

Ask A Biologist Vol 058 (Guest: Lucy Hawking)

Dear Aliens

If aliens were to contact us, what would you say? How would you say it? These are just a few of the questions that Dr. Biology talks about with guest Lucy Hawking. The two have fun with these ideas and more as part of the Dear Aliens essay contest.

Transcript

Dr. Biology: This is "Ask a Biologist," a program about the living world, and I'm Dr. Biology. If you wrote a letter to creatures from other worlds, what would you say about life on Earth, and for that matter, our planet? How would you say it? I mean, would you need a universal translator, like in Star Trek? Think about it for a moment, and start writing because what you write might be beamed into space as part of the "Dear Aliens" essay competition that is hosted by the Arizona State University Origins Project. That's right! Your thoughts, your words could be traveling through space if your letter is selected.

To get your mind ready for writing, on today's program we'll be looking outwards towards distant planets, as well as thinking about our world. How would you describe ourselves? And what might we expect life to be like in galaxies far away?

Today's guest is going to help us with our quest. Lucy Hawking is a well-known author who, with the help of her characters, George, Eric, and Annie have been exploring the universe. Did I also mention their super-intelligent computer, Cosmos? So sit back and listen in as we travel through space and explore the possibilities of life on other planets.

Lucy Hawking, thank you so much for joining me today. I'm really excited about getting our exploration going.

Lucy Hawking: Oh, thank you very much, Dr. Biology, great pleasure to be here.

Dr. Biology: This contest "Dear Aliens" I had to have you on here because I think it's such a wonderful blend of creativity and science, and exploring, and research. Because you really need to learn about where we live, and what we are, to do a good job. So talk a little bit more about "Dear Aliens".

Lucy: "Dear Aliens" is a competition which asks school age students in the Maricopa County area to think about what they would say if we received a signal from an intelligent alien life form. It asks them to think about if you have to speak for humanity, what would you say? So what would your response be if an intelligent extraterrestrial got in touch? So it really does take quite a lot of thought because it's an exercise which requires creative thinking. It requires research, it could be historical, it could be scientific and to an extent philosophical. Because it asks you to consider the human race, what have we done, who are we, and what is this planet? So you imagine an alien sends us a signal and wants to know about us. What's the most important thing to say?

Dr. Biology: That's a good question. And not only that, they can't write a book about it, can they?

Lucy: No, they can't, they have to be concise. It's going to be quite a short message. We've deliberately done it with quite tight word limits.

Dr. Biology: Right. And word limits are?

Lucy: The word limits are all on the website. I don't want to get them wrong. I know that for K to 2 it's 50 words, then I think three to four is 100. It's a sliding scale that goes up depending on the age of the entrant.

Dr. Biology: So what are the deadlines?

Lucy: Right. We would like to have entries by the 1st of April, please. If they could be mailed to us at the Origins Project -- ASU that would be fantastic. Then the ceremony, so when we're going to bounce the winning message off the moon, is on the 9th of April.

Dr. Biology: Yeah, so cool.

Lucy: At one pm.

Dr. Biology: At one pm?

Lucy: At one pm, and the winners will have their entry moon bounced. We've also got some very amazing Dear Aliens t-shirts being made at the moment, and we hope to have certificates as well. As well as some tickets to the evening performance at the big ASU Auditorium called Gammage, where there's going to be The Planets. So we're going to have a full orchestra doing The Planets, which is a very rousing and cosmic piece of music and with images, amazing images from NASA, narrated by Lawrence Krauss, who is a wonderful, wonderful presence on stage.

And then the second half of that evening will be my father, Stephen Hawking, giving a talk about his life in science. So it's a great, great evening, and all the winning entries will get tickets.

Dr. Biology: But one of the things I was curious about is on the contest, why are we only doing Maricopa County? Why didn't we do national?

Lucy: Well, we could have done it nationally, but we're trying to do outreach in our local area, and we also wanted to be able to hold an award ceremony at the end of it on the ASU campus. We wanted to be sure that students who'd entered were geographically able to come to the campus. We didn't want parents to be put under stress or expense. Especially in these sort of rather difficult times of being asked to travel a long way for their child to receive some kind of a certificate or award.

So, actually we thought that we would limit it to our local area. Also because we're moon bouncing to winning entry and we very much want whoever the winning entrant is to be able to come to ASU for the moon bounce.

