Moons

The future of lunar exploration

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For the past 20 years, I've been interested in what the requirements are and the technologies needed to send people back to the Moon and to live there on a permanent sustainable basis. The ultimate justification for sending people into space is to create multiple reservoirs of human culture. In other words, what we found through the study of the lunar samples and through the geology of the planets is that impact, the collision of solid bodies, is the fundamental process that builds the planets. And it still operates to this day. And we've seen the effects of impact in the fossil record, where they have been responsible for massive extinctions of life throughout the history of the Earth. Species that are confined to one planet are ultimately doomed. And so the primary motivation for sending people off planet is to create multiple reservoirs of humanity so that if, for some reason, the Earth ever suffers a major catastrophe, the human race, and its culture will survive. Right now, we're sort of in the prospecting phase. We're trying to assess where the resources are in the Moon, where the best sites to go are, what their environment is like. I would imagine within the next 10 to 20 years, we will have those areas known to a fairly high degree of fidelity. And at that point, we'll want to put machines down. First machines that will be operated by people remotely from the Earth, and then finally, people on the surface to make sure those machines continue to operate properly, to be maintained and serviced. And so at that point, when there's a need for human presence to assure that our automatic systems will continue to function, that's the point at which people will start to live on another world.

Right now, space missions are conducted where you bring everything that you need with you, which means it all has to be launched from the surface of the Earth. And at several thousand dollars per kilogramme to get material into Earth orbit, that makes space flight very expensive. So what you want to do is to find and identify the most useful materials and energy first and develop an infrastructure that can harvest that to use in a spacefaring system. Now it turns out that on the Moon, what we've found in the last few years is that there's abundant water at both poles of the Moon. But in addition, there are places near the poles of the Moon that are in near constant sunlight. So they allow us to generate electricity through photovoltaic cells. So we have electrical power - a form of energy - and we have water - a critical material. So the poles of the Moon are the oases in the lunar desert. They're the places where we can go and live sustainably. So the first

step to get there and actually use this material are machines that can find, harvest this ice-bearing dirt, process the water out of it, and then separate the water into its component gases to use as rocket propellant. If there's as much water at the poles as we think there is, it's literally worth trillions of dollars. The water that would enable you to build a reusable and extensible spacefaring system could effectively give you access to any other point in the Solar System. A very powerful and economically valuable resource in the Moon is the dirt. You can use that material to shield human habitats. You can use it to build structures. With very simple chemical processing, you can extract metals from the lunar soil. There's a lot of iron in the soil. That native iron on the Moon has the properties of stainless steel. There's no atmosphere, so the iron won't rust. It'll last forever. It's literally unlimited, the amount of potential resources on the Moon. The only limitation is our own imaginations.