding of the mechanisms governing organization of DNA in the nucleus. My project aims to characterize unknown proteins that may be involved in helping non-coding regulatory regions to initiate transcription of genes.

The change from undergraduate level work into full-time research can be difficult on the bench, and off. My goal as one of the postbac representatives is to help the new class of students have an easy transition into "postbachood." I hope my tenure as a liaison for the postbacs will allow us to build a community that is rewarding to be a part of.

You can contact Ariel at ***ariel.eraso@nih.gov****.*

The Rep Report

By Suna Gulay, PhD

As the current NICHD Basic Sciences Institutes and Centers Representative, I represent NICHD postdoctoral fellows at the Fellows Committee (FelCom) meeting every month and share the latest news with you here. Do you have a concern or question that you want brought up at the next meeting? Contact our new NICHD Rep Dr. Anshika Jain at **anshika.jain@nih.gov**—see below!

Changes to the FAES fellows' health insurance kick in on November 1, 2019, with important changes to in-network healthcare costs. The deductible decreases from $250 to $125 for individuals and from $500 to $250 for families. The out-of-pocket maximum decreases from $2500 to $1500 for individuals and from $5000 to $3000 for families. Maternity-Delivery & Facility Services fees decrease from deductible + 5% co-insurance to deductible only.

FelCom discussed the new anti-harassment training. Please remember to complete this by November 15. Concerns were raised about the whistle-blower portion of the training, as the related video was found to be discouraging. The Office of Intramural Research, represented by Dr. Charles Dearolf, is aware of the inaccuracies and planning to improve this section in new versions of the training.

Holidays are a great time to give back to the community! FelCom's Social and Outreach Subcommittee has bi-monthly activities planned. Please email **Dr. Rosario Jaime-Lara** to volunteer at or learn more about any of the following events:

- Children's Inn Activities
  - Thanksgiving Goodie Bags (November 21)
  - Prepare Family Dinner (January 16)
  - Origami (March 19)
- Manna Food Drive Family Box Packing
  - December 19
  - February 20
  - April 16

Dr. Anshika Jain (anshika.jain@nih.gov) from the Rouault Lab is taking over as the new NICHD Basic Science IC Rep for FelCom, as I am moving on to the next stage in my career. Congratulations to Anshika and a hearty THANK YOU to all NICHD trainees and employees, the readers of the Rep Report, all contributors to *The NICHD Connection*—especially our Editor in Chief Dr. Shana Spindler, graphic designer Nichole Swan, and Dr. Yvette Pittman, Dr. Erin Walsh and Carol Carnahan of the Office of Education—for a most excellent postdoctoral training experience!

Upcoming NIH-Wide Office of Intramural Training and Education (OITE) Events

For more information and registration, please visit **Upcoming OITE Events**.

Nov 1	Career in NIH Grant Offices
	Interviewing Skills
Nov 5	Postbac Seminar Series: PEP Talks 2019
Nov 7	CVs and Resumes: Essential Job Search Documents
Nov 12	FELCOM Event: Careers in Big Data/Data Science/Bioinformatics
Nov 13	Network of African American Fellows (NAAF) Chapter Monthly Meeting: Lunch with Dr. Sadhana Jackson
	Workplace Dynamics IV: Team Skills
Nov 14	Postbac Seminar Series
Nov 15	Postdoc Drop-in Discussion Group—Balance—Work, Life, Family
Nov 18	English Communication for Visiting Scientists
Nov 19	Stress Management and Wellness for Scientists
Nov 20	Interviewing for Graduate School

DISCUSSION FOR BUILDING RESILIENCE

Nov 1	Navigating Life & NIH While Dealing with Emotional or Psychological Challenges
	Processing Grief
	Trainees with Disabilities
Nov 8	Anxiety and Depression
	Navigating NIH as an International Trainee
	Testing and Application Stress
Nov 14	Self-Compassion for Trainees
Nov 15	Assertiveness, Self-Confidence, & Imposter Fears
	Trainees with Children
Nov 21	LGBTQI+ Trainees
Nov 22	Holiday Stress & Blues
	Time & Money Management
	Dealing with Hierarchy & Power

November 2019 NIH Library Training and Events

NIH Library Training Classes Now Available for Registration

In-person classes are held in the NIH Library Training Rooms, Clinical Center, Building 10, and webinars are held online. For more information:

- **https://www.nihlibrary.nih.gov/training/calendar**
- 301-496-1080
- **nihlibrary@nih.gov**

