

American Chemical Society AMA: I am Darlene Cavalier, who founded SciStarter to help connect interested citizens and scientists to do real science together. Ask me anything about citizen science!

AmerChemSocietyAMA ¹ and r/Science AMAs¹

¹Affiliation not available

April 17, 2023

Abstract

Hi Reddit! I am Darlene Cavalier and I'm a Professor of Practice at Arizona State University's Center for Engagement and Training, part of the School for the Future of Innovation in Society. Helping anyone participate in science drives the work I do and I've founded several organizations to further this goal: SciStarter, the citizen science network (<https://scistarter.com/>); Science Cheerleader (<http://www.sciencecheerleader.com/>) which playfully challenges stereotypes, inspires young women to consider STEM careers, and encourages participation in citizen science; ECAST, the Expert and Citizen Assessment of Science and Technology network (<https://ecastnetwork.org/>) that combines citizens with experts to improve decision-making in science and technology issues. I'm also a founding Board Member of the Citizen Science Association (<https://citizenscienceassociation.org/>), a senior advisor at Discover Magazine, a member of the EPA's National Advisory Council for Environmental Policy and Technology, and co-editor/author of the book, *The Rightful Place of Science: Citizen Science*, published by ASU's Consortium for Science, Policy & Outcomes (June 2016). I live in Philadelphia, PA with my husband and our four children. In June 2016, I was part of a ACS Science & the Congress congressional briefing panel (www.acs.org/scicon) along with Andrew Torelli, who ran an AMA on his citizen science topic here shortly after <https://redd.it/4o104w> Wow! That was fun (and a little stressful trying to keep up! Special thanks to Dr. Rebecca Jordan for weighing in!). I'm happy to stick around until 2:30 to answer more questions and address those I haven't gotten to yet... Thanks for joining me! Ask me anything about citizen science including how you could get involved!

[REDDIT](#)

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AMERCHEMSOCIETYAMA [R/SCIENCE](#)

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Cavalier, who founded

Science is built on the results of those who have come before. How can citizen scientists access relevant literature, when much of this knowledge is locked behind a paywall (including that owned by the ACS)? Probably most people participating in these projects don't need to look up a lot of research papers, but part of the goal seems to be to get people more interested in and engaged with science.

Do you have short-term plans to address this issue with eg. library partnerships for the programs you work with? How do you see this issue evolving/affecting the future of citizen science?

[pyrophorus](#)

I can see why this question was voted up! It's a real issue. As you probably know, there's a push to make data and literature open. Public Library of Science and the Center for Open Science are but two good places to look. We're seeing interesting points of access coming from peer-to-peer recommendations, too. (Someone telling someone else where to find information.) Libraries, Maker

SciStarter to help connect interested citizens and scientists to do real science together. Ask me anything about citizen science!, *The Winnower* 3:e146892.25439, 2016, DOI: [10.15200/winn.146892.25439](https://doi.org/10.15200/winn.146892.25439)

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Spaces, Science Centers, etc are emerging as brick-and-mortar hubs for this knowledge exchange, as well. SciStarter and Arizona State University are piloting lending libraries (for citizen science tools, training, conversations) in public and university libraries and a few science centers. Others are making great strides in this area, too. see <http://www.maine.gov/msl/news/display.shtml?id=640925>

What is citizen science? What makes it different from regular science?

[Steven_hawking](#)

From Rebecca Jordan (at Rutgers University). This is a complex question. Citizen science has been defined in different ways. In one paper, my colleagues and I defined it as "partnerships between those involved with science and the public in which authentic data are collected, shared, and analyzed." (<http://onlinelibrary.wiley.com/doi/10.1890/110280/full>). In many ways, the practices of citizen scientists and professional scientists are alike. I think the distinction lies in drawing specific attention to the citizen (i.e., non-professionals in that area of inquiry) contribution. Some what like saying that it is all science but citizen science explicitly has the non-professional input.