Also, I said this is a kind of pilot version of this competition. We may well do it again. But we've never done anything like this before here, and so we really thought there's certainly a value in

running something on a small scale and make sure you know how it works before you run it on a huge scale.

Dr. Biology: And I'll give the address here but we're going to have the link from this podcast so they can just click on it and get, not only the address but they can get all the details, how long the essays are, when to get it in, all those things.

Lucy: Yes, and just a personal plea. Please, please, please remember to send in a permission slip. We do need the permission slip. These school age students so we need the parental permission slip.

Dr. Biology: Right. Good point. OK, so when you get that parental permission slip, you have that winning essay ready.

Lucy: That's right.

Dr. Biology: And it's all sent together, don't forget the stamp.

Lucy: Don't forget your stamp.

Dr. Biology: Get down there. You're going to mail it to: Dear Aliens, ASU Origins Project, Arizona State University, P.O. Box 871902. That's in Tempe, Arizona 85287-1902. We'll have a link from this show right to the contest so it will make it really easy for the students and the teachers to find out how to do that.

Lucy: That's the idea. We do want to get teachers involved. I have briefing notes for teachers and for parents, for maybe home schooling parents on the websites so they can give them somewhere to start. Because it is a big question, as we've just said, it's almost so big that you don't know where to begin. So we've give them some background notes on the search for extra terrestrial intelligence and maybe some thoughts that would just get people started.

Dr. Biology: And along those lines, I'm actually going to quote you. You said, "Dear Aliens gives students a chance to write the intergalactic tourist guide for extraterrestrial visitors." And I thought, oh, that's so cool because that might be some way for them to approach it, to look at some of these tour guides, if you're going to go tour England or if you're going to tour Australia or you going to go to South America.

Lucy: That's a really good idea, Dr. Biology. I think that's an excellent idea. If you looked at the description of a foreign country, whether it's one you've been to or you haven't been to, and you can think about well what have they highlighted about this place? What things about England, about New Zealand, about Italy for example, have they picked out of that culture, of that civilization of those people to say, here's what we think you'll find really interesting. Look at the first thing they list, was the most interesting thing about that country and that'll start to give you some ideas.

Dr. Biology: The other part of this, creativity. OK, so creativity and science and often people don't think science is creative. They have a tendency to think you have to be brilliant and you, so lots of work and heaven forbid math, things like that. But in reality a really good scientist is

creative. So this is actually, even though we say it's a beautiful blend, is actually as more realistic than we think.

Lucy: Ah. I think it's very important for scientists to be able to express their ideas in ways that everybody can understand. So if we have young scientists out there, who enter, then I think it's equally a good exercise for them in learning to frame their thoughts in a way that's accessible and interesting for other people. Again, I have worked with scientists for six years now to write a series of adventure stories about physics and astronomy. I'm actually not a scientist. I'm a creative writer. So I have a lot of practice in this particular area. I've worked with quite a lot of scientists, because some very distinguished scientists, have very kindly, contributed to the books I write. They have written essays about their work for school age audience. None of them had ever written for kids before. They all did a great job and they all really enjoyed it as an exercise. They found it a very, very different, very imaginative way to frame their thoughts about their research.

Dr. Biology: I have often said that I know a scientist is really good when they can explain what they do, and why they do it, to a fifth-grader.

Lucy: I think that's very, very true. Certainly, I'm obviously influenced by the work of my father, Stephen Hawking. He has a great talent, and a great passion, for explaining his work in a very simple way. So that's kind of where this whole genre of popular science writing actually really does start with him and "A Brief History of Time." Which is, and I know this maybe a debated point, but it is the first popular physics book and it's really to his credit that he had that idea. He said, "I think people can understand my work and the work of my colleagues and the work of the scientists who've come before me, if only we can find a way to explain it to them that maybe doesn't involved too much mathematics."

Dr. Biology: Well, let's talk a little bit about the books. You have several books you've written, but the two I'm really interested in here are the ones where you had these characters. You have George, we have Eric, we have Annie and their super computer Cosmos. You've mentioned that, yes you've done this with a co-author, your father who's Professor Stephen Hawking. You along with your father have a lot of experience with space and the vast universe and so even though you're being creative, you're being creative from a grounded and realistic manner. It's not as if you've gone off on some fantastical world. You actually have an idea of what possibly could be out there as well. You brought in one the books, and what I thought you could do is read a section in it. Because I think these are the ways young readers and young writers can learn and that's the way I've learned. So if you might, go ahead and pick a section and let's go.