Nov 7	**Bibliometric Analysis Using Web of Science and Scopus** (online)
Nov 8	**Introduction to PubMed** (in-person & online)
Nov 13	**Introduction to Text Mining in R** (in-person & online)
	NIH Library Resources for NIH Staff (online)
Nov 14	**Introduction to EndNote Online** (online)
Nov 18	**Introduction to EndNote Desktop** (online)
Nov 19	**Introduction to the BTRIS Limited Data Set** (in-person)
Nov 20	**Introduction to Categorical Data** (in-person)
Nov 21	**SciFinder Structure and Reaction Searching** (in-person & online)

November Announcements

HAVE YOU TOLD US ABOUT YOUR ACCOMPLISHMENTS THIS YEAR?

Every year, *The NICHD Connection* publishes a "Year in Review," where we share the many accomplishments of NICHD fellows. Did you win a poster award at a conference? Or maybe you received a grant or accepted a new job offer. We'd love to recognize your great news! Please send a letter to our editor, at **shana.spindler@nih.gov**, with your accomplishment(s) from 2019, and we will include them in our December issue.

AAAS MASS MEDIA SCIENCE & ENGINEERING SUMMER FELLOWSHIP

Applications open October 1–January 1!

From the **AAAS Mass Media Fellowship website**:

> "This highly competitive program strengthens the connections between scientists and journalists by placing advanced undergraduate, graduate, and post-graduate level scientists, engineers, and mathematicians at media organizations nationwide. Fellows work as journalists at media organizations such as National Public Radio, *Los Angeles Times*, WIRED, *Milwaukee Journal Sentinel*, and NOVA...
>
> ...For 10 weeks during the summer, the AAAS Mass Media Science & Engineering Fellows collaborate with media professionals at radio and television stations, newspapers, and magazines. As part of their job, the scientists and their journalist-hosts strive to make science news easy for the public to understand."

For additional information about the program visit **aaas.org/mmfellowship**.

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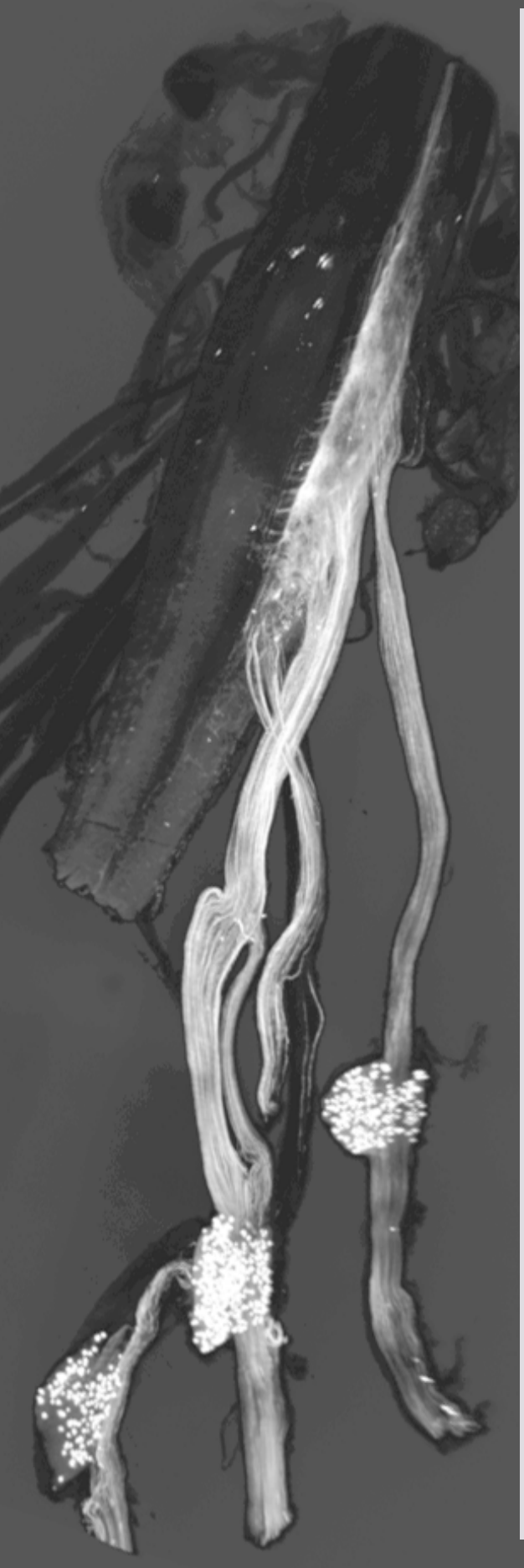


