JON SECAUR

The award-winning physics professor on the future of NASA, the not-so-hidden truth behind the Apollo program and why reading the Bible scientifically is "just plain silly."

INTERVIEW BY ANTHONY DOMINIC

PHOTOS BY BRIANNA NEAL

Anthony Dominic: It seems you can't talk about space unless you talk about money.

Jon Secaur: Well, sure you can.

AD: Yeah?

JS: You can't talk about exploring it without money, but you can enjoy it real easily.

AD: Well, in April, the Obama administration revealed its proposed budget for the 2014 fiscal year for NASA.

JS: Right.

AD: The Senate and the House are still going back and forth about how much they're willing to allocate. The Senate has proposed $18 billion, and the House has proposed only $16.6 billion.

JS: Eh, a billion here, a billion there. [Laughs.]

AD: Well, the reality is that while Congress disputes $16, $17 or $18 billion, these figures still mean that we're spending half of 1 percent of the federal budget on NASA — whereas we spend more than 20 percent annually on defense spending. So whether one agrees or disagrees with this distribution, do you believe Congress is being representative of the public's interest in space exploration?

JS: Probably so. I mean, we have so many pressing problems here on Earth. It just galls me that the House just cut food stamps, for example. I'd rather see a billion dollars taken from NASA and put into food support for poor people. And you'll probably be asking me this later, but let me just jump to it now: I think putting people in space is really, really expensive. And we don't get much bang for the buck. So I think while it is not much in terms of the overall fraction of the budget, I think $16, $17, $18 billion is really a pretty good chunk to do some serious exploration. We can build a lot of really good space telescopes and probes for $17 billion a year.

AD: There have been a lot of criticisms of the late Space Shuttle program — for example, in that it was never cost-efficient. And there were so many safety concerns —

JS: There's always going to be safety issues when you try and put anything in space. It's such a daunting task. The poor Space Shuttle; it's smaller than the tank of liquid hydrogen and oxygen attached to it. It's one giant bomb — you're flying a bomb into space. It's amazing it ever worked at all.[1] One of the problems is the shuttle was designed first in the '70s. So that's part of the trouble; we should have made a new launch system, but we just kept riding the same ones again and again and again.

AD: Do you think it's a misconception among the public that only manned missions equal good progress?

JS: Oh, absolutely. I think it's really a shame to equate space exploration with human exploration. That, to me, is an aberration. It's just not an efficient use of anything — not an efficient use of people, or resources, or money or anything else. We did it in the '60s as a show to try to poke the Russians in the eye. There's something triumphal about the image of having our people standing on the moon. That's cool. But there was very little reason to keep going back, so they finally quit.[2] Once you go a few times, you gather some samples, you check out the theories about the moon, and you're done. But any of that could have been done with robot craft. Instead, we had to have people go pick up stones and hit golf balls.

[1] On Jan. 28, 1986, Space Shuttle Challenger disintegrated 73 seconds after launch, resulting in the deaths of all seven crew members. Since its first flight in 1983, Challenger had been used for 10 missions. On Feb. 1, 2003, Space Shuttle Columbia disintegrated as it re-entered Earth's atmosphere, resulting in the deaths of all seven crew members. Since its first flight in 1981, Columbia had been used for 28 missions.

[2] No one has set foot on the Moon since 1972. Apollo 11 was NASA's first manned mission, landing on the Sea of Tranquility July 20, 1969. There were five more successful manned missions through 1972, the last of which was Apollo 17, landing on Taurus-Littrow Dec. 11, 1972.

