On July 23, 2022 I was interviewed via Zoom by a midwestern high school student Annie Wang for her series on Misinformation in Science and Society. The topic is an important one but such a big and difficult one. She's doing a lot for a high school summer project.

My first reaction to being invited was "Maybe this is a spear-phishing scam." But after a little due diligence, it seemed legit. My second reaction was "why me!?" I suspected she might have mistaken me for the cardiologist with nearly the same name who really would know something about misinformation related to COVID.

https://www.youtube.com/channel/UCAlVudzY7Zfs1EdJioRtFA

My half-hour interview is this one: https://www.youtube.com/watch?v=me0Et3MwIZ4

My thoughts are probably nothing new. You might listen with the speed set to 1.5x or 2x.

Here’s a very-lightly-edited computer-generated transcript.

M.I.S.S. #5: Peter McCullough on misinformation and disinformation in science and society!
Jul 23, 2022

Hi everyone!! I'm Annie, a rising junior in high school, and here I invite guests to talk to us about Misinformation in Science & Society.

0:00
hi everyone welcome or welcome back to miss information in science and society here to listen not to judge
i'm annie,

0:15
i'm annie, and today with us we have peter mccullough who is an astronomer

0:20
hi morning how are you?

0:25
i'm glad to be here. this is a very important topic you've picked uu. i don't know what the answers are but good

0:30
for you for trying. i mean there's a lot undoubtedly being written

0:35
and there's probably many PhD theses that are being written and will be written, and

0:40
you bit off a big, big topic here.

0:45

yeah yeah

0:50
thank you for this opportunity i'm very happy to be here too. so should i introduce myself or do you want to introduce yourself first?

0:55
why don't you say a little bit about yourself and what you're doing here, okay?

1:00

1:05
i'm annie. i'm a rising junior and i did this project because i kind of noticed a lot of misinformation especially .

( hopefully the internet's good enough for us to be able to do this i don't know whether it might be on my end or your end but everybody's familiar with how things don't work anymore it never did anyway yeah let's keep going did it freeze for you also or not? )

no it was working for me

okay very good
yeah so i started this project because i noticed a lot of misinformation, especially during covid, and being on social media i noticed a lot of that, so that's why i did this, and then outside of that, i play piano and viola. i guess those are my hobbies and thinking of going into something related to biology in the future, so STEM related, kind of.

yeah good and where do you live? where are you broadcasting from today?

i live in the northern suburbs of chicago

yeah well i'm speaking to you from baltimore Maryland, my home which is suffering the heat

anyway i'm peter mccullough. i'm an astronomer. i have made a career of astronomy since the 1980s

i currently work at an institution that helps run space telescopes: the hubble and the webb, and nothing i say here reflects the official opinions of any of the institutions to which i am affiliated and i disavow any claims to that effect. i'm speaking to you on a Saturday, on my own time, and again my opinions are my own, of course!

so i'm kind of curious why did you choose to be an astronomer?

yeah i think it was because as a young teen, i still remember and i guess this was a formative moment; i didn't necessarily recognize it at the time but the sun had gone down, my father and i were out in the driveway, and he pointed out a bright star-like object off in the west, i guess it would have been.

and he said, “well that's Jupiter” and i said “well how do you know that's Jupiter?” he said “well it looks about the right brightness and it's in about the right position so it has the right color. i mean yeah that looks like Jupiter to me,” and so then i got interested in building telescopes, again by a chance encounter that must have happened, i guess around the same time. i went to my grandfather's house and somehow was rooting around in his - or her - i hope it was his sock drawer, and i found a piece of glass about six inches in diameter and about one inch thick that was inscribed something like “Jim's Lens.” well it wasn't a lens, it was a mirror that had not yet been coated with aluminum, and i asked, “could i have this,” and they said, “well your father made that when he was your age and yeah i guess so - sure take it.” and so i built a telescope around that. i still have that and i used the telescope in my own backyard and i think it probably gave my father some pride that he had started this, he ground that mirror and polished it and then didn't do anything with it and then i did, and maybe the next generation will do, i don't know what with it. anyway that made me go to college with the idea that, “well it like astronomy, it's interesting. it seems like it has a lot of potential for discovery which is really what drives me.”

