

Morgan's Road



Torn

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Morgan's Road

By Torn MacAlester

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To My Wife,

Thank you for the inspiration and encouragement.

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Morgan's Road

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Nelson awoke with a start. Blinking, he looked around the interior of his lunar homestead. In the dimness, he saw a call light at the entrance to the airlock. He leaped from his bed all the way to the airlock and pressed the answer key. “Yes?”

“It's about time,” said a garbled male voice. “Can I come in?”

Nelson looked at the exterior feed and saw a spacesuit-clad figure at the airlock's outer door. The man held a patch cord that hooked into the homestead's intercom. The spacesuit itself showed signs of typical prospector use—dirty up to the knees and elbows.

Behind the figure, he saw an old-style crawler that had seen better days. He recognized it as similar to a broken-down crawler abandoned near Conrad Station. As he fought off the fog of sleep, Nelson realized that he did not recognize the individual. He asked, “Who are you?”

“The name is Morgan,” answered the man's voice. “Can I come in?”

Nelson hesitated, not remembering a prospector named Morgan. Over the past three years, he met many prospectors, but Nelson also could remember no one mentioning Morgan. Most of the prospectors knew each other, at least by reputation, even though they kept to themselves. It bothered Nelson to not know of Morgan.

The unwritten rules of the prospectors insisted upon not going to someone's homestead uninvited. Morgan was Nelson's fourth guest—the first uninvited. Curious, he wanted to know why this strange prospector felt willing to break the rule. "Sure." Nelson cycled the airlock, opening the outer door.

The mystery began to unravel as the inner door of the airlock opened, revealing a space-suited figure. Nelson recognized the suit as an older type. He did not recognize the unknown emblem on the right sleeve above the heavy dust. Morgan carried a dust-covered canvas box, similar to a lunch pail. The golden sun visor covered the faceplate of the helmet.

Nelson saw Morgan putting down the lunchbox and removing his gloves. Morgan's hands were pale and un-callused. His fingers ended in neatly trimmed but regolith-discolored nails. The lunar dirt had discolored Nelson's own nails within days of arriving on the moon, but Morgan's hands did not show signs of heavy work. Nelson watched as the visitor unlocked the helmet from the suit and lifted it from his head.

Nelson first noticed the inner comm helmet surrounding Morgan's face—not the common headset of prospectors but the old mouse ears with a head cover. Morgan himself had graying eyebrows. The original color might have been brown, but Nelson could not tell.

Deep wrinkles sat at the corners Morgan's blue eyes. His face was a stubble of gray and brown beard, perhaps a day's worth of growth. Morgan's thin lips had no hint of a smile, nor did they hint a frown. Pulling off the communications helmet, he revealed a long mane of graying hair. Nelson saw a hint of a sparkle in the man's eyes as he spoke.

"Thanks," stated Morgan in a gravelly voice, trailing into a question.

"Nelson." He extended his hand in friendship to Morgan.

"Nelson," Morgan smiled, returning the handshake. "Can we strike a bargain for a meal and two tanks of oxygen?"

"Sure," answered Nelson. "What did you have in mind?" Making a deal did not surprise Nelson. Prospectors usually made deals, though they fiercely followed through with them.

"A rousing conversation and a secret is all I can offer."

"That seems a little thin," said Nelson, feeling that the stranger was looking for a handout instead of a deal.

"Son," smiled Morgan, "once you know the secret, you won't think so."

Unsure, he pondered Morgan's offer. What secret could this old prospector possess? Perhaps he is mad, having some rare form of space dementia. In an instant, Nelson concluded that he would agree to the strange offer for no other reason than curiosity. "All right. You have empty tanks to fill?"

"Yes," Morgan stated.

"Take what you need. There is a spare tank behind the oxygen cracker. Take it, too."

"Thanks, friend."



While Nelson prepared a meal, Morgan went outside. After a while, Nelson heard the outer airlock door cycle.

“Been out prospecting?” Morgan asked after sitting down.

Nelson did not bother lying, since his homestead was full of prospector’s equipment. “Yes, I just got back a while before you arrived.”

“Any luck?” The man’s eyes scanned the equipment.

“No.”

