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PittCo Happenings Interview Transcript

NASA James Webb Program Director Greg Robinson

Caleb Ayers: Welcome to PittCo Happenings today. You know, today we have an extremely special guest, one that I'm honestly surprised has time for us at this point. I would assume most of you've probably seen some of the pictures taken by the James Webb telescope, you know, those are some incredible never-before-seen scenes from space, but you might not know that the program director since 2018, his name's Gregory Robinson, is actually from right here in Pittsylvania County and graduated from Dan River High School. So, Greg, thank you for taking the time to talk to us today about your local connections and your involvement with this awesome project.

Greg Robinson: Good morning, Caleb, and to your listening audience. I'm thrilled to be here, it's an honor to be on your show, and I'm looking forward to it.

Caleb Ayers: Thanks! As we said, you're here from Pittsylvania County, so tell us a little bit more about your local connections, your local history growing up here, and then do you come back here much?

Greg Robinson: I was certainly born and raised in Pittsylvania County, which is right outside of Danville. I went to Southside Elementary School and on to Mount Hermon Elementary School, Blairs Junior High and Dan River High School. In this area and northern Virginia, we have mostly the middle school, so when I say junior high it sounds funny to me now. Let's see, I do still a lot of family back there at... Of course, With covid. Prior to covid I would make it back once or twice a year.

Caleb Ayers: Okay, so relatively frequently then. And I think the question that jumps to my mind is how someone can go from living in little old Pittsylvania County to heading up a big-time program with NASA that's getting extreme national attention right now.

Greg Robinson: No, I was going to say, Pittsylvania County and Danville, they are everywhere. You picked the state, and I even say, oftentimes, even in cities, you have similar settings, if you could stretch your mind around that, where the beginnings are quite humble. So, in my case, I did go off to college on a football scholarship to the Virginia Union, so that helped put me on a path to college. Already had the smarts, and I figured out I do well in school, and then I did get an opportunity to go to college.

And I must say, doing well in school is important. And if you have the means, or go find the means, going to college is critically important to get out of certain environments, if that's what you want. So, I was always prepared. I loved math, I love science, I did extremely well in school, and so when Coach called me from Virginia Union, that was ready to go. And I often say, I wish every kid in America could go to college just for one semester. I think it would change their life because so many things open up to you that you haven't seen before: new people, all kinds of people from all over the world, bright ideas, different ideas, in addition to the classroom training. That first semester certainly changed the way I view the world.

Caleb Ayers: And did you go into college thinking that you were going to go into astronomy and studying space and things like that?

Greg Robinson: So, I'm an engineer. I'm electrical engineer, so we can do anything as we often say. The space part is really the product of the application of building systems. So, we get like any business and any product, engineers got a requirement, and we go off and make it happen. So, in this case, the way we do satellites for science at least, so the scientists say, 'We want to go to a certain place and space and study certain things,' and of course, we slow down those requirements to something smaller, so something we can build. In this case, it just happened to be astrophysics astronomy system, but I've been involved in developing satellites for science for heliophysics, studying in the sun, and later missions going to Mars and pretty much every type of science mission we have. I've been involved in developing some of those systems, so certainly not a scientist, but I try to contribute to it.

Caleb Ayers: Then, you know, I've been reading through a lot of the articles that have come out about this program, and specifically your involvement recently. So, I'll just say generally that the theme was things were not going well when they brought you in as director in 2018.

But tell me a little bit more about what were some of those problems that they were facing, and then how did you, I guess, approach going about getting that project back on track, both in terms of timeline and budget?

Greg Robinson: Developing these systems, what we call large flagship missions, they're incredibly, incredibly complex and hard to do. And we only build one of them. We have to find a way to build it and test it and test the heck out of it, so it can survive large and survive its mission in space. And you still have to fly that system for many years to get to science, so it's a delicate balance of how well do you build it, how well do you test it? Now, will it survive? And in this case, in the case of Webb, we have 10 new technologies, the largest

thing we've ever built, the most complex work that will build. So, you're going to have challenges. Just the physics is going to challenge you.

So, putting that aside, and the team had done very well when I came on, one, half of the telescope was done what we call a telescope side, the big mirror and instruments that was done. All the testing was completed. The space craft side, that also has that large sunshield, that was nearing completion and getting close to its test phase. So, some of the problems manifested by human error. People just made mistakes. That's normal and natural, as I say. If you work on something long enough, you're going to make a few mistakes regardless of what business you're in. So, there were some human errors and some of those things really bit us. On these big missions, a small problem can lead to six, eight, ten-month schedule delay, which means tens of millions of dollars in this case.

