APOLLO + 50

Five More Conference Presentations

The following are edited transcripts of five more presentations at the Schiller Institute Conference on July 20, 2019.

'My Favorite Part is Getting People Excited about Science'

by Andrea Jones

NASA

Andrea Jones

Speaking via a live feed from the Apollo 50th anniversary celebration on the National Mall in Washington, D.C., Andrea Jones—Planetary Geologist & Education Specialist, NASA Solar System Exploration Division—reported on the celebration in the nation's capital. She also fielded several questions on the continuing progress in U.S. space exploration, and its importance for awakening that which is best in people.

It is my sincere pleasure to be there with you in spirit from the National Mall. I'm the Solar System Exploration Division public engagement lead, so I work with all of our planetary science missions and research teams and try to share the science that we're doing at NASA with people like you. Here on the National Mall, behind me, there's a giant Moon map where people can walk on the Moon on the National Mall. We have guided tours of lunar sites with NASA scientists. We have Legos out here, we have Ready Jet Go! and we have people from all over the entire agency here celebrating this great anniversary. Because it is a human triumph, and it is a triumph internationally for everyone, and also for all of NASA.

The lunar landing began it all, and it's wonderful to be here on the Mall where we can show people how the distance that they're walking across the grassy area is about the distance that we first were able to go on the Moon. But with more technology and more confidence as we explored the Moon further, by Apollo 17 we were able to land in a canyon deeper than the Grand Canyon, and with our lunar rovers explore even more of the surface.

We're getting ready to do that again as we're heading towards the Moon with Artemis. We're going to be doing future explorations, and we're using our current assets like the Lunar Reconnaissance Orbiter, which is a mission at the Moon right now, today, to build on the legacy of Apollo, use our current exploration assets to prepare for future exploration of the Moon. We view the Moon as a place to really test out our boots and check the leaks in our tents before we head on to Mars. It all starts here on Earth, and it all starts with the people in your room, the people here on the Mall who get excited about space and science and exploration, and then share it through forms of art, through music, through cultural expressions.

Following her presentation, there were several questions; we present two of those interchanges here.

Question: My question is, from our last visit to the Moon to now, what have we learned as a nation, as scientists moving forward to return?

Jones: What a good question! There are so many things, but I'll just choose a few to highlight, because I really think that this could take forever. Some of the things we have learned most recently are with our Lunar Reconnaissance Orbiter (LRO). That is at the Moon right now; we just celebrated ten years at the Moon in June. Fifty years of Apollo, ten years of the Lunar Reconnaissance Orbiter. With that mission, we are rewriting the textbooks of lunar science.

Before LRO launched, we had thought that the Moon was essentially a geologically inactive place. We thought most things had happened on the Moon a long time ago, and we were just going to go read those records. But what we have found is that the Moon is still an active place today. We are watching new

impact craters form on the lunar surface all the time. We keep monitoring that, and it turns out the lunar surface is turning faster than we thought, which has implications for future exploration, because you have to build to maintain structures that will last through a heavier bombardment of especially micro-meteor impacts than we had anticipated. So that was really important.

We've also found evidence of recent volcanism; recent being again on the scale of millions of years. But given that the Moon is billions of years old, finding volcanism that's millions of years old may mean that it could even continue to happen today as well.

We're also finding more evidence of water on the Moon. From the Apollo samples, we actually did have water in them; but our technology at the time was not able to identify that water, or at least not definitively. Now we have new technology that allows us to do better analyses of the samples that we brought back 50 years ago. We have evidence from remote sensing from radio telescopes from, again, our Lunar Reconnaissance Orbiter, from the Moon Mineralogy Mapper on the Chandrayaan-1, that has helped us understand that there is water all over the surface, especially at the poles. Which is one of the reasons that we're driving towards the poles, especially the South Pole, with our next lunar missions with people. So, *so* many things; but those are some of the highlights from recent days.