“Didn’t think so.” Morgan took a few more bites of the meal. “What’s the problem?”

“Too little of value.” Nelson shrugged.

“Obviously,” Morgan chuckled. “What have you been looking for?”

“KREEP, mainly,” Nelson explained.

“Good stuff, if you can find it—thorium, rare earths,” Morgan replied, obviously aware of the definition of KREEP.

“Yeah, I know it will fetch top dollar,” Nelson grumbled then added, “If I could ever find an outcrop with enough concentration ...” Nelson trailed off, thinking about the El Dorado that seemed so far away.

“What’s going on?”

“Nothin’,” Nelson sighed. “I’ve got my problems, just like anyone else.”

“Son,” Morgan smiled, reaching for a bag he brought in the habitat. “A little vodka and some discussion?”

“Sure,” Nelson answered, then added, “On one condition.”

“What’s that?”

“Stop calling me ‘son,’” Nelson answered. “I’m no rookie, and I’m nearly fifty. Plus, it sounds weird.”

“Fine.” Morgan paused a moment then added, “Nelson.”

“Let me get some cups.” Nelson went to the pantry and retrieved two plastic tumblers.

“Those should work,” Morgan stated as Nelson sat back down at the small table. Morgan poured a little vodka into each cup. “Best stuff on the moon.”

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Nelson took too strong a sip and nodded with approval.

“Yes,” he croaked.

“So, my friend,” Morgan said, picking up his fork. “What’s going on?”

“I’ve nearly reached the end of my savings. I’ll have to exercise my back-passage option once it’s out.”

“–back passage option?” Morgan asked.

“It’s the guaranteed money that I had to put down to ensure a trip back to Earth.”

“Oh.” Morgan nodded.

“So, I’m at nearly the end.”

“Sell it out,” Morgan said.

“What?”

“Sell the damn thing out.” Morgan seemed adamant about it.

“You’re crazy.” Nelson could not believe selling out his passage.

“No.” Morgan returned his attention to his dinner.

“Morgan, I–”

“Sounds to me like you planned to fail.”

“No.” Nelson felt annoyed. Morgan seemed to know nothing about being on the moon.

“I bet you even have a house over there ...” Morgan waved his hand toward the airlock.

Nelson realized Morgan meant his house on Earth. "How—"

"—you're predictable."

"Now, the—" Nelson stammered, unable to finish the point about having the means to handle the unforeseen.

"So, what are you going to do?" Morgan asked, studying the cup he swirled in his left hand.

"I've got enough saved to get another month of supplies—probably." Nelson took a sip of the vodka. "Maybe I can stretch that to two months."

"Then what?"

"I'll keep moving," Nelson answered. "I think the more ground I cover, the better."

"That seems sound." Morgan nodded, raising his cup. "Do you think it will go any better?"

"No." Nelson believed his answer. The chances of striking it rich were never good. "The best I can hope for is to keep going for another month. I might sell a few samples, but I have nothing that pays enough to build a budget on."

"So, you'll be relying on luck?" asked Morgan.

"Yeah."

Morgan finished the last of his meal and smiled. "That was a good meal. You should be proud of yourself."

"Damn," Nelson said. "You make it seem like I'm raw. I've been here for nearly three years."

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“Son,” laughed Morgan, “everyone is a raw compared to me. No one has been out here as-long-as I have. I’m working on my fifteenth year at wandering these hills.”

“How come I haven’t heard of you before?”

“I keep to myself.”

“Nobody has even talked about you at Conrad Station,” Nelson stated, knowing he had never heard of Morgan. In fact, Nelson heard of no one like him.

“I don’t go to Conrad Station.”

“That’s impossible,” Nelson gasped in disbelief.

“Is it?” asked Morgan.

Nelson looked deeply into Morgan’s eyes. He had always fancied himself as a decent judge of character. Nelson suspected that Morgan could be lying. He knew that no one had mentioned a Morgan, which suggested the truth.

Morgan defied explanation. Nelson wondered why Morgan spoke so clearly but remained so evasive. And the question that Morgan had asked seemed strange. Was it possible for him to never go to Conrad Station?

“You are struggling with the notion of me never going to Conrad Station,” said Morgan.

