



THE STUFF OF GODDARD'S DREAMS: Goddard's Legacy & NASA's Journey to Mars

Remarks by

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Good morning everyone ...

I always enjoy the Goddard Symposium, and it's not simply because of the great breakfast. It's because of what the American Astronomical Society means to NASA, to space exploration in general and to the sort of world we'll be leaving to our children and grandchildren.

You, as much as any organization, understand that sending astronauts to Mars ... pushing further into the universe ... expanding the outer bounds of possibility ... these things take more than mere *innovation* alone: they take *imagination*.

With the box office success of *The Martian* this past year and all the wonderful buzz that surrounded *New Horizons* close encounter with Pluto – and more recently Scott Kelly's return home from his Year in Space – it seems like every day there's something new that reminds us that getting American astronauts to Mars is not only a matter of space science, but also social science.

Yes, we need planetary scientists, physicists, policymakers and all the other usual suspects, but perhaps most importantly, we need the public. One of the great joys of my job as Administrator is that I get to meet with students and teachers all the time and to remind them that everyone is needed when it comes to our Journey to Mars. By "everyone," I include educators, engineers, nurses, painters, poets, bankers, bakers, biologists, botanists, and loving parents – the whole nine yards.

Robert Goddard himself was inspired by reading H.G. Wells' science fiction. I was shown a letter he wrote to Wells and it's absolutely stunning how relevant it is to the sort of things we're attempting to do together with our many partners today.

Let me share with you just a brief excerpt – and I quote:

'In 1898 I read your War of the Worlds. I was sixteen years old [and] it made a deep impression. The spell was complete a year afterward, and I decided that what might conservatively be called 'high-altitude research' was the most fascinating problem in existence. The spell did not break, and I took up physics ... how many more years I shall be able to work on the problem I do not know; I hope, as long as I live. There can be no thought of finishing, for 'aiming at the stars,' both literally and figuratively, is a problem to occupy generations...'

Just as reading *War of the World's* captured young Robert Goddard's imagination, as we speak, children in classrooms all across our country are having their imaginations sparked when their teachers show them Scott Kelly's pictures from the Space Station or *New Horizons'* pictures of Pluto. Every time this happens, we get a little closer to sending American astronauts to Mars.

Every time a grandparent takes their little granddaughter or grandson to the Air and Space Museum or to a planetarium or even to a sci-fi movie; every time a young person shares a Facebook post about Scott Kelly; every time a not-so-young person gazes at the amazing images that he's put on Instagram; it gets us a little closer.

For more than half a century this is something that the American Astronautic Society has understood intrinsically.

You are one of the reasons that I'm able to stand before you here today and so that we are closer today than ever before in human history to sending American astronauts to Mars!

Now, you're going to be hearing from several of my NASA colleagues today and I know they plan on talking about all the wonderful work that we are doing in so many different areas, from Earth Science to education to pushing further into our solar system and beyond.

Since I know it's a little too early in the morning for you to be lectured, I instead want to use my remaining time to just put all this into some perspective.

With this in mind, I thought I'd share just a few more of Robert Goddard's own words – and I quote:

*“On the afternoon of October 19, 1899, I climbed a tall cherry tree at the back of [my uncle’s] barn ... It was one of those quiet, colorful afternoons of sheer beauty which we have in October in New England and, as I looked toward the fields to the east, I imagined how wonderful it would be to make some device **which had even the possibility of ascending to Mars** ... I was a different boy when I descended the ladder. Life now had a purpose for me.”*

If you think about it, for as long as human beings have known about Mars, and as long as little boys and girls have been climbing trees, people from all walks of life have shared Robert Goddard’s dream of ascending to Mars.

This is a dream that members of this organization have held for as long as there has been an American Astronomical Society. It’s a dream that has been shared by Presidents since Dwight Eisenhower and, I can attest personally, it is a dream that has been shared by NASA astronauts for as long as there have been NASA astronauts.

Today, after generations of dreaming, we have a clear, attainable, sustainable plan for sending our astronauts to Mars, and you don’t need to climb any cherry trees to see it.

In 2010, President Obama challenged NASA to send American astronauts to the Red Planet in the 2030s. Fast forward to 2016 and there is a new consensus emerging in the scientific and policy communities around our plan, the timetable and the choice of Mars as a destination in the first place.

Less often are folks asking, *“Why aren’t you doing things my way?”* or *“Is Mars the right destination?”* Rather, they’re asking, *“How can we be a part of this?”* and *“What are some areas where we can work together?”*

Any of us would be sore pressed to think of a better example of this cooperative spirit than the International Space Station, which, the record will show, President Obama has now extended twice through 2024. A child age 15 or younger has not known a single day on this Earth when astronauts and cosmonauts from numerous countries haven’t been living and working together off Earth aboard the Station. I truly believe it ought be considered for the Nobel Peace Prize. Just think for a moment about the significance of the fact that tens of thousands of people from 15 countries have been involved in its development and operations, or that it has hosted more than 17,000 research investigations from researchers in more than 83 countries.