I am as Layman as any Layman could ever be, what type of contribution could I have?

[OneLifeYoutube](#)

And I'm a laywoman. :) Nice to meet you! There's a huge range of contributions you can make and I bet that after you take your first step, you'll just keep moving along a spectrum of opportunities to do more or different things. The contributions range from simply downloading software to run in the background/using your computer's spare processing time (<http://setiathome.ssl.berkeley.edu/>), to sharing pictures you take in nature and/or classifying others' pictures (iNaturalist.org), to analyzing and classifying blood flow image to help speed up R&D WeCureALZ.org. You can join a distributed community and help make low cost, open hardware to power research (publiclab.org). track migratory paths of butterflies by tagging them and sending reports to MonarchWatch. You can even help advise federal science policy through activities at Expert and Citizen Assessment of Science and Technology (ECASTnetwork.org). There are more than 1600 opportunities to get started waiting for you at scistarter.com .

I am as Layman as any Layman could ever be, what type of contribution could I have?

[OneLifeYoutube](#)

From Rebecca Jordan (at Rutgers University): People with very little science experience (or different types of experiences such as medicine not chemistry) can have an important impact in citizen science projects. It is less about what you know and more about what you are interested in and what you are willing to learn!

Science publishing is at the crossroads. A lot of academics are walking away from paid publication journals, yet the publication index remains vital to their career. Where is Citizen Science in the mix? What if you contribute to something which a scientist winds up publishing behind the paywall?

[geeohgeegeeoh](#)

From Rebecca Jordan (at Rutgers University). This is a very important issue. Scientists have handled this in different ways. I have colleagues who will only publish in open (i.e., available to all) venues. In

many cases that shifts the costs to the researcher or to their institution, which does not always go over well. When I have worked with citizen scientists, I make the publications available to them. This is not ideal, however. This discussion is ongoing within the Citizen Science Association in the US.

What do you think about Boaty McBoatface?

Yeah sure, it was Internet being silly, but in the end, wasn't it just a huge missed opportunity to bring Science and Citizens together?

Wouldn't it have just called more attention to whatever that boat happens to achieve?

[YoMothaFlippin](#)

From Rebecca Jordan (at Rutgers University). I agree! The naming competition drew a large crowd...I think they could continue to capitalize on this success by detail the new Boaty's deep sea adventures!

Growing up, what opportunities do you wish you had to learn more about science at a young age? What can I do to keep my elementary-aged kids interested and engaged in science?

[nautilie](#)

Well, my answer may surprise you. I think its extremely important to get, and keep, kids interested in science. But do we need more scientists? We sometimes force-feed science to kids as though we expect them to become scientists and engineers someday. Why not show them all the ways they can help advance research and discovery no matter what they decide to do later in life. That's what citizen science means to me. That's how I got involved. I wanted to know how someone like me, someone without a formal STEM education, who didn't want to be a scientist, a policymaker, a teacher, etc, could make a positive impact on the world through science. So, in answer to your question, even if I had been presented with more science opportunities as a kid, given the way they are often presented, I doubt it would have changed my course of action. After all, when I was in middle school, I already knew that I wanted to be a professional tap dancer. :) (Turned out to be more opportunities to be a professional cheerleaders instead so I went down that path!)

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[nautilie](#)

From Rebecca Jordan (Rutgers University). Curiosity!! I work with so many different scientists and science related professionals and the one thing they all have in common was curiosity. As a parent, I ask my young child. "Why do you think this happened? Why do you think that happened?" We pose multiple explanations and then we decide which one best fits. During the doldrums of science classes that encourage memorization and step by steps, remind them to ask about the big picture about why this or that might be important or interesting. Encourage them to have fun with science!

Hi Darlene,

Why are there so little projects in citizen science concerning social sciences and/or humanities other than history, literature studies or archaeology, where users are simply asked to decode inscriptions of various sorts? Is it because researchers from those fields find it more difficult to translate their research

efforts into citizen science projects, or there is something in the core of these kinds of projects, or maybe researchers from such fields are simply reluctant to try?

