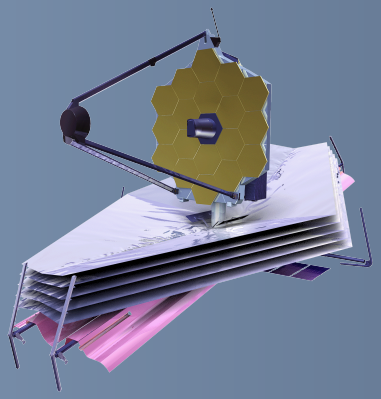
ONE Thought

December 2021



JAMES WEBB! WHAT ELSE ?

Hubble is known to almost everyone for its beautiful almost poetic pictures of galaxies. James Webb space telescope is currently the hot news.

But what has happened else in the past and what is to come ?

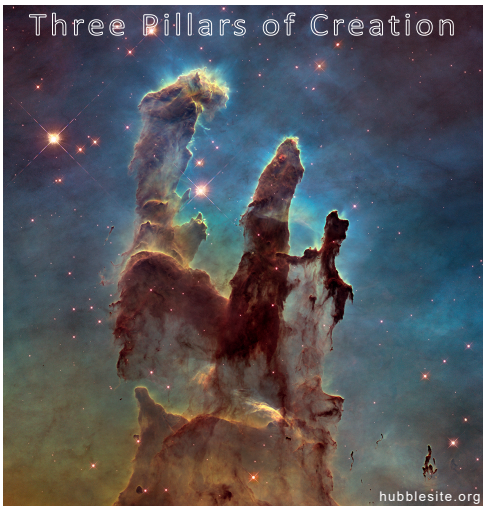
On 25. December the Infrared - James Webb Space telescope has been launched to look closer back into the origin of the universe than ever before. The quest of us humans to answer the most basic questions is restless and ever progressing.

Of course the Hubble telescope comes into mind when thinking about space telescopes, due to its phenomenal pictures from other galaxies and due to it long life span in space. Actually it has the longest lifespan of all space telescopes!

But there are many other telescopes in space. Humans launched at least 99 Spacetelescopes into the sky of which 29 are still active. Further 13 are planned to be launched in the next years.

The average life-span of such a satellite is 5 Years. Sometimes the mission fails, sometimes the planned lifespan is short and sometimes like Hubble they work for more than 30 years !

The two big consistent players of the past, the present and the future are the USA/NASA and Europe/ESA. Another important consistent actor is Japan. Russia has had a glorious past, but became almost invisible in recent decades in synchronisation with its relative economic decline in



Type	Measurement	Abs.	Frequency	Inactive	Active	Plan	Use Cases in Space telescopes
Gamma ray	Electromagnetic Radiation	Absorped by atmosphere	> 30E18 Hz	10	5		Gamma rays can be generated by supernovae, neutron stars, pulsars and black holes
X-Ray	Electromagnetic Radiation		30E15 - 30E18 Hz	24	8	3	Astrophysical objects like galaxy clusters, black holes in active galactic nuclei, supernova remnants, stars, and binary stars containing a white dwarf, neutron star or black hole
Ultraviolet	Electromagnetic Radiation		750E12 - 30 E15 Hz	14	3		Observed objects are Sun, other stars and galaxies.
Visible Light	Electromagnetic Radiation	Low atmosph. absorption	430-750E12 Hz	4	7	8	Positioning an optical telescope in space eliminates the distortions and limitations that hamper that ground-based optical telescopes
Infrared and submillimetre	Electromagnetic Radiation		300E9 - 430E12 Hz	9	2	1	Observed bodies are: cool stars (including brown dwarves), nebulae, and redshifted galaxies
Microwave	Electromagnetic Radiation		300E6 - 300E12 Hz	3	1		Primarily been used to measure cosmological parameters from the Cosmic Microwave Background
Radio	Electromagnetic Radiation		< 300E6	2			Typical targets for observations include supernova remnants, masers, gravitational lenses, and starburst galaxies
Particle detection	presence, energy, momentum, spin, charge, particle type		-	3	3		Particle detection is looking for cosmic rays and electrons.
Gravitational waves	Disturbances in the curvature of spacetime		-	1		1	Ripples in space-time generated by colliding neutron stars or black holes

comparison to the other players. The Role of Russia has more or less be taken over by China and India. Such research is an indicator of economic power. The publicly announced future launches focus mainly on visible light but also on x-rays, infrared and gravitational waves. I am curious about the future disoveries and insights from all these space telescopes !