“How is that possible?” Nelson asked.

“The answer to the question will give you the secret that I promised.”

“I don’t understand.” Nelson watched, feeling dumbfounded, as Morgan began dressing into his space suit.

“You will figure it out,” said Morgan, “once you have answered the question.” In silence, Morgan finished donning his space suit. With a wave, he closed the airlock's inner door.

Nelson sat wondering about the strange man, the strange question, and his own sanity. He sat for some time contemplating the situation.

With a start, he noticed Morgan's lunch pail still sitting on the floor near the airlock. Nelson ran to the video feed, hoping that Morgan hadn't departed. He could see a small crawler driving away toward the northeast, leaving a track in the regolith as it receded. Frustrated, Nelson picked up the lunch pail and tossed it into a corner. He heard the thud of its contents shifting as it came to a rest.

Damn him, he thought. All he did was to create a distraction.



After some sleep, Nelson took the long trip to Conrad Station for supplies. He glanced at the tracks heading away from his habitat to the northeast, wondering about Morgan and the riddle. An answer came to him. Morgan was the partner of someone else—likely someone who would benefit from Nelson’s failing venture. I’m an idiot, he thought as he turned down the rutted tracks leading toward Conrad Station. I will not make it easy on Morgan and his partner, he vowed. I’m not leaving the moon.

Nelson pledged to try everything to extend his stay beyond a month. His first task was supplies, including filling the fifty-gallon collapsible water tank stored in the crawler. That, plus the water in the habitat, represented about 40 days. After that, he needed to focus on the cash to get another twenty days.

He settled into the routine of driving toward Conrad Station. He knew driving the ninety kilometers took three hours. Setting the auto drive, Nelson relaxed.

Once inside the airlock of Conrad Station, he removed his helmet to hear a friendly woman’s voice.

“Bless my stars, if it isn’t Nelson,” said Maxine, the station supply coordinator. She stood about five four and was about fifty, as best Nelson could guess. She had an infectious smile which brightened his mood. Her eyes were green and sparkled all the time.

“Hi there, Max.” Nelson waved. She always went by Max, saying that it was a more fitting name for her since she was the only

girl in a house full of brothers. Her physical and mental toughness had led her to the moon in one of the early missions. Since then, she found a niche as the supply coordinator at Conrad Station.

“You’re cutting it a little close this time, don’t you think?” she said, coming over to hug him despite his dirty spacesuit.

It had been rumored that someone had come to replace her, and that they had ordered her to go back to Earth about five years back. The rumor was that she spaced the replacement and told the company to go to hell if they wanted to fire her.

Nelson believed the rumor, all except the part about spacing the replacement. She was tough enough to do so, but Nelson felt that she would not have been so mean.

“It’s no big deal,” Nelson answered. “I’ll drive back in the dark. I won’t be able to do anything until sunrise, anyway.”

“Okay. We’ll just get you ready quickly so you can go back immediately. Everyone else has already been in, so you are first and last in line.” Max was a delight to everyone. She could tell you to go to hell, and you would feel obligated to go because she would say so in such a nice way and with an infectious smile.

“Excellent.”

“What do you have for me?”

“Just some rocks for tourists, and some crates that might be worth recycling.”

“I’ll give you three hundred bucks for the lot.”

“That much? I would have thought it would be worth one-fifty at most – you haven’t bothered to look at them.”

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“Whose setting the prices here?”

“All right.” Nelson held his hands up defensively. “Whatever you say.”

She punched him in the shoulder.

“Ow!” he replied, even though he did not feel it through his thick space suit.

“Besides,” she said, looking somewhat pained. “I bet you need a refill on your water. That will sting.”

“How much?” Nelson already knew the bad news since he read the sign in the airlock, but let her say it anyway.

“Two hundred bucks a gallon,” Max stated, a slight frown on her face.

“Ouch.” Morgan rubbed his shoulder, realizing the price had hurt more than her earlier punch. He knew that Maxine had nothing to do with it. She passed on the prices.

“Told you.” She said, “Did you hook up your bladder for refilling yet?”

“No,”

“You can go out and hook it up, but first let me know how many days’ worth of food you want. I’ll get it together while you’re filling up.”