AD: So do you think that's what changed? We went to the moon simply because we were at war?
JS: Cold War, sure.
AD: And ideologically speaking, and in terms of technology, we were attempting to prove our superiority to the Russians?
JS: Absolutely.
AD: I mean, Sputnik was built from the empty casing of a ballistic missile.
JS: Yeah. See, I was alive then. In 1957 — I faintly remember, I was just a little kid — I felt so bad that the Russians beat us. And our first missile launches in the '50s were embarrassing. You can find old clips of them. The rockets take off and fall over and blow up. So by the 1960s, when Kennedy was elected, Russia was really ahead of us. And it was scary because if they can put satellites in orbit around us, that means they can have bombs coming down on us, too.
AD: Right. It was a national-security issue.
JS: Very much so. And it was terrifying to think that Russia was ahead of us in that way. It really showed a vulnerability and a weakness, many people saw it as. So I think that's exactly why we went to the moon. To show we in fact could do it and they couldn't — "ha-ha."
AD: And to really put this in perspective, like we were just talking about — NASA currently makes up less than half of 1 percent of the federal budget. In 1966, it made up more than 4 percent of the budget.
JS: Wow.
AD: Do you think that because space was a government priority, therefore it became a citizens' priority? There was a narrative? Us versus them?
JS: That is very well put. Yes, there was a national fervor. Going to the moon for exploration purposes had very little to do with it.
AD: In terms of exploration, do you think this is just all a question of money, or is it more complicated? Does $10 billion more to NASA mean that we are that much more likely to have an antimatter rocket or a functional solar sail sooner?
JS: Well, I suppose you could argue academically that you can't do those really cool things until you put a lot of money into it. But those things are so far away, especially antimatter rockets — they're so far away — there's no amount of money you can pour in now to make it happen any sooner.[3] I really don't think you could ever make a connection and say, "Well, if we spend $10 billion more this year, we'll have an antimatter rocket one year sooner." We don't know enough about it to make any kind of connection like that. And I'm not sure we need antimatter rockets anyway. We can explore our solar system with the rockets we have. We have one putting out toward Pluto right now.
AD: And Voyager 1 just exited the solar system last year.
JS: Yeah, and there's nothing to see out there. I mean, 40,000 years would be the time to get to the next star. Even [with] an antimatter rocket, it may be 1,000. But we're still not going to be around to see it. I'm all in favor of planting trees today so you have shade 10 years, 100 years from now. But I don't know if I'm interested in investing in something that will pay off in 1,000 years. I think I'd have trouble getting excited about something like that.
AD: So you feel that we need some more realistic short-term goals and that we shouldn't be distracting ourselves with antimatter technology and such?
JS: I think so. I think we ought to be building better space telescopes. The poor Hubble, when it was launched and needed glasses. What an embarrassment that was. [Laughs and playfully smacks forehead.] Oh, duh! And the James Webb Telescope. I don't know if that's — I haven't kept track — if that's going to go —
AD: I think the last word was that Congress was not in favor of funding it any further.
JS: Yeah, and see, that's something we could spend a few billion on. That would be worth having. The Hubble has been through so much, so the Webb Telescope would be the next logical step.[4] We need a good telescope in space — rather than sending people to Mars, which I think is really silly. And the Kepler Mission, for example, is so cool. Doing nothing but looking for stars being eclipsed by planets. That's exciting to have a mission do that full-time. And now it's quit working partly.
AD: Wasn't it a wheel or something?
JS: A gyroscope, yeah. It's sort of like a person in a chair like this. [Starts twisting chair back and forth.] You can turn and look left to right, but you can't look up or down. So if all the stars you want to see are right here, you can still study them perfectly. But if you want to look up at that one — oh, well, damn, that's unfortunate. But that's a great mission. Very, very productive. I'd like to see us build another one of those, or a better one of those, and put money in things like that.
AD: You bring that up — I had a chance to hear Natalie Batalha, who's part of the Kepler Mission, speak this summer in Chautauqua [New York].
JS: Did you really? She was there this summer?
AD: Yep.
JS: Oh, wow.
AD: And she said — which [Kepler] launched in 2009 — and since then, they've only been able to comb through about two years of the data they have collected. But she said from what they do have, they know that one in every six stars they've observed has an Earth-sized planet.
JS: Wow.
AD: And her exact words were: "Mark my words, that number is going to increase," as they get to look at more and more of this data.
JS: Yeah, I heard her on "On Being" Sunday morning on NPR, and they had a little clip at the end of it and talking about what happened to Kepler, and her saying they can still do some research, but even if the satellite failed completely, they still have years of stuff to go through.
AD: I know she's interested in looking at "Goldilocks zones," as she calls them, the place in solar systems where it's just right [for an Earth-like planet to exist]. And she was even talking about the step after Kepler. And that we could study the star light which shines through the atmospheres of different planets — with whatever [telescope] would follow Kepler — to determine what the atmospheres are made of.
JS: That's exactly right. The gases in the atmosphere absorb and re-emit light. And since light is re-emitted in all directions, it's as if, from our point of view, it's being absorbed. So you get little dark notches in the star spectrum. If you look for the star light shining through the atmosphere of the planet, for the brief time as it's happening, and you look at the difference, and you see where the notches are, the new gaps, you can tell exactly which elements are there. Spectroscopy's a fascinating tool for astronomy. So that would be the next thing to do.
AD: Right.
JS: I don't know if most people understand just how big the space is between stars. So going to visit stars — either that's something for 10,000 years or something we just don't even bother with at all. In Seven Ideas [That Shook the Universe], I teach that if the sun is reduced to the size of this light bulb [grabs light bulb off shelf and holds up], and you shrink everything else in the universe the same way, the nearest star would be another light bulb, and it would be in New Orleans — with nothing in between. And we can't even see that star because the bulge of the Earth gets in our way. The nearest star we can see is Sirius, and it's in Las Vegas.
AD: Isn't it like 7 light years away?
JS: About 8.3. Yeah. And you figure, it took Voyager since 1977 — 30 years — to leave the influence of the solar system. If the light bulb is our sun, the entire solar system would fit on campus nicely. And certainly even the magnetic influences, like maybe Portage County. So if it took 30 years to get out of Portage County and you're going to Las Vegas, well, you know —
AD: [Laughs.]
JS: There's no point in even thinking about going there — with people, certainly not, and not even with equipment. But good telescopes in orbit, not influenced by the Earth's atmosphere, can take us there by analyzing the light. So that's where our money ought to be going, I think.
AD: We agree that money is fundamental in advancing frontiers. How important is education is in this process, and how responsible do you feel as a professor at a prominent public university to educate people about science in general?
JS: I think as [Neil deGrasse] Tyson pointed out in his talk last night, science literacy — we've been battling this issue forever. And the more politics that gets tied up in scientific issues, the worse it gets. Climate change is such a good example — or such a bad example, however you want to look at it. The science is really incontrovertible, but because it's politically inconvenient, you have people denying that it's true. And what happens is the sense that truth is negotiable. And if truth is for sale, that's where things get really bad. When truth becomes a commodity you can buy and sell. So I really feel an obligation to help people be smarter about science so they can really discern between things.
AD: A lot has been written about the incompatibility of faith and science. And I