Moderator: Andrea, could you tell us why you got interested in space? How it happened, and why you do what you do?

Jones: Well, I'm a scientist, that's my calling. But I grew up camping and hiking and learning about the world at the beaches, in the mountains; wondering why are the oceans where they are, and why are the mountains getting taller in some places and getting shorter in others. Then my parents took me out West, and I got to see the night sky in a way I had never experienced. I was just awed and inspired and amazed that there were worlds outside in this huge galaxy that I had never even really thought about. So, I got into geology; I wanted to study the Earth, and then I really wanted to study the stars as well. I found this field called planetary geology, where you can combine your love of the Earth with your love of space and put them together.

I went back to graduate school and did my graduate work in planetary geology and with the HiRISE Camera, the High Resolution Imaging Science Experiment on the Mars Reconnaissance Orbiter. From there, I just couldn't get away from space missions, so that ultimately led me to NASA Goddard. It has been a great ride, but really the story is that I love science, but my favorite part is getting other people excited about science. So now I get to stay informed with the science, but really what I get to do is get other people excited, and that is just the best job I can possibly imagine.

'There are Things We Have To Do Together'

by Dr. Xing Jijun

EIRNS/Sylvia Spaniolo

Dr. Xing Jijun

Dr. Xing is a Counselor and Head of the Science and Technology Section of the Consulate General of the People's Republic of China in New York. He spoke about the progress in China's space program and the economic transformation of China over recent decades—but transcending these specifics, he emphasized the change in thinking, in human identity, which is now required from people all over the world—such that we can all live together, cooperate, and progress into the future. The following are edited excerpts from his presentation.

A half-century ago, a great moment was accomplished by three astronauts from NASA. Their action created a great moment, which of course belongs to the three of them, and to the American people—but not only. It also belongs to all human beings. Our Chinese people belong to this, and even today, this week, also in China, we are having a lot of activities and events to celebrate, and to commemorate this great moment. It's a great pleasure for me and my colleagues from the Chinese Consulate General to be present here today. We were asked to provide some remarks about China's space program. And later, we will share with you a very short video to introduce the Chinese space program and activities.

Before that, I would like to say a few words: As

human beings we really want to share with everyone a lot of things that we have already done, and what we need to do and have to do in the future together. People talk about a "space race"—and of course, whenever you're talking about a "race," you think about competition. Well, competition is very important, for the market, for many things, but *cooperation* is also important. Especially for space exploration; without *cooperation*, success will not be possible.

These three American astronauts were supported by many thousands of people, in NASA and in other fields. They did their pioneering job, but for further exploration of space, we should mobilize all peoples to join in. We face a lot of challenges, many challenges. The first challenge is that we have to change our mindset—that's my understanding. I have three points to bring up. The first: We should be friendly to all people on this Earth, on our planet. We should be friendly to nearby people and to the people far away. Simply by doing that, you make people happy, because no matter where you go, when you are friendly to people, people are then, likewise, friendly to you. This is mutual benefit.

Secondly, we should respect knowledge, science, and research, because without knowledge, without research and innovation, it will be impossible for us to go into space, to go to the Moon, or to go to Mars.

The third point is: it's very important to be optimistic about the future. People have already mentioned this many times in our discussion today. With people working together, with people-to-people discussion of their scientific advances and technological developments, we are all sure to have a great future.

Taking these three points together, we see that as human beings, we are all the same. If someone from outer space were to come here, they wouldn't care about your color, or whether you're tall or you're short. We are all human beings to them. If a problem arose, they wouldn't care whether you were from China or from the U.S.A. So, only when we work together, can we can strengthen the capacity to conquer any challenges that come from anywhere.

There is a dream in force in China, a space dream: We want to work together with our international colleagues, especially with our colleagues in the U.S.A., to explore things outside our Earth, even beyond the Moon. We have already sent our rover to the far side of the Moon, and this year, there are some more initiatives, and in a few years, hopefully, we'll go from Earth to Mars.