“Thirty.”

“Good. I’ll start getting it together.”

Once outside, Nelson hooked up the collapsible tank to the water spigot. He began filling it, knowing that the last of his savings

went into the water tank. Being from Wyoming, he had learned that water and water rights were very precious in an arid climate. The moon was dryer than any Earth desert.

As he watched the water fill in the tank, Nelson's thoughts drifted to Morgan's question. Was it possible for Morgan to never go to Conrad Station? Nelson's own supplies were clearly answering that question. Morgan would not have needed any more supplies for prospecting. Nelson had plenty himself, and he wasn't buying today.

How about space suit parts? Properly maintained, a suit would last. The only difficulty would be the visors and the face plates getting scratched by the constant abrasion from the regolith. Nelson had bought a polishing kit when he first arrived two years ago. The coatings from that kit had worked well, and he seldom needed to replace them. Morgan could have lived without them.

Oxygen was also unneeded from the station. The oxygen crackers at his homestead had kept him supplied with the precious gas without breakdown. Properly maintained, Nelson could not think of a reason for them to fail. A good solar array providing power and plenty of lunar soil kept an oxygen cracker running indefinitely.

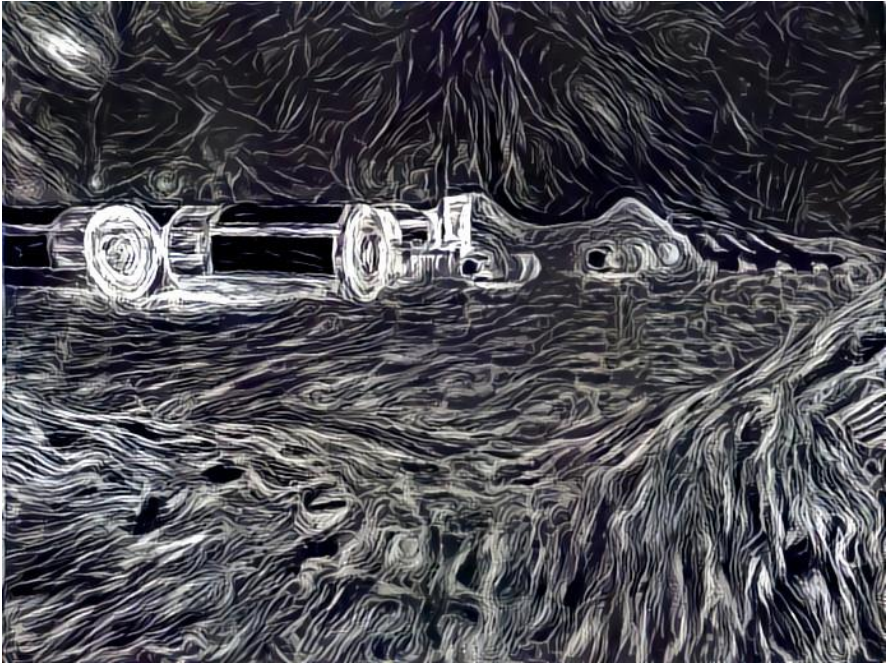
The solar arrays for the homestead had few moving parts, so they would not likely to break down, either. The airlock for the homestead was also fairly simple. There were few ways it could break down. Careful maintenance would also keep them working for many years. Food would be a problem, but Morgan could easily grow his own. Nelson couldn't imagine himself eating a vegan diet, but Morgan could have easily existed on one.

Nelson realized there was one reason that would force Morgan to come to Conrad Station. He would need water. The homestead recycled some water that he used, but it could not recycle all of it. Every time the airlock cycled, water vapor escaped to space. A human

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being needs at least a gallon of water per day, and all of it came from Earth. Unless...

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After filling the tank, Nelson hurried inside. After removing his helmet, he saw Max look at him strangely.

“What’s wrong, Nelson?” she asked.

“Nothing,” he said, feeling his face tugging with a grin. “Tell me, has there ever been an old prospector called Morgan around the station?”

“Morgan,” her hand caressed her chin as she thought, “No. I can’t think of a Morgan.”

“Think, Max. It could have been years ago. Back when the station was new.”