PHOTO BY JACOB BYK

[3] A solar sail is relatively new a method of spacecraft propulsion that utilizes solar power, as opposed to rockets. The Japan Aerospace Exploration Agency (JAXA) launched the first solar sail spacecraft to Venus in 2010, and NASA launched the second into low-Earth orbit in 2011. Antimatter rockets, however, are only theoretical, as they would require a means of effectively creating and containing antimatter. When and if this is possible, the energy produced by the collision of matter and antimatter particles would be exponentially greater than that produced by the combustion of liquid hydrogen rockets.

[4] The Hubble Space Telescope was deployed in low-Earth orbit April 24, 1990. It has captured unprecedented, now-famous images of star clusters and nebulas from thousands of light years away, such as "Pillars of Creation" in 1995. Congress considered canceling its proposed successor, the James Webb Telescope, in 2011, but instead capped the project's funding at $8 billion.

> "I'm all in favor of planting trees today so you have shade 10 years, 100 years from now. But I don't know if I'm interested in investing in something that will pay off in 1,000 years."
>
> **Jon Secaur**
> Assistant Professor

"CLIMATE CHANGE IS SUCH A GOOD EXAMPLE — OR SUCH A BAD EXAMPLE, HOWEVER YOU WANT TO LOOK AT IT. THE SCIENCE IS REALLY INCONTROVERTIBLE, BUT BECAUSE IT'S POLITICALLY INCONVENIENT, YOU HAVE PEOPLE DENYING THAT IT'S TRUE."

Jon Secaur
Assistant Professor

know you're a person who believes that's not the case.

JS: In fact, what I want to do, I want to send a little present to Tyson. I want to buy him a View-master. To me, the View-master is a great metaphor of how science and religion can operate together. You know how they work — there are two images that are very similar but not identical. If you look through either eye in a View-master, you get a nice flat picture, but the objects are shifted slightly in one eye compared to the other. So the differences in the two images generate the third dimension in your head and you see the wonderful sense of depth that's there. To me, science and religion are like that. They're like the two eyes, the two sides of the View-master. You can be a complete atheist and look at the universe and really, really like it and see all the wonderful stuff out there. Or you can be a complete nonscientist and appreciate the universe. Or you can be a religious person and you can combine those two images and have a deeper joy, a deeper appreciation for what you're seeing. Were you here for [Tyson's] talk yesterday at 3 p.m. in the planetarium?

