

# An Interview with Raychelle Burks

Dr. Raychelle Burks is an associate professor of chemistry at [American University](#) in Washington, D.C. Dr. Burks is an analytical chemist who worked in forensics before returning to academia for research and teaching. She is also a science communicator who has appeared on television as well as events such as the [#InclusiveSciComm Symposium](#) and [DragonCon](#), and is one of several researchers featured in the forthcoming documentary [Picture a Scientist](#). Below are excerpts from an interview that CAISE conducted with Dr. Burks in September 2020.



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## Early experiences with STEM

The one that stands out is a junior high trip to Washington, D.C. for an American government class where we visited the D.C. FBI field office. They had this little display and a formulaic tour where they talked about forensic science, which really caught my attention. That would be the first time science was remotely interesting to me. Once I saw the connection between practical, useful things in science, then I went down this whole nerd rabbit hole.

## Thoughts on careers and research work environment

The people in the chemistry field are historically pretty evenly split into one-third industry, one-third academia, and about one-third government laboratories. There's actually a lot of mobility compared to some other disciplines. I've been a chemist for a long time, though my jobs have changed.

I have a working class background, not an academic or a white collar family background. This shaped my thinking to be more “You have jobs, your jobs pay your bills” than “You have to follow your bliss”. My frame of mind is that I like this job, but it *is* a job, and I might take a different job. I ask my students, “What's the life you want? Try to find a career that fits it.” Which is a privilege in and of itself, if you're afforded the opportunity to do that. As I've gotten older, I've realized that the work environment matters more than the technical work. There are a lot of ways to be a scientist or to work in the scientific enterprise, and not all of those environments are supportive or healthy, no matter how cool the technical work is.

A “good” job looks a little bit different to everybody but I think a lot of people would agree that you want to have suitable resources in your job like opening the cabinet and having markers, proper

training, having certain levels of latitude depending on the level of expertise, along with a clear path of opportunities for advancement. Cultivating those environments is itself an expertise (e.g. organizational psychology, management). I think we can all point to stories of major institutions, organizations, and companies that are doing super cool stuff, but that are awful places to work for certain populations.

## **Exciting new developments in science**

The sheer power of computation -- the amount of data you're able to examine, the speed of which you're able to examine it, is mind blowing. The technology that is considered commonplace in 2020, would have been considered space-age or futuristic twenty years ago. If you had told me that my phone would have 512GB storage capacity back then, I'd have been like, "OK, Nokia flip phone, whatever." As an analytical chemist who has been around for several years, I've watched computational speed and processing power improve in instruments, which enables us to improve upon established methods -- and invent new ones -- to observe things we once only dreamed about monitoring. I can't wait to see what things will get more portable, more powerful, and more automated.

I tell my students that when you have an instrument, the goal is for it to be like a Crock Pot, i.e. to be able to set and forget it. Then you can switch tasks. Go analyze data, go to lunch, or go home. You set it up to run overnight, which is probably the most efficient thing. I remember in grad school thinking it was space age to log on remotely to monitor an instrument. Now, you can fairly easily write code and have the instrument send you an email like, "Hey, something's going on." One of my former students, for a process we regularly run, wrote a Python script that sent an "It's done" email. Apps alert users! That kind of stuff is just -- wow! What are we going to be able to do next?

## **Explaining forensics to non-scientists (and their reactions)**

Sometimes, I tell people that I think of ways to kill large numbers of people...and then I design systems to either stop or investigate people with the same idea. Gallows humor is quite a popular coping mechanism in this type of work, which can be gruesome. There are times in forensic science that you have to think about, "How could this be done?", while considering how it has been done in the past. I focus on designing detection methods for illicit drugs, explosives, chemical weapons. So it is the history and use of these agents I am most focused on. People have a range of reactions about my work depending on what's going on in the news. For instance, the ex-KGB agent poisoned by polonium in London, the alleged use of Sarin gas in Syria, or the West Fertilizer Company explosion in Texas. Those things come on the news and people say, "Oh, that's what you work on?!" In a way...yes. I do think about how -- for lack of a better word -- weird it is to do research in a field where bad, often criminal things have to happen for it to be needed and supported. But maybe because these things do happen, far more than we'd like, we do need folks trying -- in their own ways -- to help via prevention or investigation.