“What are you talking about, Nelson?”

“Is there an old prospector called Morgan?” he pressed. “He may not have been here in years.”

“I can't think of one.” Her expression changed, and her eyes opened wide. “You can't mean Morgan Johnson.”

“What about him?”

“He landed about twenty years back, up north. Everyone got concerned after no one heard from him after a while. We sent out search parties, but no one ever found any sign of him. His lander wasn't even found. We assumed that he crashed or couldn't make the journey to the station because of a broken-down crawler. We gave up after about a month.”

Nelson grinned and grabbed Max, giving her a big kiss on the lips.

“What the hell is wrong with you, Nelson?” she shouted after the kiss.

“Not a thing!” Nelson grinned.

“Pay up and get out of here, then. You have gone space silly or something.”

Nelson handed Max his debit card. He knew that he just dropped ten grand on a barrel of water, but he did not feel the despair that had been bothering him earlier. When she handed him back the debt card, she grabbed him and kissed him.

Stunned, he paused a moment then spoke, “Thanks, Max.”

“Good luck to ya,” she answered.

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Nelson immediately drove back to his homestead. The drive seemed to take forever, even though Nelson pushed it all the way home. It was a stupid thing to do. His batteries would be too low for anything until sunup in fourteen days.

Impatiently, he waited as he traversed the distance to his homestead. He had never wanted to complete the journey so quickly before. He arrived with the sun barely above the horizon. It would be dark soon.

Nelson did not unload his cargo upon arrival. Once the airlock cycled, he removed the gloves and helmet from his suit.

He ran to the corner where he had thrown Morgan’s lunchbox. It was one of the thermos-type boxes with a seal, allowing it to be taken out into the vacuum. Nelson opened the seal and tilted open the lid. He grabbed the regolith-covered rock that he saw within the box. He could feel the coolness and the moisture in his hands. Slowly, he brushed the wet soil from the rock, uncovering the icy surface.

Nelson called his accountant, telling him to sell out everything. The ensuing argument ended when Nelson flatly stated that he would never come home. He needed to sell the house, the return passage, and the remaining investments.

Morgan had delivered a secret. A secret that would make Nelson independent and maybe rich. Morgan lived on the moon, self-sufficiently. He could do it because he had found the biggest treasure of all: ice. Replacing the ice in the lunchbox, Nelson closed it and looked to the external viewer. He saw the tracks that Morgan’s crawler

had left in the regolith. Those tracks were the road to everywhere Morgan had been. It was Morgan's road. Nelson vowed to follow it until he found the ice.



Epilogue

The old man finished his story and said thanks for the drink. He bounded out of the Conrad Station bar, leaving behind a baffled tourist.

The tourist commented to the bartender,

“That was a load of crap.”

“What?” asked the barkeep.

“That story,” said the tourist.

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“What about it?” The barkeep collected another glass from the rack and dried it.

“At least it only cost a drink.” The man shrugged.

“Do you know who that was?”

“No. Who was it?” asked the man.

“That was Nils Carmike. Back in forty-one, he and Milton Johnson discovered a huge ice deposit up north of here,” answered the barkeep.

“You mean that story—”

“—a romantic tale.” The barkeep set down the clean glass in front of the customer. “What will it be?”

Bonus Scene

Alex handed the customer his whiskey in the Lunar-strawed cup, expecting to have a reaction. All the tourists reacted. “Why not a proper glass?” They would ask, not knowing that it was impossible to drink most liquids from a regular terrestrial glass. This man did not. He merely accepted the glass without comment.

“I understand there was a prospector that tells stories here,” the well-groomed man said, not even bothering to try the whiskey first.

“Yeah,” Alex answered. “Nils hasn't been here in months.”

“Oh,” the man looked confused.

“Sorry. Did you need a story?”

“No,” the man shook his head. “I was hoping to share one with him.”

“That's a first,” Alex laughed, wondering about the strange man. “This is the first time any Earther came in here claiming to have a story.”

“Probably,” the man said. “I represent some old interests that need some explaining. I was told the storyteller here could illuminate some things. Can you ask him to send a message to this address when he arrives.” The man handed Alex a card. Reading it, Alex noted the physical address—somewhere in Athens, Greece.