AD: No, I wasn't.

JS: Somebody asked him about that. In fact, he kept it until the last question. And he said — which I started people applauding for — fundamentalist religion is what's opposed to science. The trouble with fundamentalists looking at science is they take the Bible as if it's scientific truth, which it was never meant to be. Any science in the Bible is cool, but it's not science in the way we have it now. Science in the way we have it now started with Galileo. And so using our understanding of science today to look back at those writings is just plain silly.

AD: How do you articulate that to the public, to people of faith who feel antagonistic toward science? Who feel like science is eroding their faith? That we make this scientific discovery, and that crosses this out in the Bible, or this crosses that out?

JS: I don't get much chance to, because the church I go to is all people who pretty much agree the Bible shouldn't be taken literally. But if I do, I refer them to a favorite book of mine. It's by a Catholic layperson. It's called "And God Said What?" by Margaret Nutting Ralph. Heard her speak one time years ago. It's a very accessible, easy book. And what she does is look at the different literary genres of the Bible. People who don't know better think of the Bible as one book, and they think all of it is absolute fact, as if it's news reporting. It'd be like looking at Sunday newspaper. Anybody with a brain knows they're different parts of the paper. There's the ads, there's editorials, there's the comics, there's the news, there's the sports, there's the classifieds. Nobody with a brain would read it all the same way. No one would say the comics are literally true. They may be really true. Like, you may look at a comic and say, "Boy that's really true. That's exactly how I act." But nobody believes it's literally true. It's obviously fiction. But wise people look at the Bible and realize there's 60-some books in there and know there are different kinds of literature. And her book is the whole idea that some are fiction on purpose. "The Book of Jonah" is fiction, damnit. It should not be taken literally. "Jonah" is a comedy, a farce. It should be taken as a big joke. It's hilarious. The point of Jonah is to show how silly the Israelites were to believe God only cared about them. The whale is invented just as a technique to get Jonah back to Nineveh in Babylon. A whale didn't actually swallow him. I mean, Jonah sings a hymn of praise to God in the belly of the whale. Who would do that? B

PHOTO BY JACOB BYK

PHOTO BY LEAH KLAFCZYNSKI

AN ASTROPHYSICIST EXPLAINS THE FUTURE

During his visit to Kent State, Neil deGrasse Tyson shared his observations, predictions and opinions about where America is heading in regard to scientific progress.

BY DYLAN SONDERMAN

In a secluded conference room in the back corner of the Science research building, I awaited the arrival of Neil deGrasse Tyson at 2:30 p.m. on Sept. 25, 2013. Tyson, an astrophysicist and the Frederick P. Rose Director of the Hayden Planetarium in New York City, was coming to give a short press conference with Kent State student media. He was going to speak on Kent State's campus later that same day as part of the Presidential Speaker Series. The goal of his presentation (titled "An Astrophysicist Reads the Newspaper"), in his own words, was to share the unique outlook of his own "professional life trajectory" as a scientist.

When Tyson entered the room, calmly and without fanfare, he came over to the table and sat down right in front of me. He spoke with candor and ease, answering my questions to the best of his abilities. Tyson is well-known in not only the scientific community but also in the public eye. He has authored several books on astronomy and cosmology, advised the government in various capacities on scientific matters and, perhaps most famously, led the shift in thinking of Pluto as a dwarf planet.

"True explorers do not need to be encouraged," Tyson said when questioned about the idea of encouraging people to take an interest in space exploration. "They have the pure urge, and the people that fund them have geopolitical urges. It is this combination that makes it happen."

Because there are not the same geopolitical motivations for further exploring space today as there were during the Cold War, the true explorers of this generation might be in for a wait before pursuing their inclinations. Relating to America's current prospects, Tyson lauded NASA as the "future of the nation" and referenced his address to Congress about increasing the amount of funding allocated to them; though he also says he feels that the organization needs to be "more ambitious" in its endeavors. (He referred to space-shuttle missions as "boldly going where hundreds have gone before.")

"Cutting back on university science programs is bankrupting the future of our country," Tyson said. Immediately after the press conference, we went next door to Smith Hall, home to Kent