November Announcements

(continued from page 12)

16TH ANNUAL NIH GRADUATE STUDENT RESEARCH SYMPOSIUM — OUTSTANDING MENTOR AWARD NOMINATION

From the NIH Office of Intramural Research and Education

Every year, the symposium recognizes three outstanding mentors for his/her leadership and dedication to his/her graduate students. To nominate your mentor, please write a brief nomination letter (1–2 pages) describing why your mentor should receive the Graduate Partnership Program Outstanding Mentor Award. **Nominations are due December 14, 2019 at 5 p.m.!**

You may wish to consider how your mentor has played a role in the following areas:

- Your ability to conduct science (critical evaluation skills, experimental design, etc.)
- Your ability to communicate scientifically (written and oral)
- Networking
- Career development
- Leadership/mentorship in the lab
- Scientific responsibility

Nominate your mentor at: **https://www.training.nih.gov/gsc/symposium/16th/mentors**.

16TH ANNUAL NIH GRADUATE STUDENT RESEARCH SYMPOSIUM — GRADUATE CERTIFICATES

Are you graduating soon or did you graduate in 2019? Every year, graduating students are recognized for their accomplishments and awarded a certificate by the GPP. The certificates are presented at the symposium by Dr. Sharon Milgram, Director of the Office of Intramural Research and Education. Submit the certificate form so we can congratulate you for your success! Graduates who are unable to attend the ceremony on February 20, 2020, can make arrangements to have their certificate mailed to them.

The deadline to register for certificates this year is November 30, 2019. Submissions made after this date will have to wait until the next cycle. The submission form can be accessed at **https://www.training.nih.gov/gsc/symposium/16th/certificate**.

All graduates are required to register in the **alumni database**. If you have any questions, please contact **Dr. Philip Wang**.

(continued on page 14)

November Announcements

(continued from page 13)

NICHD FELLOWS ADVISORY COMMITTEE: SEEKING NEW MEMBERS!

The Office of Education formed an advisory committee in 2016, and we are seeking several more dedicated members to help us develop and initiate academic support programs for the institute. Both domestic and visiting fellows are needed. We want to achieve a broad representation, culturally and academically, so we can address the needs of all our trainees at NICHD. The committee meets monthly to exchange ideas and informally discuss ways we can enhance and tailor the training experience within the NICHD intramural program.

Some potential topics for our committee are how to:

- Increase the participation for training activities
- Expose fellows to various careers in science
- Identify teaching opportunities and internal and external research funding mechanisms
- Establish a structure for sharing scientific and career resources within the institute

The advisory committee will also steer the 16th Annual NICHD Fellows' Retreat, to be held in Spring 2020.
This includes developing the agenda/program, inviting speakers, reviewing abstracts, selecting fellow/student presenters, and moderating some of the sessions—it's a great service opportunity, plus you'll get to be part of the team that plans our biggest annual event for fellows!

Don't miss this opportunity to serve your intramural NICHD community.

The committee meets once a month on Thursdays, from 3 to 4 p.m.
Our upcoming meeting will be announced soon by email.

Please contact Dr. Erin Walsh at **erin.walsh@nih.gov** if you are interested in joining the group.

November Events

MONDAY, NOVEMBER 4, NOON – 1 PM

Annual Postbac Course
Meet the Scientist: Clinical Research
Fady Hannah-Shmouni, MD

This workshop is part of the 8-week course available for all NICHD postbacs. Pre-registration was required. For more information on upcoming opportunities, please contact Dr. Erin Walsh at **erin.walsh@nih.gov**.

