



Thoughts from Linda:

The Future of Geography
*How Power and Politics in Space
Will Change our World*

Tim Marshall
2023

"The dinosaurs became extinct because they didn't have a space programme."

Larry Niven, science fiction author.

In this most current and informational book, Tim Marshall lays out both our current status on planet Earth today as well as projects some likely scenarios for the future of space programs. He quickly notes that we are in a new 'Space Race' where the challenge is to emerge with humanity as the victor. And, as you will see from the reading of this book, that conclusion is far from certain.

Like many, I well remember watching Neil Armstrong walk on the moon in July of 1969. There have now been 12 people who have walked there, out of the roughly 110 billion humans who have ever walked on the surface of the earth. His refresher of this story is filled with numerous interesting details and exemplifies how he writes throughout the book.

For example, he reminds us that the Saturn V rocket, which launched Armstrong, Aldrin, and Collins into orbit at 17,000 mph, was the most powerful launch vehicle ever built. Its three stages consisted of the first stage, which fired its engines and lifted the 365-foot-tall rocket off the ground, burning 40,000 lbs. of fuel per second. Before it even cleared the launch pad, it was going at 62 mph. This stage broke off after 2.5 minutes when it ran out of fuel, and the second stage ignited its engines. After another 6 minutes, the Saturn V was at an altitude of 105 miles. As the second stage fell away and the third one took over, the capsule was in orbit at 17,000 mph. After another three days, using a telescope, a sextant, and a computer less powerful than a pocket calculator, they descended the Eagle lunar module and landed with only 15 seconds' worth of fuel left in the tank.

While the rest of that story is history, in a little-known story, he goes on to reveal that Armstrong knew he was not alone up there, as the Russians were also attempting to get a machine on the moon and back at the exact same time. They had launched an unmanned spacecraft called Luna 15 from Baikonur, Kazakhstan, three days before the Apollo 11 launch. It actually landed on the moon while the Americans were out for their Moonwalk and planting the American flag. Most likely, it came in at an angle and crashed upon impact. Appropriately enough, the crash site was in an area called 'The Sea of Crises.' It was not until 1989 that these facts came to light in an unclassified way, as *glasnost* opened up an era of information sharing.

I learned this and a lot more from reading this book. His explanation of just what our current space landscape looks like is clarifying for the non-scientist reader. His primary thesis is that we are taking our current paradigm of how we have organized ourselves on the planet into space. In other words, countries are out to compete more than they collaborate (at least the big ones), and even in light of global treaties, the main theme is 'to the victor belong the spoils.' With this frame in action, as he notes, our future in space is fraught with danger, and with this mindset and the weak treaties currently in place, we have a new territory that is 'ripe for the taking.'

I appreciated his ability to select the most significant elements of the story as of the second decade of this century, as well as his crafting the story, supported by graphics where needed to explain the concepts and map the territory. For example, he has some simple graphics that help us understand the various orbits where today, satellites circle the earth. Low-earth, mid-earth, and high-earth orbits are explained, as well as the areas of geosynchronous and geostationary ones. You'll learn what the Karman line is (the point where a craft will start to break free from Earth's gravity) and just how the ISS works. He takes us through the landscape of low earth, which is where most of the satellites are, and describes them as ranging from the size of a Rubik's cube to those weighing over 2200 pounds. He provides a most interesting space tour of all of these altitudes, noting the satellites and other devices located there.

The book is short (under 250 pages) and divided into three sections with a total of ten chapters. The Chapter names describe the path: *Looking Up; The Road to the Heavens; The Era of Astropolitics; Outlaws; China-The Long March...into Space; The USA-Back to the Future; Russia in Retrograde; Fellow Travelers; Space Wars and Tomorrow's World.*

During the read, you'll get familiar with new names to add to your knowledge of the leading thinkers and space scientists of the past. He describes the 'big 3' of Robert Goddard, an American, the first person who got a rocket off the ground using liquid fuel rather than the compressed powder that had been used since the Chinese developed the technique in the 9th century. He tells the story of Hermann Oberth, the German scientist who was tarnished by working for the Nazis. It was his research that led to the development of the V2 rocket, which had such a devastating effect on civilian targets during WWII.

He thinks the greatest contributor to our knowledge of space is the lesser-known Konstantin Tsiolkovsky, a self-taught, deaf Russian scientist who published the first theoretical proof for the possibility of spaceflight six months before the Wright brothers made history. This self-taught genius wrote in the 1800s about how to build space stations powered by solar energy and drew sketches of gyroscopes that could control a spaceship's orientation, airlocks that would enable spaceships to dock with each other and even pressurized space suits that would allow cosmonauts to venture outside their craft. As early as 1895, he was theorizing the concept of a space elevator. His primary theory, the *Tsiolkovsky rocket equation*, set out the relationship between the rocket's speed, the changing mass of the rocket and its fuel, and the speed of the gas as it was expelled. It formed the foundation of space travel.

Every Chapter delves more deeply into the Chapter's topic and is rich with content. In the Era of Astropolitics, you'll learn that today, there are approximately 8,000 satellites in orbit, with about 60% of them active. He notes that there is "plenty of room, and they will be joined by many, many more. There is room for hundreds of thousands of them, but with each new one, the risks of collision and outright conflict increase." You'll read about the current treaties in place and the big players in the universe today: China, The USA, and Russia. He takes you deep into the philosophy of each nation and its current program and approach. You'll learn about the secondary players such as Japan, India, Germany, and the UK as well as those 'in the wings.' Surprisingly, these include unexpected names such as Tunisia, Ghana, Angola, Bolivia, Peru, Laos, Iraq, and a dozen other countries not usually associated with space exploration. He also covers the territory of private individuals who are now factored into the space equation, such as Elon Musk and Jeff Bezos, with the implications of these private actors in the arena.

This book is filled with knowledge. As he notes and chronicles, "Man has always looked up at the stars and sought meaning. We are wanderers by nature." Marshall contends that our current mental models are, of course, governing our outward strategies just like on Earth. We have frames where nations go it alone; that the strongest win; that

territory is a 'thing' and there for the taking; that partners are not to be trusted; that competition is the game."

In my judgment, our approach to outer space is an extension of our own level of consciousness here on Earth and our low level of psychological human development. At a time when a modern telescope in space can look back in time and detect light that has been traveling for more than 13 billion years, we still have not evolved enough as humans to handle our scientific advancements.

And yet, as he notes, "What is certain is that we will continue to venture ever further from Earth. We will settle on the Moon. We will live on Mars and beyond. It will take time, but we will find technological accelerators that will drive the changes we cannot yet imagine. As Arthur C. Clarke put it: 'They are as much beyond our vision today as fire or electricity would be beyond the imagination of a fish.'"

In his optimistic conclusion, Marshall says that "...future generations will, perhaps, have been able to peer behind the very first second of our 13-billion-year journey and find...something rather than nothing. All the imagined and unimagined wonders are out there, in front of us, waiting to be discovered by *Homo Spaciens*."

Let us hope that this is so. This book will provide you with an understanding of the many facets of our current world in outer space and offer fascinating insights into a probable future for mankind. I highly recommend it.