Investigation is what I like about analytical chemistry -- you're a bit of a detective. We don't tend to make chemicals but find them or make systems to find them. Oftentimes, the sky isn't the limit. You have to build a gadget to detect something under a number of time, equipment, and budget constraints. It's kind of like the old TV show [MacGyver](#). You have a cardboard box, roll duct tape, a Sharpie marker, a bottle of water, and one stick of gum. Make it work. I like the engineering and problem solving aspects. Hopefully, I inspire my students to like those too!

## Effective science communication in “fandom” and at conventions

Fans at a convention are really in love with their fandom, as much as I am in love with chemistry, and they have a level of expertise in their fandom, in Marvel (comics), or [Murder She Wrote](#), [The Expanse](#) for example. Just as I would with any collaborator, I don't assume that they're not bringing anything to the table, which would be more of a deficit model. I treat it like a multidisciplinary collaboration and go in with an asset model, thinking what can I bring to the table as a chemist? What are my fellow fans, not in STEM, bringing to the table?

One of the most enjoyable panels I did was “[A Song of Ice and Fire and Chemistry](#)” based on George R.R. Martin's books. These are real die hard fans who know their stuff, whether it's the show [Game of Thrones](#) or the book series. They know every character, what they wore and how everything was described, in depth. I bring how I think a particular poison or chemical weapon would have worked, etc. It's a framework for how we can engage in conversation.

Even with the most outlandish plots and fantasy worlds, I try to focus on, “OK, how can we make this work? What sequence of highly improbable events would have to occur?” while leveraging the enthusiasm and the passion people have for the fandom to share a lot of scientific and technical information. And, if you are also a part of the fandom, you have the authenticity for respectful communication to occur.

I've been doing science communication for what seems like a long time and my approach has evolved, especially over the past five to ten years. You have to articulate the goal of your engagement. Is it self efficacy? Is it formulating a relationship? Whatever it is, you have to treat it like you would anything else that you do in a professional context. Part of that is preparing, just as we do when we design research. I think we have to always ask ourselves, “What is my philosophy of engagement? What is the right communication or educational approach for addressing it? What is the preparatory work that I've done to make sure that my communication skills are up to the task?” We should have all of that pretty well set before you walk to the mic or log on to Zoom.

## The Value of Enjoyment

There's also value in silliness. People sometimes say to me, “You do a lot of this pop culture stuff.” I sure do. I will talk about chemistry as zombies *all day, every day*. Does it have any scholastic value? Who cares? Can't we just have fun things? Especially right now. And science can be fun. It can also be very tedious and analytical, which I -- as an analytical chemist -- also find fun sometimes. I want to

show that -- the fun. As a professor, I do a lot of formal education with learning objectives and skills development goals. Just as important is talking about the science and engineering of Batman's gadgets, Wonder Woman's lasso, Black Panther's suit, and Captain America's shield.

### **Public scholarship and activism**

There's been many black public scholars -- Ida B. Wells and W.E.B. Du Bois. And many current ones like [Dr. Danielle Lee](#). To me that means you're engaging the public, having conversations and explaining your scholarship beyond your peers via journal articles. When you're in academia, it is not uncommon to communicate very inwardly, within your discipline, but maybe not so much with the community that you're living in or serving.

I find it easier to be a public scholar with social media because, in many ways, you can control it. With invitations and keynotes -- things like that -- someone still has to invite you. We have all seen how that can go, when you just have "manels" (all-men panels). Or an all-white panel. In an era where we can actually engage and control your brand or your engagement through social media, I'm heartened that we have a lot of public scholars. Many of my social media followers are not academics or STEM researchers and nerdiness can be spread beyond the Ivory Tower. I think being transparent about your work is important. Obviously, my job does involve quite a bit of privacy and confidentiality but I can still share certain aspects.