Lucy: Right, well thank you very much, Dr. Biology. I'm going to read an excerpt from the first third of "George's Cosmic Treasure Hunt". And what's happening here is that George and his friend Annie think that they may have a received a message from the aliens. Now Annie's father, Eric, is a scientist and he works with a supercomputer called Cosmos, and Cosmos is the world's most powerful computer. But unfortunately, at the end of the first book "George's Secret Key to the Universe", Cosmos sort of exploded with the effort of rescuing Eric out of a black hole.

Dr. Biology: Oh, no.

Lucy: I know. It was such a big and difficult task that poor Cosmos kind of went into meltdown and he's never really worked since. And so, Annie in an attempt to resurrect Cosmos, managed to get him working for just a few seconds, and a strange message had flashed up on his screen. Now her father doesn't believe her. He thinks it was just some sort of odd computer malfunction. But Annie is absolutely convinced that this is somebody out there trying to get in touch. So here we go. "I think, said Annie firmly, that someone out there is trying to get in touch with us."

"What are we going to do?" said George.

"We've got to go out there," said Annie, "and see for ourselves but first we have to fix Cosmos. We need to see if the aliens are sending us any more messages and then maybe we can send one back."

"How would we do that?," asked George. "I mean, how can we send a message that they will understand? And even if we knew how to send it, what would we say? And in what language? They sent us the message in pictures. It must be because they don't know how to speak to us."

"I think we're going to say, 'Leave our lovely robot alone, you pesky aliens!'", said Annie, looking fierce. "You're messing with the wrong civilization. Pick on someone else."

"But we want to know who they are and where they come from," protested George. "We can't just say, get lost aliens and never find out who sent the message."

"Hmm, what about come in peace and then go home?" said Annie. "So we find out who they are but they're not allowed to come to earth if they have evil intentions."

"Huh, yeah," said George. "Who's going to stop them? They could land here and be like huge scary machines who could stomp us into the ground just like we do with ants."

"Or," said Annie, her eyes shining in the light from the flashlight, "they might just be teeny weenie like little wriggly bacteria under a microscope; only they don't realized how large we are, so we don't even notice them when they arrive."

"They might have 14 heads and dribble slime," said George. "We'd notice that."

They heard a creaking noise followed by footsteps on the stairs the bleary-eyed Eric came out into the veranda. "Oh, what's going on here?" he asked.

"Oh, George couldn't sleep," said Annie quickly, "because of, um, the jet lag so I'm just getting him, uh, a glass of water."

"Huh," said Eric, his hair sticking up all over the place. "Upstairs with you both now."

George sneaked into the room he shared with Emmett and hopped back into the bed, but not before he'd taken Annie's flashlight from her. He was wide awake now so he got out his copy of "The User's Guide to the Universe" and turned to the chapter of getting in touch with aliens."

Dr. Biology: Haha. Brilliant. Oh, so now.

Lucy: There we go.

Dr. Biology: Yes, well you actually touched on a subject - that - one of the questions is, are aliens going to be friend or foe?

Lucy: Well, of course this is something that's been quite hotly debated, and certainly my father's weighed in with that, with saying he doesn't believe we should contact aliens, because he thinks they might be very dangerous. I think if anyone's been to the cinema lately, there's a few films out there at the moment which imply -- Battle Los Angeles, I'm thinking of -- that imply that they would be very, very war-like, and that their interests would be not even in colonization, would just be in destruction of the human race so that they could take our resources.

Now I think none other than the very distinguished Seth Shostak from SETI has pointed out that the idea of aliens coming for our water is really laughable. That the idea that the aliens would want to transport something as heavy, for a start, as water interstellar distances is very unlikely. But I think there's really is no way of knowing.

There are also plenty of hopeful reasons to think they might be a peaceful civilization. They might be very intelligent. They might be intelligent enough to see the folly of war and aggressive behavior. They might come in the spirit of exploration, spirit of peace.

I'd just like to point out, our competition is talking about what would we say if they got in touch. We're not suggesting initiating the contact. We're suggesting that aliens have got in touch with us and we are replying.

Dr. Biology: Right. And that's a really important point. So what would you say if they say, "Hello, we're here"?

Lucy: To be honest, I think we'd probably say "Hello" back again.

