SPACE EXPLORATION

What is red and flies through space?

Is it a bird, is it a plane, is it an asteroid?

It's Elon Musk's car flying through our Solar System! On 2 February the SpaceX Falcon Heavy rocket performed its first successful launch, bringing a very unique payload into space: a car. The red car, known as the Tesla Roadster — with 'Starman' in the driver's seat — was hurled toward Mars in what must be one of humanity's boldest, though perhaps not most thoroughly thought-through, publicity stunts. Despite concerns from scientists about the impact a non-sterilized object might have on Mars's pristine environment or its contribution to the increasingly pressing problem of space pollution, this stunt managed to captivate humankind.

Always up for a challenge, astronomers have managed to find science in even this commercial endeavour. For example, Hanno Rein, Daniel Tamayo and David Vokrouhlický performed extensive simulations to calculate the evolution of the car's orbit and its probability to physically collide with a planet (preprint at <https://arxiv.org/abs/1802.04718>; 2018). Their simulations followed the car's orbit for a thousand years and found a whopping 6% probability for it to collide with Earth over the course of the next million years. The next most probable solar object to find

Credit: Adapted by David Gerdes from Ž. Ivezić et al., *Astron. J.* **124**, 2943–2948; 2002, AAS/IOP

itself in the way of the car is Venus, with 2.5% probability. Interestingly, Mars, the intended target, appears to have no chance of being impacted upon by the marauding Tesla car.

Meanwhile, David Gerdes and the Dark Energy Survey collaboration, during morning twilight and after science observations were done for the night, turned their telescope to where the car was supposed to be. With a four-minute exposure, they measured its optical colours

and placed the car on a colour–colour diagram (pictured; where a^* is a function of the $g - r$ and $r - i$ colours). The car's colours stand out compared with other main-belt asteroids, including C-type, S-type and Vesta-type, which are shown with small coloured dots in the diagram. The SpaceX Roadster is shown as the big red dot, clearly offset from the rest. With a $-0.8 i - z$ colour, it is by far the bluest — despite its red physical colour — among the asteroids. Why? The car is still attached to the upper stage of the (white-ish) rocket that launched it. Given its comparably much bigger size than the car, it is perhaps not surprising that the upper stage dominates the reflected light and gives rise to the measured blue colours.

In the meantime, new questions arise. We know that the car is tumbling while also being exposed to the cosmic radiation and micrometeorites permeating our Solar System. How will these factors change the observed colour of the car with time? Inquiring minds want to know and scientists will be only happy to oblige! □

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