So when I talk about the Chinese dream of space, that dream goes back long, long ago. We have stories, fairy tales, a lot of stories about a beautiful girl who wants to find a lover, who longs to go somewhere else to have a better life, to go to the Moon or beyond. There are so many stories. We have learned much from such stories. That is the driving force for China to work together with other people, and to do many more such things.

Human Technological Progress, Like Photosynthesis, is a Principle of the Universe

by Krafft Ehricke

Krafft Ehricke presented "Lunar Industrialization and Settlement—Birth of Polyglobal Civilization," to the conference on "Lunar Bases and Space Activities of the 21st Century," Conference of the National Academy of Sciences, Oct. 29-31, Washington, D.C., 1984. A video segment was played at the conference.

Technology is not the solution to our own shortcomings. To do that, we have to grow, we have to mature. But technology often can make it easier. If you have a no-growth philosophy and if you regress into the Middle Ages, then you create an environment in which that, what you are asking the human being to do—namely to live with less, to exist very modestly, and be this and that and the other thing, and not to grow—is impossible, because a dog-eat-dog fight is bound to break out under those conditions. We've come too far. We have to go on. Life shows us that technological advances are the road to go. But based on those technology advances, have to come the advances of the species and the advances of our civilization.

In the first formation, in the light of the young Sun, there was no control, by anybody, over the generation of inorganic matter. Earth was like a gigantic flower, which soaked up solar energy and also utilized other energy to establish basic organic compounds, and amino acids. When life began to stir here, there lived, made of those fossil assets, Haldane's famous "soup that ate itself up," or something similar to that. Eventually those resources ran out. The first great crisis of life on this planet occurred, because those compounds were living off previously generated organic substances—

Courtesy of Krista Deer

Krafft Ehricke speaking on "Lunar Industrialization and Settlement—Birth of Polyglobal Civilization" at a 1984 conference.

and eventually off each other. Heterotrophic cells living off the autotrophic cells. The forerunners of the plant-eating animals were the heterotrophs and the autotrophs were the forerunners of the plants.

It was then, that we saw for the first time, two things: That what seemed to be an absolute limit to growth, was no limit to growth. It was a hindrance that had to be overcome and was overcome by technological advance—incredible technological advance, namely photosynthesis. And secondly, that life, and metabolism—if it is to have endurance, has to endure over long periods of time, and cannot rely on the results of the preceding sphere, of the preceding generation of materials.

Industrial Revolutions by Life and Mankind

And so, we cannot rely on fossil fuels forever, obviously. That's a very analogous situation. We have to start going to the primordial energy resources, which are so abundantly all around us, and in the atom. Technological advance occurred by the generation of an enzyme in the photoautotroph, which ultimately led to the chlorophyll molecule, and the chlorophyll molecule and photosynthesis inaugurated the first industrial revolution on this planet.

This industrial revolution did what we are doing now: It realized that it cannot be totally planetogenic. It had to go to space resources. It went to the solar resource. Since it couldn't go out into space—biological technology does not lend itself to going out into space—it took that resource from space that came to Earth, solar radiation. Solar radiation became the fourth element, so to speak, of the new environment of life: water, land, and air, and radiation.

With photosynthesis, life developed control over the basic staples of life. Life created out of primordial materials—CO_2, and water. With the aid of solar radiation, life changed solar radiation to chemical energy. And with that, the basis on which everything else relied was created, including the parasitic oxygen metabolism, which replenishes the only primordial resource in short supply, namely, CO_2.

So, in the womb of what was created here—the highly negentropic biosphere, an immensely complex system of ecological niches that developed, over time, to encompass an entire planet, and industrialize it, and process its energy and its materials—in the womb of this biosphere arose then the human being as the seed of the next higher metabolism.