There are lots of folks who have to do some level of activism just to do their job. I think that it's a real privilege when folks say, "Oh well, you want to keep that activism separate." When I hear that, I think, "How nice for you that you don't have to worry about it." Which also says a lot. And that's just not been my life experience. I've found that I've had to do some level of activism in order to get into certain rooms, in order to have access to certain resources. Resources that I should have always had access to. But I would not call myself an activist. I would say that I try to be a public scholar and I've had to sometimes engage in activism out of necessity, for myself and others. Being an activist is itself a role with expertise and specialized skills.

### **Reactions to incidents of systemic racial injustice**

I've been Black my whole life. My Blackness, specifically black womanhood, has affected my whole life. Let me be clear, Blackness is not the problem. Dr. Imani Perry wrote an excellent article published in June titled "[Racism is Terrible. Blackness is Not](#)". Racism is the problem. White supremacy is the problem. Colorism is the problem. And these have been problems for generations and generations. Yes, there currently is this kind of public awakening. I admit to thinking, "WHERE HAVE YOU BEEN?!"

Part of that frustration is that I lived through the Rodney King case. Another Black person brutalized on camera by the state. I've heard it described as a [racism pandemic](#). And now we are in another pandemic -- Covid-19. An article titled "[A Pandemic on a Pandemic: Racism and COVID-19 in Blacks](#)" really struck me. What we have been seeing is who's being hit the hardest, who has the luxury or the type of job where they can work at home and order groceries, who's delivering those groceries, and

which people live in hospital, food, or social care deserts. The limits of our healthcare system -- who it best serves and why.

These issues are, in fact, society-wide. With regard to STEM, one has to consider if research on health disparity got the funding it should have. Why not? Why were programs aimed at mitigating or eliminating such disparities not supported? We see now the glaring need, but experts -- the researchers in those areas -- have been sounding alarms for a very long time. Why were they not listened to? Disputing that need on the basis of intellectual merit is a casual dismissal of the study of marginalized communities as not benefiting humanity. The cruelty of such a dismissal takes my breath away. And it was -- IS -- bad science.

### **Impacts of COVID-19 pandemic on academia and learning**

Workwise, my students and I haven't been in the labs. We've switched to doing a lot of computational work, writing up papers and grants, etc. Months in and there is data on how Covid-19 affects academics. Women academics are being less productive by some [measures](#) and you ask, "Why is that?" On social media, you'll see posts like, "Oh, yeah, I've taken up my hobbies and I've submitted some papers." And I think, "How did you do that?" And then you realize, "Oh, you're one of those folks that don't have to deal with being a primary caregiver and you posted that with no self-awareness either." There are practical things to talk about. People are in my workplace -- it was the interim provost who brought up that we know that these disparities exist, that we have to look at them and think about how we're going to respond for our faculty. Hopefully, people will be empowered to have conversations and come up with responses that don't further penalize those most vulnerable and result in further disparities.

In science communication, education, and outreach, there's been the big shift to online. For example, at GEEKGIRLCON we're doing [demonstration videos](#) instead of the two-day in-person events. The formal education landscape has shifted as well. Many educators, myself included, shifted to different engagement and assignment types. Certain assignment types don't really work and you have to think about everything differently, especially when time zones come into play and students can not participate in real time. And then there's just content, i.e. -- in the context of a pandemic -- is this what we need to focus on? Or what should we be bringing up right now that is especially timely? Here's another area where having an online community of scientists and educators has been really helpful!

### **Highlighting Black joy and interrogating whiteness**

There's also a [great article](#) I read, from a colleague at American University, which talks about how people that are marginalized are often viewed from a framework of pain and trauma rather than joy. It's as if we're not allowed to talk about black joy. Instead, the question is, "So your pain and your trauma, tell us about it." Which made me wonder, "Do you ask those questions to white people?" I listened to a podcast from [Franklin Leonard](#), creator of the Black List. Leonard said something like: "Why don't we ask people who are in the majority, how does this impact your work? How does your whiteness inform your professional access, opportunities, and decisions?"