Dr. Biology: Right.

Lucy: I think that's the first thing we would say. Although, obviously as you've heard in that excerpt from "George's Cosmic Treasure Hunt" whether they say hello or whether they say "zork", I mean, who knows?

Dr. Biology: Right. I mean this goes back to Star Trek and the universal translator. We don't have one of those yet.

Lucy: No.

Dr. Biology: So the question again and you could go to some Hollywood movies, that thing on mathematics they say is a good way to do it. There are all sorts of possibilities and this is what they can write about as well.

Lucy: Yes, exactly. I mean it could contact us in mathematics. They could contact us in "George's Cosmic Treasure Hunt", the message comes in pictograms.

Dr. Biology: Right, could be in song.

Lucy: It could be in any way, and we just won't know until we receive that message. We can speculate and we could think about how we could answer but we can't know. So for this competition, the field is wide open.

Dr. Biology: All right. As a writer, let's put on our writing cap and give some advice for getting started, because sometimes the hardest part about writing is that first sentence.

Lucy: Oh, it's so terrible. I mean and I wish I had some easy advice to give on this because if I had some easy advice, I'd be able to take it myself. I think all writers fear the blank page more than anything else. And I think, the other thing that we all seem to have the same habit is looking at the blank page, being determined that you are going to write something, and then thinking of five other things that immediately you feel you have to go and do. So one thing I think is useful is just to scribble down thoughts as you have them. Because sometimes you have your great thoughts when you're not intending to have them, so you could be maybe in the back of your parent's car, you could be having dinner, you could be falling asleep, anything like that.

So if you have a good thought, even if it's not a good thought, don't even think about whether it's a good or bad thought, just jot it down somewhere. Because you think you'll remember it but you may not. It'll be really useful for you because then if you've got five, say once when you get to five points, look at what you have and see what you could do with those five things.

Then if you get to it and you don't like what you've done you can change it. But it's much easier to start with something, actually have something and then work on it.

So that would be my best advice is when thoughts come in into your mind and you think, oh yes Dear Aliens, hmm, I would say then just write it down on a bit of paper or write it, jot it down on your computer, whatever.

Dr. Biology: Right. And because it's very portable, paper is portable.

Lucy: It's still my favorite way to write.

Dr. Biology: Right. Or you can use a journal. I mean a lot of times students have those anyway for class.

Lucy: Exactly.

Dr. Biology: This is a good reason to have a journal. I actually have a classic black journal, and I have a collection of them and they just keep growing and they have random thoughts, some of which I'll never get back to, and others are the ones that you go back and say, oh, yeah, I know, I remember jotting that down or something was very interesting and it may not have been used for a long time but it's still there.

Lucy: I have stacks, and stacks, and stacks of notebooks. And sometimes I go back and I look and I think, what on earth did I mean by that? I have no idea what that means. And a lot of times I look back and I think oh yes, I know exactly what that was. If you'd ask me to quote the phrasing of what I wrote, I would never have been able to do it from memory but if it's there on paper and I have it, that can lead your thought process onto something really interesting.

Dr. Biology: On another show, we had Paul Davis, a cosmologist, physicist, and a microbiologist Ferran Garcia-Pichel. Both of them fit in this realm called astrobiology. So this is, you know, life in the outer worlds type of thing. And a lot of times, learning about life on other planets is to look at life on our own planet that live in some rather extreme areas and so that, that was where we talked a little bit about extremophiles. The show is about life and building ET. Not to give anything away, I'm going to ask you because you've thought about these things. I'm going to let you build because they could've build their own favorite possible being and I can tell you right now that, of course, Ferran, being a microbiologist, didn't get anywhere out of the soil, it was really, really tiny.

Lucy: [laughing]

Dr. Biology: And Paul was off on to another tangent altogether. But I thought maybe you would share with us maybe your favorite alien.

Lucy: My favorite alien. Well, there are all sorts of features that we could talk about whether aliens do or don't have them. There are some that we could sort of make assumptions about some of their physical features, what they might be like and they would be very dependent on the conditions on their home planet for example. So say, if they live on their home planet and they move around the surface of it, then they will have something akin to feet. They will have something we might not recognize them as feet or think of them as feet but they'll have some way of moving especially if they need to move towards a source of food or source of liquid, who knows?