Each sphere, each large environmental sphere (some of which took on planetary proportions, and others had subplanetary proportions), has to have one umbilical metabolism: I call it an umbilical metabolism, because it is that kind of metabolism that interacts between the negentropic sphere, and the entropic wilderness on the outside. It was photosynthesis that did this. Oxygen metabolism is not an umbilical metabolism. It's parasitic. It eats other animals, and it consumes plants. Animals and humans, being in this respect the same, rely on the umbilical metabolism of photosynthesis, and some other fermentation metabolism such as nitrogen fixation, but the primary one is photosynthesis.

In that respect, the human being is not so much a descendant of the ape or proto-ape; the human being is actually the descendant of photosynthesis, because information metabolism is the first metabolism that actually can interact with inorganic matter and therefore is an umbilical metabolism; and is broader, even, than photosynthesis, because we can interact with nuclear matter, we can build a chemical industry of vast proportions, although chemosynthesis has done that, too; we will in the next century, I'm sure, build up an atomic industry of enormous proportions—and a subatomic industry; and a quark industry.

This goes far beyond that. And for this, and some other reasons, information metabolism transcends planetary limitations, and is *the* metabolism on which life moves now over into space itself.

A Space and Science Policy is the Alternative to War

by Krista Ehricke Deer

Krafft Ehricke's eldest daughter, Krista Deer, was challenged by the conference moderator, Dennis Speed, to describe for the conference what it's like to be part of the family of a genius.

EIRNS/Sylvia Spaniolo

Krista Deer

This is quite an intriguing subject. Having my dad around on a daily basis, there was never a moment that was not an opportunity to learn something. We grew up with relief maps in the family room, so if we had a question about anything geological or geographical, my father would say, "There's the map, go up there and look for it." It helped me with school. I got there and I already knew where India was, where somebody may not have known that.

My dad was like a mentor to me. He was a very easy person to grow up with, very even tempered, and available. We would go for a walk at night, his eyesight was failing, he couldn't look up and see everything in the sky any longer; but whatever time of year it was, he would tell me everything that was in the sky as we walked. Our walks turned into learning about the stars and the constellations. He never even looked up, he just knew. "It's August, so look for this." I enjoyed that a lot. It made us go for more walks.

We did not waste time. My mother had to go to Germany to help a friend get out of East Berlin. During that time, my dad and I drove together in the summer from Buffalo to San Diego, where he had been working. I was between third and fourth grade, and I learned my multiplication tables on that trip. He worked with me on that trip, it was fun. I got into fourth grade and I knew everything about multiplication.

We had to be very quiet in the house. I have two sisters and we were not allowed to make any noise around the house when he was working in his study. My solution was to go into the study with him and lie on the floor—I got to be with him that way—and I don't know how many times I read *The Rise and Fall of the Roman Empire* in his study.

My dad definitely believed in no limitations: Man has no limitations except those he imposes on himself. It is not just the Earth that belongs to mankind, it is all of space. He believed that it was your rightful field of endeavor and activity to go to space. By expanding life through the universe man does fulfill his destiny, man is programmed for exploration, rather than being glued to Earth forever until we run out of everything and everyone's looking for resources, going to war. So you better get going.

In 1971, he compared mankind that stayed closed, and had no growth, with space-exploration vectored growth. No growth leads to poverty, competition for resources, and ends in war. We're seeing some of the things already that are on that chart.

But he not only presents a problem, he always has a solution to what he tells you. Always.

Ten years later, in 1981, he toured Germany with Helga Zepp-LaRouche. He was attacked for his progressive positions on what needed to happen. Very militant, even violent environmentalists, came into a hall where he was speaking and verbally attacked him. The police had to be called and have them removed. It was horrible. When he came back from the trip to Germany, he said it reminded him of Germany in the 1930s. He was very disappointed.

After that, he kept talking about the solutions to our problems. He presented a comprehensive solution to environmental and other problems caused by no-growth policy. Unfortunately, we're following the no-growth policy right to the letter. The result doesn't look so good.