I have some intuitions, as I am myself a researcher in the fields of social sciences/humanities (the demarkations are a bit blur in Central/Eastern Europe), but I wonder what your (and other redditors') opinion would be on this matter.

[jarekko](#)

From Rebecca Jordan (at Rutgers University): Humans have proven much better pattern detectors than machines. I think the use and value of reCAPTCHA embodies this (<https://www.google.com/recaptcha/intro/index.html#creation-of-value>). Your question also highlights the similarities/distinctions (if they are distinct!) between what has been traditionally viewed as crowdsourcing and citizen science! I think there are norms/traditions in different fields that can account for why we see certain projects in certain fields. My colleague Caren Cooper has provided much insight into the history of citizen science (www.carencooper.com).

Hi Darlene,

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[jarekko](#)

I bet it's a little bit of both. I'd love your suggestions here. I bet others would too.

Given that pharma is not willing to publish negative results, is it possible (even with bias issues) citizen science can create an open-commons drug related Database of adverse reactions *that a scientist would trust*

[geeohgeegeeoh](#)

Hi, it's Darlene. I'm not sure my first comment was posted here. I bet you'll enjoy learning about this group: <http://biocurious.org/> "a community of scientists, technologists, entrepreneurs, and amateurs who believe that innovations in biology should be accessible, affordable, and open to everyone."

Given that pharma is not willing to publish negative results, is it possible (even with bias issues) citizen science can create an open-commons drug related Database of adverse reactions *that a scientist would trust*

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Oh you're going to love this group. <http://biocurious.org/> They are " a community of scientists, technologists, entrepreneurs, and amateurs who believe that innovations in biology should be accessible, affordable, and open to everyone." They mean it.

Hi Darlene! I see there's currently a self-reporting project called Dental Arcade, but are there any other citizen science initiatives available as far as forensic/DNA analysis?

Reddit is full of armchair detectives (myself included) who would be pretty enthusiastic about something like this.

[dangerouslyloose](#)

Hi! You might like spacemicrobes.org which tracked microbial populations on earth and in space (on the Space Station!). Check in with those folks to see if they have some new projects on the horizon!

We launched a citizen science project yesterday (and did an AMA here). What are good ways to get word out?

[QSIT Researchers](#)

Add it to SciStarter and it will become part of our marketing machine. This is a free service. Our partners pull from our database to promote projects. Partners include the National Science Teachers Association, Discover Magazine, Astronomy Magazine, Science Cheerleader, the United Nations Environmental Programme, PBS, WHYY, and more. We'll spread the word!

Neat concept! What has been your favorite "citizen" project you have worked on so far and what was the impetus behind this idea?

[Bkeeneme](#)

SpaceMicrobes.org and one we are working on now with NASA, YLACES.org and GLOBE.gov to recruit, train, equip and retain volunteers across the country to ground-truth NASA satellite data!

Where do you see online learning going, especially in the sciences which usually require lab courses? How do you think the process or accreditation for these courses will change?

[rhuang97](#)

I'm so glad you asked this! People are already become experts on topics through online learning. And some open courses have figured out how to offer college credits, too (see <https://www.edx.org/gfa>). We are *just* starting to take some best practices from there and from movements such as LRNG.org to see how we might start offering college credits (perhaps community college credits) to citizen scientists. Why not? Why shouldn't their informal STEM experiences be translated into formal credits, if that's what they want? The National Science Foundation's grant to SciStarter and ASU, enables us to build what we are calling SciStarter 2.0. This will roll out this fall. People will be able to find and join projects much easier AND be able to track their contributions to projects regardless of the project or platform (SciStarter is project agnostic!). As we create this citizen science portfolios, we'll be in a better position to understand if/how formal credits might work in this field. There will most certainly be a integration of online learning and assessments...