If their planet is an orbit around the star and it's lit then they will probably have eyes. At least they would have something, some means of seeing. Presumably, they will need to take in some form of fuel so they might have a mouth.

So they may have these features but I tend to think that whatever we can imagine an alien is looking like is probably wrong. I think every possible vision of what an alien looks like, that we've ever come up with, you could take all the representations from all the comic books and TV shows and films and that'll all be completely bogus.

However, there are some features that I would like aliens to have. I would like them to be intelligent. I would like them to be peaceful. I would like them to be interested in communicating with us. If they are a very advanced civilization, which if they do manage to find us and contact us, we're going to sort of really assume that they are further advanced than we are. That they might be able to share some of their wisdom with us. They might be able to tell us how we can deal with some of the problems we have now.

They might also give us hope that life is possible in other parts of the universe. Because at the moment, we really only know about life on planet Earth and we're making a little bit of a mess on that one. We're very over crowded. We have real struggles for resources which are not going to get any better in the short term.

So that's my hope for the aliens, is that they will be able to share some wisdom with us that will help us in our future.

Dr. Biology: All right.

Lucy: Now, I just have somebody else I have to mention quickly. You talked about Paul Davis, and I just wanted to let you know that this competition is actually sort of based on him really because Paul is very distinguished, very famous scientist. He's written a lot of books, done a lot of teaching, travelled the world. A lesser known fact about him is that he's head of the SETI Post Detection Task Group. This means that if we did get a signal from ETI, that's extraterrestrial intelligence, then Paul would actually be the one person on planet Earth who would be responsible for formulating our response. So I find out about this, in the summer when I knew I was coming to Arizona in the fall and that gave me the idea for "Dear Aliens". So when I got here I said to Paul, well if they get in touch, what are you going to say?

And it occurred to me that this would be a great chance to ask young people what they thought. Ask them to imagine that they were basically in Paul's shoes and that they would have to decide what to say. So Paul obviously has been a big part of this competition and he will be the final decider on judging the competition entries.

Dr. Biology: Well, and knowing him, I would be a betting person that he will use some of it actually, I think he's very open minded.

Lucy: Yes, I think he is, and I think that's one nice thing about this completion as well. For kids considering entering it to know is that, their essay will actually be read by the person who might have to actually do this in reality. So Paul, if he ever does get contacted by the aliens he will have read your messages.

Dr. Biology: Wow, history making.

Lucy: Exactly.

Dr. Biology: All my guests on Ask Dr. Biology can't get out of here without answering three questions.

Lucy: OK, give it to me Dr. Biology.

Dr. Biology: Right, typically, I have scientists but I also had reporters and journalists and a wide range and because science includes everyone and it doesn't mean you had to be a scientist.

Lucy: No.

Dr. Biology: So, this is slightly modified. Typically we say when did you first know that you wanted to be a scientist or a biologist, and in this case when did you know you wanted to be a writer and how did you know what you wanted to write about?

Lucy: Well, when I was in say in fifth grade, I use to regularly write stories and they were always stories about other worlds and other civilizations, sort of those strange creatures. I would draw maps of them and illustrate them, so I suppose I had that interest from really quite an early age. I was sort of a creative child and that I did a lot of drama, dance, and singing. I used to make my own radio show and insist that my parent's friends would allow me to interview them with a microphone. So I was probably very irritating actually thinking back.

Dr. Biology: Oh, no, no, no.

Lucy: So I think I knew I wanted to do something creative although it took me quite a long time to work out in which field I wanted to be. I certainly did a lot of acting in my teenage years. I was in a lot of productions, a lot of plays, a lot of musicals and then it was really at university and then post university where I became a journalist because I realized I wanted to go to writing and that seemed the best way to get into that world.

Dr. Biology: And then when did you find the subject that really got you going? Because I know you've written smaller pieces like most people that get into writing, they do shorter pieces but your books, you actually have two genres, I would say.

Lucy: Well with them, the adventure stories about physics, that idea came when some of my son's friends were talking to my dad at one of my son's birthday parties and they were asking lots of questions and saying, "So Stephen, what would happen if I fell in a black hole?" And it was so entertaining to see them absolutely gripped and entranced waiting for my father to type the response because he speaks with a synthetic computer voice, and he gave them the answer to this question and they were so thrilled with his response, all about what will happen depending on the size of the black hole and I get turned into spaghetti if it was a small one.