i just love that idea of being - sort of one of or maybe even the first person - ever to witness something kind of significant and important and interesting and, i've had a few occasions like that in my life
and they are special. it was really wonderful
and i went to college with the idea of becoming an astronomer unless something else caught my fancy more
and math almost did but didn't. i felt i was really not, you know, actually
adequate enough to make math a career. it's just really hard
to push the boundaries of math compared to ... you point a telescope
and might just get lucky and discover something.
i mean it's also true that - what's that saying - luck favors the prepared or something
like that. you make your own luck, and that's certainly true
you can win the lottery just by buying the ticket but it helps to - in the real world -
it helps to study hard, work hard, yeah be lucky,
and do well with other people.
7:25
yeah that's a really cool and inspiring story. so i saw that you,
i think, you co-founded the XO Project and that's really cool and i saw you had several discoveries;
i think six. Could you talk more about that? i think that's really cool
7:48
yeah that sort of been probably my most important contribution
to astronomy and it was really rather small. when you asked me for an interview, i was like
"why would you want to interview me? there's plenty of people that are more interesting and
capable and accomplished than i am." But i did have this
idea and i was well positioned to found and to run for about a decade,
a project i called the XO Project which was just a whimsical play on words. x and o
didn't stand for anything. it just sounded like exo which is short for extrasolar
and so when we found planets they would be XO planets and that was, to my mind, humorous.
We found a few and we did that quickly and then better-funded, larger programs made ours obsolete.
there were two that come to mind: HAT,
hungarian astronomical telescope or something like that,
and WASP, wide-angle survey for planets i think.
and then TESS made all of that obsolete. TESS is the transiting
exoplanet survey satellite and it just you know
swooped up everything such that all those other projects are just totally obsolete
now, essentially, and it commoditized the discovery of exoplanets by the transiting technique, that is,
that the planet passes in front of the star and the star's total light dims by a tiny fraction, one percent or less,
okay. it's been very prolific very important technique. it allows a lot
of follow-up studies to be done, many of which have been done with Hubble and are now
being done with the Webb. so it's been a really a great run since about
the year 2000 - so it's been more than 20 years. Very
satisfying to work in this field and it's exploded. it's been an enormous growth industry,
justifiably so, and probably has another 10 to 20
years good run to it until things, just like all things,
it'll become a situation of diminishing returns where you have to put in extra large effort to get a
little bit further along and probably i'll be retired long before that happens.
10:47
yeah that's really cool so do you think there's misinformation within the field us of
astronomy?

yeah there's misinformation in every field. I remember - i don't know if
he would remember - but my PhD advisor
wisely waved his hand at his bookshelf, which was much larger than this bookshelf, and
was wall-to-wall filled with the journals. this was back when they would send you a printed volume every
month and then it became [two per month,] and then it became three a month and
so he had this wall of the astrophysical journal and he waved his hand at it with me sitting there soaking this
up. he said, “90 percent of this is wrong and we already know it's wrong -
so get the data right. that's what matters. the interpretation will be wrong, and it'll work itself out over time. that's called science.”
so whether it's misinformation? i guess what he was describing was misinterpretation, and that's … that's just the way it is. We make mistakes. we try to correct them; other people point out our mistakes and give a better interpretation. i mean astronomy is not experimental. in general it's an observational science where we just sort of look and then we tell a story about what we see. so it's very open to multiple interpretations and there is some element of an interpretation might produce a hypothesis and then you get more observations and they might invalidate that hypothesis or they might sort of be consistent with that hypothesis and then you make another hypothesis and keep making more observations better observations. but i think astronomers are also human and we are susceptible just like every other human to mistakes that are of a human nature that are harmful to science and to other people and we've suffered a lot the last few years because of that and i would say largely because of not just but largely related to social media. one of the major sort of philosophical differences that should be pointed out in your topic is the difference between misinformation and disinformation. here i'm going to say the only difference between those two is intent: a person producing disinformation knows it's wrong but has some incentive in getting other people to believe it, at least enough to propagate it further, and doesn't care that it's obvious or maybe it isn't obvious, but doesn't care that it can be shown to be wrong. they care to convince enough people fast enough that it sort of blossoms and causes whatever trouble or whatever they're trying to create, and that's much more insidious and difficult to deal with. Misinformation? you know, yah that's okay, but if you … if your intentions - if everybody's intentions are good — you still can have problems: as, well, your series of interviews will discuss. but if you have people out there, and you certainly do have people out there, purposely trying to deceive other people, that's harder to combat. i mean we expect it in politics, expect it of spies, some criminal elements - we shrug and go, “of course they're going to do that.” But to have other scientists doing this is very destructive to morale and trust. In fact trust is the key point here. If we value truth, well that's good, but what do we really value that's more foundational than truth? that is trust, because truth is being right or wrong. As my advisor said, “90 percent of this is wrong.” But nobody gets upset about the fact that it's wrong - we're going to correct it - it'll work out but if you don't trust your colleagues, in particular if you don't trust the system to figure out what's true and what isn't, that's very harmful to morale and good people will say, “i'm just not going to play the game if it's not fair. i'm just not going to. i'm going to go into art or something. some other creative outlet,” and we suffer a lot, i think, from that now in that people that would otherwise choose to be productive, good helpful astronomers or scientists, i think are going to choose other careers, you know, if you choose a different career then that's one less person that's helping figure out what's right and what's wrong in all this. so i would say disinformation is much more of a concern. i would argue than misinformation - although misinformation is also a big issue and it's primarily due to technology. i mean technology amplifies everyone's power and in particular it empowers small groups of people, even individuals, to do good or to do evil. And the web is one technology that works in the intellectual domain of communication between people, and the web is very powerful and very
vulnerable to this disinformation, or if you choose to limit
yourself only to misinformation, that's also true that a well-meaning person can read something
and go, “wow! Good!” and then they share it, and then this viral thing transmits much faster than COVID-19
ever will.
and it's not new, right? i mean Mark Twain said, i won't be able to get the quote right off top of my head, but
he said something like, “A lie can go all the way around the world while the truth is still putting on his pants.”
so it's always been true that rumors and stuff like that - they get around and they get around faster now to a lot
more people. Yeah?