Where do you see online learning going, especially in the sciences which usually require lab courses? How do you think the process or accreditation for these courses will change?

[rhuang97](#)

From Rebecca Jordan (Rutgers University). There are a number of online citizen science programs that integrate learning, data collection, and real science! Regardless of how one might feel about online learning. Many students (not all) prefer it and the flexibility online learning affords. While the mode of learning is changing, the metric for success will still need to be assessment on learning. This will force many of us who educate to get creative! It can be done!

What real use is citizen science? What can we, the great unwashed, actually hope to help with? Do you have any examples of this that have shown decent results?

[Veeoh](#)

From Rebecca Jordan (Rutgers University). There are a number of examples of communities collecting data to enact a change in the way a resource is managed or in the way that research is practiced in that area. I think a bold example involves the team of citizen scientists who worked with Dr. Edwards to test water which led to the nationalization of the Flint, Michigan water quality crisis.

What real use is citizen science? What can we, the great unwashed, actually hope to help with? Do you have any examples of this that have shown decent results?

[Veeoh](#)

Yes, see above.

What was the hardest part in gaining followers or users and generally getting citizens interested in science?

[bradforrd](#)

Convincing them their contributions will make a difference...that they are needed and valued.

What are the fundamental controls that ensure natural bias are removed from citizen science and in your experience do you believe it to be typically greater or lesser than inherent bias in a 'proper' scientist?

[Use_The_Sauce](#)

From Rebecca Jordan (Rutgers University). Bias can exist in all aspects of science, but certainly there are concerns regarding the credibility of citizen collected data. Much of the work that I have done (as an ecologist not a chemist) has included a test of variability between and among citizens and professionals. In many cases I found similar levels of variability between citizens and professionals. In some cases professionals and citizens had equal levels of errors but professionals were more likely to miss something whereas citizens were more likely to misidentify something. I think the important piece of this is that researchers need to test their data collectors for bias.

What are the fundamental controls that ensure natural bias are removed from citizen science and in your experience do you believe it to be typically greater or lesser than inherent bias in a 'proper' scientist?

[Use The Sauce](#)

Great question. I'd say equal.

If I have an idea for a study or some research, how would I go about finding scientific help locally and abroad? Could I 'pitch' my idea to a university or am I on my own until I can organize something substantial?

[rhinocerosGreg](#)

From Rebecca Jordan (Rutgers University). This has been done in a number of ways. Many people have contacted scientists in the field of inquiry directly. Others have directly gathered data (and even obtained funding!). I think this depends on what you intend to study. What are the resource needs, are there ethical concerns, etc.

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[rhinocerosGreg](#)

You might want to check out Thriving Earth Exchange, too.

What are the biggest challenges of citizen science? How do you avoid the obvious credibility issue when conducting something like this?

[Ghawr](#)

Rebecca Jordan (from Rutgers University): For me the most difficult challenge with citizen science is the most difficult challenge for science...Funding! Finding the resources that allow projects to obtain the proper equipment and training can be so tough!

Is there a network of university labs available through this initiative? If not, wouldn't it be a good idea to set up such a network, so that the public have access to equipment and facilities to carry out or participate in research projects?

[dingbat101](#)

See ScienceExchange.org And, soon, you'll see a Citizen Science Tools Database on SciStarter in partnership with Arizona State Univ. This will make it possible for researchers to find the right tool to power their project, and for participants to access the tools they'll need in order to get involved in projects!

I've heard of things like contributing processing power, looking at satellite images of Earth and the universe, and donating DNA for studies.

What do you consider the most significant contribution made by citizens to science so far?