I didn't think that they were really interested in this and I also realized that my father was very good at giving answers that were informative but entertaining at the same time. So that was what gave me the idea for the George series. I think it's been a wonderful, wonderful thing to do.

Dr. Biology: It's great collaboration.

Lucy: We've just finished the third and final volume which is called "George and The Big Bang," which I think speaks for itself really.

Dr. Biology: Yes. Oh, I'm glad to hear about that.

Lucy: Yeah, there we go.

Dr. Biology: All right, so now we know that you've always pretty much been a writer, and that the beginnings of George and Annie and Eric and the wonderful computer Cosmos, I'm going to take it all away.

Lucy: Oh, no.

Dr. Biology: I want you to stretch. I'm going to take that away from you and I want you to think about what would you do or what would you be if you could be anything else if that was taken away from you?

Lucy: What would I be if I could be anything else? If you'd asked me 10 years ago, I would have still said I would like to go into acting cause I still, I think that's an amazing career and fascinating to have the challenge of portraying a different person, to actually get inside somebody else's skin and see the world as they see it and react as they react, is like being able to live more than one life. I think that's what's so fascinating about it. But to be honest actually, if I had to choose a different career now, I'd probably be an ice cream maker.

Dr. Biology: Really?

Lucy: Yes, I think that would be really nice.

Dr. Biology: Do you have a favorite flavor?

Lucy: Well, I just stopped off at my favorite place in Scottsdale, which is called Sweet Republic, on my way here and I had some of that basil and lemon sorbet which is absolutely delicious.

Dr. Biology: I don't know that I wouldn't have put those two together.

Lucy: No, no, no, but it's really, Sweet Republic is a place that fortunately I only just discovered. I only have two months left in Arizona and so I think that's a good thing, because it's the best ice cream I've ever had in my life. So if I had to have another career I would have little ice cream shop like Sweet Republic.

Dr. Biology: OK.

Lucy: But I'd have the walls lined with books. That would be the only difference, ice cream and books.

Dr. Biology: Well, if you have the shop, I'll come in and try some of your creations.

Lucy: Thank you.

Dr. Biology: All right, the last question. What advice would you have for young writers or communicators and I say young but quite frankly there are a lot of people that have always wanted to be [a writer], so I say those young at heart as well, what would you say?

Lucy: Well, I'll give the same advise that I was given. It was a friend of mine who was a very established poet and writer and I said to him "Look, I want to be a writer." He said, "Well then I have some advice for you." I said, "What was that?" expecting to hear something life changing, and he just looked at me and he said "write". That's it, that's my advice.

Dr. Biology: Write. Practice the craft.

Lucy: Write, just write, yup, although I'm going to add something to that -- and read. I think reading is the forgotten part of writing. I was a very early reader and a very obsessive reader. I used to try and read books under the dinner table. I would just sort of take a book. I would wander around the house reading my book all the time and I still do that. But I think reading is really important part of writing. Because if you don't love books and if you don't love reading then I would question why you would want to go into writing.

Dr. Biology: Yes, I think so. There's something about reading versus watching a movie or television. We talk about that a bit because you become part of the creative process and I think that's a great way to do it. Well, Lucy Hawking, thank you so much for visiting with me.

Lucy: Well, thank you, Dr. Biology. This has been really a lot of fun, and thank you very much for featuring "Dear Aliens".

Dr. Biology: Oh, it's going to be a hit, and I know it's going to go on to bigger and better things so maybe we'll even have you back for the next iteration.

Lucy: Thank you, maybe next year.

Dr. Biology: All right, we'll do it since you'll be back home, we'll do it via...

Lucy: We could link up via, yeah well have to link up internationally or perhaps you'll never know, perhaps I can get the Origins Project to ask me back.

Dr. Biology: Oh, there you go.

Lucy: For the "Dear Aliens" next year.

Dr. Biology: Yup, that'll be good. Well you've been listening to "Ask a Biologist" and my guest has been author Lucy Hawking, currently the writer-in-residence at the ASU Origins Project. The Ask A Biologist podcast is produced on the campus of Arizona State University, and is recorded in the Grass Roots Studio, a house in the School of Life Sciences, which is division of the College of Liberal Arts and Sciences.

Remember, even though our program's not broadcast live you can still send us your questions about biology using our companion website. The address is askabiologist.asu.edu or you can just Google the words "Ask a Biologist". I'm Dr. Biology.

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