Stonehenge Skyscape

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At the midsummer solstice this year (2019), English Heritage launched https://stonehengeskyscape.co.uk/ – a new website to enable people around the world to experience the skies above Stonehenge, and to learn more about the movement of celestial bodies in relation to the monument.

Stonehenge is famous for its alignment on the movements of the Sun, and is arguably the most iconic example of an ancient monument connected with the sky. Dramatic sunrise and sunset pictures have captured the imagination and, in part, have come to shape our view of the world-famous site. The stone circle receives 1.5 million visitors a year, but due to the fragile nature of the below-ground archaeology, the unique evidence for working and shaping the stones, and the Bronze Age carvings, access to the site has to be restricted. Only a small number of people get the chance to stand inside the stone circle at sunrise or sunset, and even fewer can experience the site on a clear, starry night. Without this first-hand experience, though, it is difficult to understand how Stonehenge aligns with the Sun. Digital technology has provided one way of sharing the perspective of standing within the stones – and some experience of the skies above the monument – with a global audience.

Logging on to the website, viewers will see an image from the centre of the stone circle showing the daytime sky, accurate to within a window of approximately five minutes. This "Ambient" mode is a composite image, not a literal view; various image sources have been blended programmatically to create an impression of standing within the stones. The webcam itself, a Raspberry Pi-based solar-powered camera, with a 220° fish-eye lens, is mounted about 100 m away from the stone circle. Weather conditions are accurate – you may sometimes see raindrops on the Perspex dome! Website visitors can pan and rotate the view or use the highlighted squares at the top to move backwards in time to view a previous sunrise and sunset.

Switching to the "Skyscape" view reveals markers that show the paths of the Sun, Moon and five visible planets, with a shaded band depicting the total annual movement of the Sun. This is to help people understand how the monument was carefully constructed to align with the midsummer solstice sunrise and the midwinter solstice sunset, and how

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the movement of the Sun changes over time. A central compass and a line depicting the solstice axis help to cement this knowledge. Moving to night, a computer-generated view of the sky on a clear night replaces the webcam image, accurately displaying the live location of the stars and again showing the tracking of the Moon and the planets. The model is pulled from several sources, including data from NASA and JPL. For a full list of open-source software and datasets used, click on the "About" button on the website. A final "Tour" view labels some of the key parts of the stone circle.

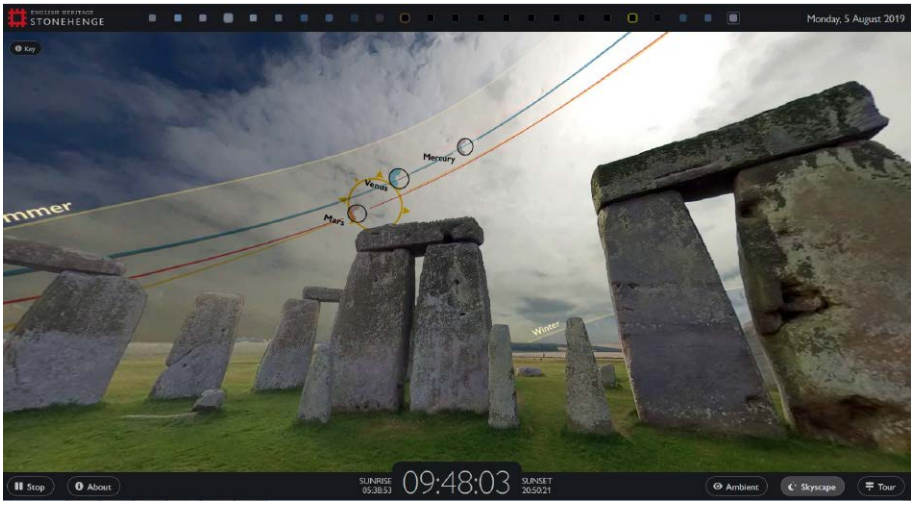

FIGURE 1. Stonehenge skyscape in its "Skyscape" view depicting the visible paths of the Sun, Moon and planets (coloured curves), and the band of annual movement of the Sun (shaded area) against a realistic sky background and Stonehenge stones, looking towards the east.

Astronomy is a crucial aspect in understanding why Stonehenge was built and how it was used by prehistoric people, and the website brings that knowledge to a wider audience. We have had lots of positive feedback and over 100,000 unique visitors to the website since launch to the end of August. Aside from the technical and informative aspects of skyscape, it is hoped that it provides an atmospheric and beautiful view from within the stones; a place to pause and reflect on the connection between Stonehenge and the ever-changing skies above.