

## Astronomy Talk 24<sup>th</sup> May 2022

### Mega-constellations

This Zoom talk was given by Dr Paul Daniels, President of the Federation of Astronomical Societies. 54 attended.

The launch of large numbers of Low Earth Orbit (LEO) satellites is a problem both for ground-based observers, and also because of the increased likelihood of collisions. The cost of launching a satellite has come down from £100 million to \$25,000, so many organisations are planning to launch large numbers. The US FCC approves satellites with no consideration of others, and is principally concerned with use of frequency slots.

SpaceX and its Starlink satellites were the main topic. These are LEO satellites intended to provide fast internet connection worldwide. They have tried to make them less visible, but with little success. They also have provision for de-orbiting their satellites, but with the 42,000 planned, they will need to launch and de-orbit 500 – 700 each month. The 20 a day brightness streaks of re-entry, the pollution of so many launches and the loss of rare earth elements, together make it a bad day.

Despite dedicated bands, there is radio leakage and interference, and astronomers often need to use unallocated bands, e.g., if objects are red shifted. Visibility is a problem for a time after sunset, but while the satellites are in sunlight. After that they continue to radiate the heat they gained, called thermal lag. New telescopes will have problems, particularly the Vera Rubin telescope which will have a wide field view: saturated satellite trails wipe out what's behind them so that data can't be recovered.

Paul showed an animation of the Earth covered with the planned orbits of the Starlink satellites: very worrying! Approx. 1 in 40 of Hubble's images is spoilt already. CMOS sensors are easier to edit to remove trails than CCD sensors. By and large amateurs use CMOS and professionals CCD.

Publicity called these post-launch trails "wonderful" to see, but media awareness has now caught on to the negative aspects. It's all about a value judgement about global access vs. astronomy. The US in particular sees space as somewhere to be exploited, especially militarily, and we need more international treaties to control the use of space.

The talk lasted 90 minutes, so we had a break after 60 minutes, and with questions the evening lasted 2 hours. An extremely erudite and deeply researched talk.