Q&A with Chris Hadfield

Interviewed by Susan Straight

I'm Susan Straight, editor of *Dimensions* magazine, and I'm here with Commander Chris Hadfield, astronaut and former commander of the International Space Station. He became an internet sensation for his YouTube videos of life in microgravity as well as for his album, *Space Sessions: Songs from a Tin Can*, recorded onboard the space station and produced by his son, Evan. He recently co-hosted the National Geographic series *One Strange Rock,* hosted a six-part series on BBC, and teaches a MasterClass.com program on space exploration. Chris we're delighted to have you with us for this Q&A.

Can I start by asking you how living in space has affected the way you live on Earth?

Thanks, Susan. It's a delight to be speaking with you also. I think it gave me a permanent and—maybe profound is the right word—better understanding of the world itself. To have been around it…and I think you make an interesting distinction not just visiting space but living in space…To have been around the world many thousands of times, to see the world in a very clear, unfettered, and complete way and watch entire seasons change on the planet and go around it 16 times a day. You think of the world continuously and how it's connected to where you are. It makes you a better steward of the world. You think about your actions and the actions of others. You think about the history of it and therefore the future of it. And it's a perspective that I think is personally worthwhile but also one that is worth sharing and trying to let other people see the world and its reality if we possibly can.

You've been an exceptional science communicator, speaking through every form of print and digital media as well as through music. What are some ways you'd like to see science communicated more effectively? What role can science centers play in that?

I think any place that gives people a personal feel for what the science means—that is the vital link. In fact, the very minute you say "science" you've diminished your purpose, because science is a category and a class that's taught at school. As soon as you mention science, people put it into a pigeonhole in their head, what you're going to talk about next. If you talk about wonder and curiosity and delight and surprise and invention and discovery, those are all human emotions and interactions and wonderful ways to go through the world. But if you say "science" people are thinking of the periodic table and how they didn't really understand some of the classes they took in school.

If you truly want to try and communicate the science behind all of this work around us, you need to put it into human terms. It's just organized curiosity, that's all science is. That same wonder that we had as children that drove us to explore on our pudgy little feet when we started walking or to taste everything before anybody could tell us not to, that same necessity

to explore and discover, to me that's the very essence of trying to share all that science contains.

Science centers traditionally, since they first really began in the 1960s, were—and are—a wonderful way to do that. To let people directly physically interact with something that otherwise might have just been theoretical. To go in and use hardware and practical demonstrations and virtual reality and such that suddenly takes people well beyond their day-to-day and lets them see the wonder and the delight and the discovery around them.
And you can do it, as I tried to do my best during my space flights, as I still do now around the world. I think the underlying messages that come from it are really vital in order to continue to thrive as a species but also to deal with the ever-changing problems that we have on our home planet. And so, people need to feel a connected link to the science so that it changes their own decision-making. It allows them to see themselves as part of this big overall process and not as science just being some subject they did in school that doesn't really affect their life at all.

You've said that the measure of effective communication is whether it changes behavior. What behaviors would you like to see changed?

When you're talking to someone, especially if you're speaking to a group, if all you do is amuse them, if their behavior doesn't change, then they didn't really absorb what you said. They just experienced a transient entertainment. You were a song, or a brief taste, or a brief thought. But the next time they're faced with a certain set of circumstances, your words or your ideas won't be prevalent and ringing in their head and therefore their behavior won't have changed. And that's O.K. if you just want to entertain.

But I'm sure at all the science centers around the world the intent is that people will be entertained—it'll catch their attention and it will focus their energies for a little while—but they'll also come away thinking about the topic in a more informed or a different way. So, the next time they're looking up at the sky and thinking, "Wow, look how blue the sky is—and I know why the sky is blue." Or "Why can you have a double rainbow?" Or "Why does the sun feel hot on one side of my arm and not on the other?" Or "Why do I burp?" Or whatever. They aren't with just the same mental process they had before. Through an entertaining engagement you have also educated someone enough that in the future when they think about it they'll do it in a more informed way and they'll make different decisions.