On a personal level, I must say that it was one of the highlights of my many years with NASA to be able to welcome Scott Kelly home last week after his year in space. I’ll

tell you this; the impact of this year in space will last for years to come. It will truly be felt all the way to Mars.

Scott's mission encompassed 5440 Earth orbits and more than 143 million miles traveled. This happens to be in the ballpark of the Journey to Mars itself – and no, that's not coincidence. We designed it that way for a reason. You see, we are working hard every day to learn more about the effects of long-duration spaceflight on human beings and use this knowledge to help us develop all sorts of new technologies

One of the happy coincidences of the times in which we live is that these technologies not only drive exploration; they oftentimes drive job creation and economic growth as well. That's one of the reasons that our friends in business and industry have shown such great enthusiasm in working with us – and we with them. In fact, we help businesses transfer thousands of technologies a year into the market.

One of the most significant developments in our partnership with industry is around commercial space and the President's strategy for growing the nascent market in low-earth orbit.

Let's be honest, few would have imagined back in 2010 when President Obama announced his strategy for partnering with commercial carriers to return the launches of cargo and crew to American soil, that less than six years later I'd be able to stand before you and present such impressive numbers: Commercial carriers have now transported 35,000 of pounds of space cargo (and counting!) to the International Space Station (ISS).

Meanwhile, we're firmly on track to return launches of American astronauts to the ISS from American soil on American commercial carriers. What's more, our neighbors across the country are working at more than 1,000 companies across virtually every state on NASA's commercial space initiatives.

In crafting this strategy, the President sought to create a new commercial space market in low earth orbit while developing a sustainable and affordable system for resupplying the Space Station with cargo and crew. At the same time, this would free up NASA to work simultaneously on the vehicles and technologies necessary to get our astronauts to deep space.

We've been doing exactly that; hitting important benchmarks with new exploration systems like the Space Launch System rocket (SLS) and *Orion* Crew Vehicle, which will, possibly as soon as 5 years from now, carry our astronauts into deep space.

Our plan calls for spending the balance of this decade working in low-Earth orbit in what we call an “Earth Reliant” stage with our crews merely hours away from return to Earth. We’ll graduate to what we call a “Proving Ground” stage in the 2020’s and spend much of the that decade in cis-lunar space – the area around the moon – where our astronauts are several days away from Earth. After that we move onto the “Earth Independent” stage – which is self-explanatory. That’s when we’ll send our astronauts to Mars where they will be months from home.

As I wrap up, I just want to make a final point about what all this can mean in terms of our children and grandchildren. Because, when I think of the world in which my granddaughters will be raising their own children . I see a world where their kids view human beings living and working on Mars as a fact of life (much like they view living and working on the International Space Station today).

It will be a future in which NASA and its international partners are using Mars as a stepping-stone to the rest of the solar system.

I see a future, where a robust private space industry is launching human beings, cargo and satellites of all sizes to space at a significantly lower price-point – thanks to the work we’re doing today to make launches more affordable and to advance emerging small-satellite technologies like “CubeSats” and “Nanosats”... a future where our grandchildren’s children are drinking cleaner water, breathing cleaner air and making use of cleaner energy, because of NASA’s work on Earth Science and all sort of sustainable technologies.

I see a future where fewer Americans are losing a sister or a son because the medical technologies we prefect to protect our astronauts from exposure to radiation on a long-duration spaceflight help revolutionize medicine.

I see a future in which the technologies we’ve developed to detect signs of life on other planets continue to help emergency workers listen for beating hearts in the rubble after a disaster; a future in which the stunning images being sent home to us from the James Webb Space Telescope teach my granddaughters and their kids more about our universe than has ever before been conceived; a future where maybe, just maybe, humanity finds the answer to the age-old question of whether we’re alone in the universe.

President Obama has set us on a visionary course; it’s my sincere hope that future leaders from all sides of the political spectrum see it through, because I truly believe the sort of future I laid out is well within our grasp.

I began today by talking a bit about Robert Goddard. You know, when he first started publishing his research and telling people about his belief that we'd someday be able to send a rocket all the way to the moon, people laughed at him.

The press nicknamed him "moon man." Others called him "moony" and "moon mad." Some folks actually wrote songs making fun of him. Others mocked him in cartoons. I shudder to think how he would have been treated in our Internet age!

Yet, as history looks back at him, nobody's laughing now.

Nearly seven years ago when I became Administrator of NASA, there were people who, when you told them NASA is going to send astronauts to Mars, they'd look at you as if – well, as if you had lost your mind. It brought ridicule on both ends of Pennsylvania Avenue. Now you tell that to people like my grandchildren and they respond: "*Why stop there?*"

Sometimes people ask me, "*Why are you so optimistic all the time?*" It's because of this enthusiasm I hear in the voices of my grandchildren and because people like you and your members are out there continuing to believe in an incredible future.

It's because people all over the world are looking up – just like Robert Goddard – and imagining a future where we have a permanent human presence on the Red Planet and it's because every day I get to work with the most remarkable people who have dedicated themselves to make the impossible possible and turn science fiction into science fact.

Thank you for all you are doing to share hearts, minds and imaginations across our country and around the world!