“Sure,” Alex answered, putting the card in his pocket. “At least you didn't ask to speak with Morgan.”

“That would be impossible,” the man said, setting some currency on the bar.

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“Sure,” Alex said.

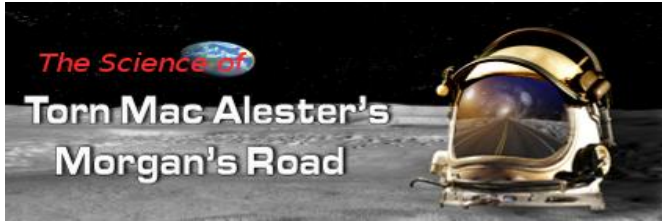
“Friend, I didn't get your name.”

“I didn't give it, since it's irrelevant.” The man left.

Alex cleaned the bar, wondering about the strange man.

“He's an alien I tell you,” said another patron, one that Alex knew and could safely ignore.

The Science of Morgan's Road



Morgan's road began as a story about the lunar regolith. Regolith is essentially lunar dust. Because of repeated bombardment by objects ranging in size of mountains to microscopic grains, the Moon's soil has been beaten down into tiny dusty grains. This dust is everywhere, and as experience by the crews of the Apollo landings, it gets onto everything. Most of the sample containers returned to the moon did not seal properly. There was significant contamination of the soil by the atmosphere of the spacecraft and later the Earth's atmosphere [1].

The moon's lack of atmosphere has ensured that any disturbance of the regolith will last for years. In fact, the disturbance in the regolith associated with the Apollo missions remains to this day. The lunar reconnaissance orbiter LRO imaged each of the Apollo landing sites, showing the tracks left by the astronauts and lunar rovers[2]. Morgan's road extends this idea of long lasting or permanent tracks. Nelson will be able to track Morgan back to his secret—the ice that allows him to survive on the moon. The tracks associated with Morgan's crawler would be a permanent record of every place that Morgan visited, including the source of the ice.

The moon held a secret until long after the Apollo missions had concluded. In fact, the scientific paradigm of the era held for a dry moon. Use of radar from the Earth, and the flight of the Clementine mission past the moon revealed hints of water ice existing in the permanently shadowed creators of the lunar poles. Later missions, notably the LCROSS mission, confirmed the discovery [3].

Part of Morgan's Road deals with the economics of spaceflight and lunar exploration specifically by looking at Lunar supplies. Supposing that water was never discovered on the Moon, any water used by the people on the Moon would have to be shipped there. Including water and oxygen, twenty-five thousand pounds of supplies are needed to support one person for one year on the moon. To put that in perspective, that is about the mass delivered to the surface by the Apollo Lunar module. So, that would mean that the equivalent of a Saturn V launch every year to support one person on the surface. To make this viable, the support costs need to be reduced by in situ resource utilization ISRU [4] capability and the ability to recycle the water [5].

In Morgan's Road, Nelson pays approximately a hundred dollars a gallon for water. The price seems extreme, since enough water for a person to survive a month would be fifteen hundred dollars a month. This would seem almost unsustainable for all but the richest individuals going to the moon on their own dime. But it's even more financially difficult than that. The price per gallon in Morgan's road has to be heavily subsidized. For example, to put a pound of payload on the moon for Apollo was over seventy thousand dollars. So at ten pounds per gallon, it would cost Apollo seven hundred thousand dollars to ship a gallon of water to the moon. Even the most aggressive schemes in the modern era suggest that the price per pound to the surface of the moon would be about a thousand dollars. Morgan's Road shows that unless there is a significant shift of the burden of resource management, an unsupported population on the lunar surface is difficult to achieve.

Though it makes for a good story, Morgan's secret is hardly a secret to us. The moon has water and some interesting mechanisms for gathering it. It also has been a surprise to find water in the lunar soil at equatorial latitudes. This discovery, using the moon mineralogy

mapper and the Cassini space probe, changed all perceptions of the moon. The existence of this water is a major game changer for the economics of space flight [6]. The water can make propellant, which changes the cost function for activities in cislunar space, since that propellant does not come from Earth.

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