The solution is the open policy of utilization of space. This means bringing life to the Moon, the industrialization of the Moon. He envisioned fusion power plants to power a city on the Moon, called Selenopolis, a fully functional city, large enough for tens of thousands of people.

It's critical to continue this fight to advance the evolution of mankind. If we don't want to just go to war all the time in resource wars. We just need to get going. We need to convince the right people; and make it part of our economic plan, not an extra piece, but the driving force of it.

Genius Lights the Way

by Wade Goria

Wade Goria is an expert on Alexander Hamilton, published author, and principal lecturer at the National Lighthouse Museum.

EIRNS/Sylvia Spaniolo

Wade Goria

It's the job of good government to harness the energies, the entrepreneurship, the intellect of great people in order to achieve great things. Going to the Moon, going to Mars—what does this have to do with lighthouses? It's not because they look like rockets. It's because lighthouses light the way to the sea.

Let's look at two great geniuses. First, Alexander Hamilton, a guiding light of American commerce. Alexander Hamilton is one of those great people who was able to fashion one of the greatest countries in the history of the planet. Hamilton grew up on the island of Nevis and would later live on St. Croix. He was a very sensitive, very engaging child. Most people who knew him as a young boy described him as a very kind and understanding young man. He did not come from the poor struggling background that a lot of people would like to fashion that he did. He had difficulties, but had an extraordinarily gifted mother, who came from a French Huguenot background, who taught him fluent French.

The Marquis de Lafayette was very complimentary of Hamilton's French. Hamilton learned all about French culture, the French economy, and he learned all about the business of Beekman and Cruger. At 14 he was literally running an accounting house involved in every imaginable activity. There is no founding father that had this kind of background. He had intimate knowledge of the business of rope, lime, cattle, timber, bread, flour, rice, pork, black-eyed peas, corn, porter, cider, pine, oak, hops, shingles and lampblack, which is a resin that was used in ink. He knew all about these products, where they came from, what they did in the economy.

As Secretary of Treasury, he issued a series of reports that I'll briefly summarize here. One was his report on credit. The others were on banking and manufacturing. One of the things he understood is that credit is one of the most important things not only for a person but for a nation. And unless we had good credit, we would not be able to borrow money at low prices, there would not be trust, there would not be the kind of conditions that would create entrepreneurship and trade and commerce. So he wanted to make sure he restored our credit, he wanted to give the country a solid banking foundation. He created a mint so that we could have a unified currency. And his Report on Manufactures is really a very important thing.

Hamilton also became the Superintendent of the U.S. Lighthouse Establishment created on August 7, 1789, a full month and a half before he became Secretary of Treasury.

The lighthouse bill created the first infrastructure in America. At the same time, Hamilton's creation of the Society for Establishing Useful Manufactures was critical to the establishment of Paterson, New Jersey, which became the embodiment of manufacturing and industry that Hamilton brought forward in the United States.

Fresnel's Revolutionary Lights, 1841

Members of the Navy and Coast Guard were constantly complaining in the early 18th century, "We can't see those lights, they're invisible, what are you going to do about it?" The solution came from French genius Augustin Fresnel, a true embodiment of the Renaissance. Fresnel recognized that improvements could be made. Isaac Newton had relied on a particle theory of light. It was Fresnel's wave theory of light that revolutionized our concept of light, and his breakthrough—and the invention of the Fresnel lens—made possible the power of the lighthouse in Navesink, New Jersey.

It produced a light equivalent of 900,000 candles, and can be seen 75 miles away. It made nautical entry into New York Harbor safe and very operational. The Fresnel light would open up new sea lanes never before used. The concomitant invention of steam technology, along with the screw propeller, saved the Union in the Civil war. These developments created a global system of tremendous wealth and power, and it is that wealth and power that would eventually allow a man to land on the moon 50 years ago, which is why we're here today.

So I think we all owe a great debt of gratitude to Alexander Hamilton and to Augustin Fresnel, because they were true geniuses who helped to make all this all happen.