We also had a few failures, which we expect when we test things, that's why we test them, so we can bring out any latent issues. So, a combination of those, and then just some schedule delays. Better planning was necessary. So, between those three, just physics, human error and need for better planning, those were the primary areas.

One of the things that was important initially was assuring that we had alignment through the whole organization, from the NASA administrator out to the White House of office management and budget, to congressional committees, all the way through the project team and our contractor workforce and our international partners, the European Space Agency and the Canadian Space Agency. Not that anyone was doing anything wrong, but sometimes a team can go on the field, and everyone runs the play a little bit differently and no one gets to end zone. So, we just needed everyone to be aligned and it took a lot of work to get there.

Another area was creating a culture of transparency. It's important when you have stakeholders to let them know what's going on, and for everyone in the system to know what's going on at the same level. And that was critically important, especially when we slipped schedule and asked for a lot more money. Congress doesn't just throw money around, so they had to have some confidence that we could actually get this thing done. So, creating that transparency, regular tag ups with them is really important. And better advanced planning, planning beyond a month or two or three, we needed to plan six, eight months out, and we know certain milestones need to be accomplished then. So, it's a combination of things that got us there.

Caleb Ayers: And you're talking about all those different entities involved, how many people were directly involved? I mean, obviously, there's the White House, there's Congress, there's

those that are sort of administering even the funds and things like that, but how many people are directly involved in this project roughly?

Greg Robinson: So, this project was in development for about 20 years, and we're talking a huge industrial base in the US, in Canada, in Europe, and multiple space agencies. When I came on the program on a half years ago, we were talking over 10,000 and now we're estimating the numbers as we go back and sharpen up our pencils is close to 20,000 people over 20 years were involved in developing Webb. A pretty big number, and not all of these people worked on it at the same time. Now, you may do a contract for a part, and you have 10 people working at the on the Pop Shop for many large corporations and space agencies.

Caleb Ayers: That makes sense. And I know that the spacecraft launched with the telescope in December, and you know those pictures were just coming back over the last few weeks. But can you explain a little bit about, I guess, dumb it down for the non-scientific and the non-engineering side, but how does this telescope work and what might be different about the James Webb telescope than the ones that have come before it?

Greg Robinson: So, the most famous one and the best one before was Hubble, and Hubble launched more than 30 years ago. It is still working, it's given us amazing information and images about our universe, Hubble is primarily an optical telescope. Webb is optical and infrared, and infrared allows you to look through smoke and clouds and dust and all the different things in space you can't see through with the naked eye, and then even with certain optical devices, you can't see through them. If you imagine like night vision goggles, where you are actually looking at heat signatures. So, Webb allows us to look through all of that so we can see very clear and places that have a lot of clouds and dust and things. We can look at the same area of space that Hubble looked at and we'll get the same image and what is extremely clear, and the other one, it's less so.

In Hubble's defense, at the time that was the state of the art, so it looked mighty nice, but we can look a lot deeper, a lot clearer. Certainly, that's because of the infrared technology. And we have science instruments on there that can process the environment of Exoplanets. So, we can look at Exoplanets in other galaxies, determine with pretty good certainty potential habitability. And you probably saw one of the first images showing water vapor, so we can look pretty close into these. We've never been able to do that before. Of course, we were able to find expansions before Kepler and tests, and they found thousands, but now we can actually look into those planets.

Caleb Ayers: You're talking about being able to look deeper into those Exoplanets. What are some of the other significant things that have been observed so far with the James Webb telescope?

Greg Robinson: So, it's still early, what you saw on the 12th of July were the first science images, and one of those was the deep field, looking back into the universe. Over time, we will actually look back in that region of 100, 200, 300 million years after the Big Bang. So, we'll be able to look back pretty far and see the early formation of galaxies and our universe, and that's what we call the toddler years. So, we're looking at the adult years today, so we'll look back in the universe when it was a toddler.

Caleb Ayers: Can you explain what that means to look backwards in time? Because to me that sounds like science fiction.

Greg Robinson: Well, it is at a certain level. But it's real. So, the light travels at a certain speed. For laymen, at 186,000 miles per second, which is pretty fast. So, the next time you rev up your car and say I do zero to 60 in a certain amount of time, just think 186,000 miles per second. That's how fast light travels.