[Dayofslths](#)

Here are just a few, that Dr. Caren Cooper has cited in the past: Birds are breeding earlier

Climate is changing

Jupiter-sized planet discovered

Invasive mosquito species has arrived in Germany

About 50 types of bacteria live in your navel! Learn about these and other citizen science discoveries in her forthcoming book (preorder on Amazon): <https://www.amazon.com/Citizen-Science-Ordinary-Changing-Discovery/dp/146830867X> You might also enjoy this book, available on Amazon: <http://cspo.org/news/rightful-place-of-science-citizen-science/> (I worked on this book, :))

Hi Professor Cavalier! I'm currently CEO of an educational platform that advances psychology in my country. I've loved astrophysics since a kid and after making a lot of friends in the hard science community here, I realise that a similar platform for the hard-science community would do a lot of good for the public and for scientists.

After looking at your websites, I must say that I hadn't thought so far or so boldly. I have only imagined a platform for students and the public to learn more from experts and hold regular discussions or sharing sessions. What you have done completely blows my mind.

Are you interested in expanding to other countries, like say, Singapore? Our top University, the National University of Singapore, has a center for Quantum Technologies and also has tonnes of funding.

If not, could you share some difficulties you've faced in your endeavor, and share how one might think to overcome them?

Thank you so much.

[BlackRosette](#)

Thank you for the kind words. We are interested in expanding to other countries. We have a significant number of global projects and/or projects that can be done in other countries and we see that we have about 10,000 members outside of North America .

Hi Darlene,

Huge fan of SciStarter! Thanks for all of your outreach!

Kind of a general question: what do you consider the biggest benefits of citizen science, whether for the researcher, the participants, or the larger scientific community?

[Ms_Mediocracy](#)

Thanks! Empowerment. The researcher doesn't always benefit...if he/she doesn't have the bandwidth or resources to support the community of citizen scientists, the project may fail, for example. If researchers and participants view the experience as a real collaboration, things tend to go well. (BTW: based on some recent interviews we've done with SCiStarter users, the #1 reason people quit a project is because they never hear back from the project owners.)

I have an idea about a genetic modification to mosquitos to limit disease transmission of such diseases

as Zika and Malaria. I know this has already been tried with some success, but I have a slightly different approach that doesn't also limit the mosquito population. It would therefore have less impact on the ecosystem and be more likely to have long term results. How can I make this idea a reality?

[beaucannon1234](#)

From Rebecca Jordan (Rutgers University): Consider contacting a scientist directly!

(<http://rci.rutgers.edu/~dinafons/>)

As a non-scientist, how can I get a project started on your network so that it get exposure for the field of interest (benthic studies) so that both scientists and citizen scientists be recruited?

[FriedGuppy](#)

Add it to the SciStarter Project Finder!

What are the challenges you've faced in making people interested in science? How can people with just a small interest/knowledge in science contribute?

[lanabananaaas](#)

They don't even need an interest in science per se. Data and insights are needed from farmers, fisherman, bird-watchers, cheerleaders! (spacemicrobes.org), pet owners (scistarter.com/project/748-Dognition) , and even just folks taking showers! You'll find these on SciStarter.

Isn't "citizen science" a bit of a misnomer, since professional and amateur scientists alike are all just citizens?

[MikeManGuy](#)

yes, kind of. We hear that. It's a loaded term, too. But it's one most people understand w/o much explanation.

Can you describe a typical day in the life of a science cheerleader?

[ZyklonBae](#)

I'll speak for some of the Science Cheerleaders. The Science Cheerleaders are current and former NFL/NBA and college cheerleaders pursuing careers in STEM. Some, like Talmesha, cheered for the NFL's Redskins then the NBA's Wizards while earning a PhD from Johns Hopkins. They are busy! Still, they find time to meet up with youth cheerleaders and others at small and large events. They each have their own story to share based on their own experiences, but by-and-large, they talk about how the same qualities that make someone a good cheerleader, can make them an excellent scientist or engineering. They talk about empowerment, dealing with stereotypes, time management techniques, public speaking tips...which classes to take in high school and college, etc. At every event, they activate a local citizen science project, too, to show their parents (and them, of course), how EVERYONE can and should get involved to help shape and advance science!