Yeah.

I don't know what the answer is. For me personally, the answer is: I don't believe basically anything I read,
especially on social media, unless I know the person personally. now i choose not to use social media much
and i only have a tiny number of friends and
you know if somebody writes something on the internet, i'll believe the argument if i can read the argument
and feel like i understand it, but if they're presenting some observation, say,
i've got to go find a more reputable source for that publication about the observation than just somebody
who's a friend of a friend of a friend on social media. I just
know that i will not believe any of that, because it can very easily be misinformation of one sort or another.
Disinformation? Yeah. I hope that we'll go through a fad or phase here
where everybody will learn that i just can't trust anything like that.
i have to trust … find trustworthy sources of information … and believe those.
It's true to some extent - it's not been nearly as successful as the
elimination of spam. you're probably too young to have experienced this, but in the 1990s,
our email boxes were being inundated with spam and it was usually some form of pornography.
it was just … you had to search through your email to find the literal ones that you got from a colleague or a
friend … and then … that all went away! the technology arms race won!
the filters were able to identify spam and even though apparently it's
zooming around the internet, lots of stuff is all being transmitted, it's all
being filtered out, and you don't have to look through your email inbox trying to find the legitimate emails.
So that's like an arms race that was won by technology.
I hope that there's something that could be done
for disinformation and misinformation, but i'm, i don't see it. i don't know.
maybe somebody will figure it out. i hope so! Yeah, i said quite a bit there.
21:13
yeah yeah yeah that was a good advice to just think twice about information you read and stuff like that. so
you said, misinformation, like disinformation, could be really damaging. what do you think the worst type of
mis- or disinformation i guess, is? what it would be about?
21:37
well I don't worry too much about it in science. it's there,
but science is pretty much self-correcting; at least in the past, it has been, and i
think it'll survive this pretty well. we have a lot of systems in place to deal with it: the peer review
process, the journals that are pretty much gatekeepers for reasonable
information: it reduces the noise that you have to put up with otherwise.

i guess maybe it is the risk to democracy, but it probably is deeper than that. i think the
erosion of trust is probably the greatest harm and potential more harm coming down the pike.
if humans generally trust each other a lot more is possible
to be accomplished than if they don't trust each other and
there's been an enormous harmful phase/fad of distrust amongst
people that should otherwise be trusting each other. and you know, the consequences of trusting
and being disappointed by somebody misbehaving,
i think are much less than the generic and general
distrust of other people. some people deserve to be distrusted:
they have behaved N times in a row. i mean, it's the “fool me once, shame on you; fool me twice, shame on me.” i will be fooled twice, three times, maybe four; if it's a family member or another friend, maybe four or five; at some point yeah, you gotta do something about that.