Why don't I get the opportunity to talk about the joy? I see it too with Latinx and Indigenous colleagues. What if instead, we were asked about how our moments of joy informed our lives and work? For example, "You've talked about your wonderful quinceañera. How did that experience inform your work?"

When you see all these STEM articles about grit, perseverance, and "how did you make it through", with the implication that it's amazing that you did. You know, I would love to see someone ask those questions to a person who had, on paper, all of the opportunities. Again, paraphrasing Franklin Leonard: "If someone wants to pay me to moderate a panel of powerful white CEOs and studio heads, I'm going to ask them, so how has your whiteness afforded you undeserved opportunities?" Instead of asking the "usual questions" to people from marginalized communities.

It's not that we can't or shouldn't talk about pain and trauma, but when does that become something else? Something exploitive? What do we want to talk about? How often are members of marginalized communities empowered to talk about whatever they wish?

What if we want to talk about joy? Are we giving space for that? Space and time to talk about how their joy empowers them. Instead of just, "So you're Black, how did you make it through?" what if the question was, "How have your identities made your life beautiful?"

I'm not saying, "Positivity all the time!" But what are we doing with these questions that seem to always focus on trauma and pain?

## The importance of humor

I recommend [Dope Labs](#), which is hosted by Black women scientists who have great guests and commentary, along with super production. Dope Labs addresses a variety of topics and they have a lot of fun and crack jokes.

Anyone who follows anybody on Black Twitter knows this phenomenon, that there might be a respectful pause but [the joke is] going to happen. It's a way to process emotions but everyone knows when it's gone too far. There are unwritten rules that you learn in your culture. And I'm sure that different Latinx cultures and indigenous cultures have their own rules. What is our vibe? What is the way that we joke, or care, or trash talk, or whatever? And so I think you see that in Dope Labs and I appreciate that. Even in tremendous times of unrelenting hate -- when I think about the jazz, gospel, soul food within the unbelievable context of things going on -- you still find joy and you live your life. And I think that's part of the holistic picture. It's not just trauma theater, which can be very exploitive.

I want to stress I'm not being like a Pollyanna, where everything is sunshine. But people get to dance, and they fall in love, and they have all this good stuff that happens to them. I think that we need to consider that in our approaches and be thoughtful about that.

Unlearning colonization and the hardest work of one's life

I was born, raised, and matriculated into a colonial world. This seeps into your very core. And I've spent a significant number of years of adulthood thinking, "Wow, *that's real trash.*" Look at all this internal stuff I'm going to have to unpack or get rid of. With a movie like *Black Panther*, we treat it like science fiction. Imagine a world where you have not been poisoned by white settler colonialism. That's why it feels like science fiction to many. What would that be like? Is there any corner of the world like this?

I've been unpacking some of my formal education. I grew up in L.A. County Unified School District and I could tell you what some teachers I had told us about the missions. I'll be mad to the day I die about that. There is so much to undo, so much to unlearn, and learn anew. That's the work you have to do. Trying to treat the poisons of white supremacy and the patriarchy. You realize how deep it goes, because you grew up in it, your parents grew up in it, their parents grew up in it. It's a lot to shake off. That is the hardest work of my life.

People think that my chemistry is hard. I love chemistry. Some days I think the hardest work of my life is trying to be a better person. It's trying to unpack all that trash. And some days, it's so hard. *[Raychelle starts to tear up and so do we.]*

That's the hardest work of my life, and it makes everything else look easy in comparison. And I think that, when you're committed to doing the work, you have to be honest about how much work you have to do on yourself. And in a weird way, I now get to say that chemistry is not my hardest job. The hardest thing I'm going to do is trying to unlearn and dissect bad viewpoints, ones that I don't even remember acquiring. That's how long they've been around and that will take the rest of my life.

It's hard work that we -- my co-conspirators and I -- are doing together. We're working each day to be a bit better, to do a bit better.

The older I get, the more I realize my dad had the right idea. Dad would often say the following when we would leave the house: "OK, again, don't be a jerk today." Thanks, Dad. I think that's a good approach to work. To life.