WEDNESDAY, NOVEMBER 6, 1 – 3 PM

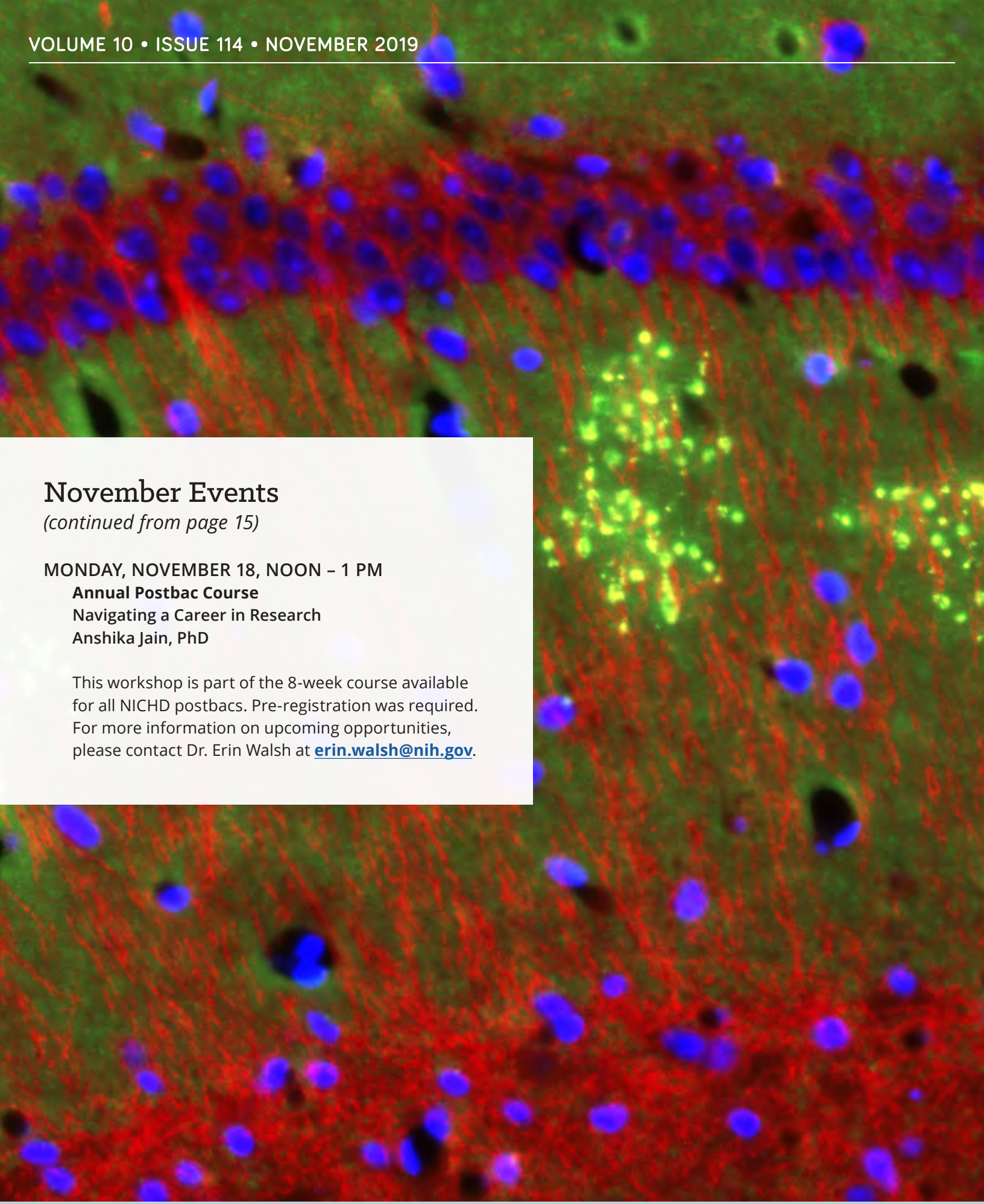
Responsible Conduct of Research Training for New NICHD Postdocs
"Discussion of Ethical Research Practices: Making Good Choices"

This mandatory training is for all postdocs who started after January 1, 2018.

An interactive session that promotes both self-directed and team-based learning required for all new postdoctoral fellows, through the Office of Education. Led by the Office of Education, this session will include case studies and reading assignments related to research integrity and discussions on ways to reduce risk factors.

The session will begin with a brief discussion on pre-assigned reading materials, followed by small-group, team-based learning exercises involving complex cases that promote discussions of either fabrication, falsification, plagiarism, mentoring expectations, and/or trainee responsibilities. The workshop will include good practices of data management and presentation, including lab notebook management—both physical and electronic. For additional details and to register, contact Dr. Erin Walsh at **erin.walsh@nih.gov**.

(continued on page 16)



November Events

(continued from page 15)

MONDAY, NOVEMBER 18, NOON – 1 PM

Annual Postbac Course
Navigating a Career in Research
Anshika Jain, PhD

This workshop is part of the 8-week course available for all NICHD postbacs. Pre-registration was required. For more information on upcoming opportunities, please contact Dr. Erin Walsh at **erin.walsh@nih.gov**.