but in the political realm we expect disinformation and yet the technological amplification of that disinformation, i think, is making both the system fail and the general distrust of people of authority and systems, that is very dangerous. i mean: i remember a relative of mine went to somalia in 1997 or other and when she came back she told me a little bit: it’s a beautiful country, absolutely beautiful, and she said all these wonderful things about Somalia, and she said, “yet there's no government there. it is total chaos run by a bunch of sects and warlords and whatever. the general people suffer enormously from not having some institution of government and laws that govern things.” so like… if you … i don't know … i'll just make up an example: you drove down the highway and it didn't have a speed limit sign and yet authority figures were allowed to pull you over and say “you know you were going 25 miles an hour” and you go, “it's a highway” and they go, “yeah, but i feel like 25 miles an hour is too fast so here's a ticket - or - i'll put you in jail.” okay you decide that arbitrariness of the authorities makes it not worth driving on that highway. to make this analogy - to try to connect this analogy - if you enter a career like science and you think, “you know, if i work hard, and i'm smart, and i'm lucky and i jump through the hoops, there'll be a career for me, and i'll be satisfied and bring home a reasonable paycheck, and feed my kids and so on.” that's a pretty good system that's worked for a long time; if something interrupts that bargain that you expect, you might not enter that [career] … you might not drive on that highway because it is too arbitrary. so this distrust of institutions is dangerous. it's dangerous to our survival as an ecosystem. people gotta get into groups, bigger and bigger groups, to do bigger and bigger problems, and they need leaders that they can trust and that erosion of trust is going to make things hard to do.

i hope that wasn't too abstract.

no yeah

i'm certainly not an authority on this and you certainly … i hope you continue this series and maybe get some real experts to wax more eruditely than i have done.

oh yeah, that was very interesting. i think that pretty much covers everything so just to wrap this up: do you have any advice for people and especially teens?

27:53

i do. i would advise you to find role models that you can aspire to. i mean - i'm not joking when i say this - i'm very serious about my role models. i know people are gonna laugh when they hear this, but my role model is my dog. my dog is a wonderful person. he's not really a person but he judges people not at all by how they look, whether they're old or young, black or white. you know, if they're mean to him, yeah he's gonna back off and go [shrinks backwards] … but he mostly loves everybody and is friendly to them and tries to see how he can make them happy,
and he trusts them - even probably when they don't deserve to be trusted.
and he lives a pretty simple life: give him some food, give him some shelter, give him
some love: that's what he wants, and we all would benefit from a role model.
if you had … if i had to pick a human: i would say…

last year i saw that the u.s president biden appointed a
presidential council of science advisors: there are 30 people and you can find their names
somewhere on the web. that is a group of people that are so
accomplished in science in their respective fields. oh my goodness, is that inspirational
to see! just pick any random one, google their name, do a little research.
Wow! i'll never do anything even close to what they've done
and so… they're an inspiration to try harder to accomplish more. Wonderful.
Probably being humans, they got their own foibles; they've got their own problems, and whatever else.
i think my advice to you and other high schoolers is:

*maintain hope even in the face of what seems truly hopeless situations facing you.*

Well, okay, there is a little life experience i can give you:
i don't know if it's applicable, but maybe it is. when i was your age, very learned people, experts in the field
claimed that there was about a 10 percent probability that we would
experience nuclear annihilation from the ussr and the united states.
10 percent! i don't know … within the next decade or something like that.
and i'm [i was] 18. and they're telling me that there's a 10 percent chance within a decade … well i can do the
math: that means another decade, another decade,… this is bad! very demoralizing and depressing.
but before that decade was out, a solution that i had not at all
anticipated happened, and the threat of the ussr and the
united states creating a global nuclear war went away in the sense [that] the ussr went
away. now the threat hasn't gone away, but it at least is not as omnipresent
as it was when i was growing up. so maybe some of these terrible things that you're facing
will get solved. so don't give up hope, and even if they don't get solved, at
least you'll go down swinging! you'll go down living a good life,
trying your hardest to contribute something good to the world, and
maybe we're all doomed, but maybe it won't happen on our watch. that'll be your grandchildren or great
grandchildren or something like that.

yeah thank you so much for that
32:08
thank you for the opportunity to help out a little bit. i won't be here forever:
you guys take over please; do a good job. meanwhile your intent is important.
that's another thing that relates to trust. it's become fashionable these
days to say, "intent doesn't matter, only impact." well that's hogwash!
intent matters enormously, in so many ways and so many things.
anybody tells you that, take it with a grain of salt. they might mean well; they probably do
mean well, but they are setting up a situation of enormous harm
when they claim that intent doesn't matter. intent matters a lot!
so intend well. sometimes you're going to step on somebody's toe: say, "i'm sorry"
move on … keep doing good things.

all right thank you so much

sure

33:15
yeah have a great rest of your day

you too … all right… bye!