And if you talk to them about why we shouldn't have lead in our car gasoline … if you just mention it then maybe they won't have any different thought when they're buying a car or filling up their car at the pumps. But if they have listened clearly to an idea about the global impact of the way we use fossil fuels or transport ourselves around then people might make a different decision in how they purchase things and how they use machinery and equipment. And to me that's the very essence of the behaviors I'd like to change. I think it serves us all better if people are more informed in their decision making as adults in an advanced technical society.

What's your favorite science center and what do you like about it? (OR what's the one you visit most often/which was your favorite as a kid/what was the last one you visited/etc.)

I grew up on a farm so there was no easy way to get to a science center. But one of the very first science centers in Canada where I grew up was in Toronto in the province of Ontario. It's called the Ontario Science Centre and it was part of Canada's 100th anniversary project in 1967. It eventually ended up opening in '69, the year of the first moon landing.

There I was: nine, turning ten years old, and we did a school trip to the science center. School trips are always fun, but we were going to a place that took all of the boring theory that the teacher had been droning on about up at the front of the classroom and we got to go interact with it and play with it. One of the moon rocks that Neil or Buzz had picked up and they already had it by the fall of 1969 in the Ontario Science Centre. And I felt like I was in a cathedral or in some great, magical place and I could reach up with my finger and reach toward a piece of another orbiting body. To think that that was now possible, that rock right there came from the moon. I was amazed that that could happen and that I could be so close to it. And it shifted my perceptions of what might be possible for a little kid like me. That if Neil and Buzz could do that and it could get to the Ontario Science Center, then maybe I could go do that. That this is a thing, that people do.

And so, I really think that science centers and in my case, the Ontario Science Center, was very pivotal and informative in helping me to integrate science and ideas into the actual thought processes of how I visualized the rest of my life.

What's the next step for space exploration and what will it take for us to stay aspirational as a society?

We normally go in phases in exploration. You can see evidence of it throughout human history. We're living somewhere and then some small subset of us, whether it's a village in the Rift Valley in Africa or wherever and we go, you know there's too many of us here, or there's not enough food to eat, or some of us need to go somewhere else.

Historically we would send out a probe, which at that time would be, like, your eldest child. And that probe would walk for four days, have a look and walk four days back and go, "Nope, we don't want to go over there. It's the edge of the Sahara…Yep, we want to go there, there's an oasis or there's a spring or something."

So that would have been exploration. And once we found a place that was desirable, then we would move and some of us would start to settle somewhere else. And that pattern has always been limited by technology. We didn't get to New Zealand until 750 years ago. No human being had ever been there because the technology hadn't taken us across the ocean. We didn't get to the Americas until about 18,000 years ago. We didn't get to Antarctica until just a little over a hundred years ago. We didn't get to space until a little under 60 years ago.

So we're still early in the exploration phase of space, but we did start settling space recently. That transition from exploration to settlement really truly happened on the international space station. So, when we're looking forward to exploration, now that we're in the near-space settlement phase, I think it makes sense to keep looking where our technology can take us with robots and with remote sensing and telescopes we can look right across the universe of course and continue to probe and think and puzzle and choose places we want to go. But as far as actually sending people we've only been as far as the other side of the moon when they were orbiting it. No one has walked on the other side of the moon. Only 12 of us have walked on the moon total.

So I think the next natural phase of that exploration will be to send our machines and our probes as far as they can go and once we've chosen places that make sense for people to go and for our particular set of skills to make sense, then we will send people. The next place will be the moon, initially to continue the exploration but with the intent in the fairly short term of settlement. As improbable as it seemed in Antarctica 100 years ago, I think we're at the phase now where we're about to start settling the moon. And we'll learn enough there that then opens up for human exploration as far as Mars. And then eventual settlement, just like we've done around the world.

And I think that process has always both challenged us and inspired us. If you really want to inspire our young, then they need to see opportunities that didn't exist for us. They have to recognize how the change in technology and circumstance has opened up a vista and a possibility that they didn't have. And that's where so much of invention happens, and so much of the expansion and improvement of the human condition and quality of life. So I think that's where we're headed next in space. Send the probes as far as they'll go and then slowly incrementally move into the third dimension of human exploration and settlement as we've been doing for a hundred thousand years.

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