I talk about grown as a kid and shining the flashlight up at night, and I wondered how far up did that light go and how long did it take. Did it pass the moon? Did it get to Mars? And of course, I had no answers back then. So, we are actually seeing stars and galaxies that actually started many hundreds of million, and in some cases, a few billion years ago, and that light is just reaching us. So, we're looking at something that happened a long time ago just reaching us. So, when I shined that flashlight, somewhere in the heavens, that light is reaching somewhere else today, because it kept traveling. When I turn off the flashlight, it would actually stop, but generally, it would keep traveling. So that's kind of that concept.

Caleb Ayers: So, there are those things around us that are things in our solar system than we would be seeing those more present, but things that are the further away, the farther in the past that we would see them by the time that light gets here, that's the general idea.

Greg Robinson: You have action that occurred in the past, you understand it.

Caleb Ayers: Yeah, that's hard to wrap your head around.

Greg Robinson: It is. And you think about the Mars missions, the Curiosity Mars Mission, the one before perseverance, the current one while they're still working, we talked about seven minutes of terror. So, when we send a mission to Mars and we have to land, we have to get out of the orbit and get on the surface. When we send the signal to the satellite and say, okay, now it's time to do that activity to get on the surface, it takes seven minutes for that signal to get to us. So, by the time it lands on Mars, and we know that it landed, it's seven

minutes later, so the activity happened, we knew about it seven minutes later because of the communication signal. So, it's not exactly the same, but if you think about it that way, something already happened and then I get a notification today. Or something happened in the past, now I see it today.

Caleb Ayers: And can you explain just really quick a little bit about the images that are being generated. There's some editing, there's some interpretation involved with that, so can you tell me a little bit about that process as well?

Greg Robinson: So, the data comes in. The mirror actually collects the light and sends it to the secondary mirror and then sends it to the science instruments on board. Those Science instruments actually process what they saw and what they collected from the mirror into an image, and in some cases is spectroscopy data, not always an image. And then of course, that's transmitted to the ground. The scientists, they know exactly what they're looking at, and they process it in a way that you can really appreciate it, or even for scientists, and even laymen like us.

So, when their data comes in and the images come in, they're not in color, they're actually black and white. There are certain color patterns you add to heat or light or other types of things. So blue may mean something, green may mean something, and this is universal in the science community. So, when they show an image, the signatures for our eyes have been added in so we can see what they're seeing in the black and white. That's a very layman's explanation, the scientists would do a much better job explaining that.

Caleb Ayers: Well, I think, yeah, we need the layman's explanation here. You were talking in the beginning about the importance of even doing well in school and investing your time and energy in school and taking the time to go to university. What other messages would you share with Pittsylvania County residents, with the Pittsylvania County Danville Community, whether they be the students who are still making their way through the school system right now, or just the community at large?

Greg Robinson: Well, first I say, find something you think you might like, and depending on your age, that may change 50 times before you become an adult. But find something you think you might like and work hard at that. Again, that's going to change, and when you find something else you might like work hard at that as well, and that's whether you're in school or outside of school. I also say maximize your time dealing with other people. When you get in the real world, most of times you're working on teams, small teams, large teams, you're working across the country, across the world. And people are different. People communicate different, you learn leadership skills, when to lead, when to follow, and what the difference is. So, make sure you spend some time dealing with people, whether it's on

the sports team or just in the school building, in the playground or in the community. That will go a long way when you get into the work world.

Caleb Ayers: Well, now I know we've seen incredible community support and interest in this project. Obviously, it's a very cool project by itself to see these images coming from areas of space we've never seen before, but also knowing that a local person from Pittsylvania County was so deeply involved in getting that to the finish line, so it's really an honor to get to talk to you, Greg. I just wanted to open up and see if there's anything you would want to add or anything else you think it's important that people now?

Greg Robinson: Yeah, so lastly, I will say, certainly I was blessed with a lot of smarts, blessed with a good community and had opportunity from sports and things like that. But in addition, at the end of the day I think I was blessed overall and at many turns. It's easy for things to go in a different direction at different points in your life. So, I was blessed with good decision-making and good support along the way, so I try to make good decisions and also maximize the benefit of people around you supporting you.

Caleb Ayers: Well, absolutely. Well, Greg, I really appreciate you taking the time to talk to us about this project and to really just speak some good advice over us. We Appreciate it.

Greg Robinson: I appreciate it, Caleb.