

# Star-Stuff: a way for the universe to know itself

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**Figure 1:** An immersant standing among the stars in *Star-Stuff*. Blue lines trace out constellations across their body while stars are born in the red glow seen in their heart before orbiting outward as they age. CC BY-SA 4.0.

## ABSTRACT

Inspired by Carl Sagan, *Star-Stuff: a way for the universe to know itself* is an immersive experience created to remind immersants of their fundamental connection to humanity and the universe. This hybrid VR artwork brings two people together in a surreal experience that can be shared with a remote stranger or a co-present friend. Their bodies are transformed into constellations surrounded by a myriad of orbiting stars whose lifetimes unfold before their eyes. By reframing the body in a shared aesthetic this unique experience encourages immersants to see themselves and others in a common light, as “star-stuff” brought to life, free of superficial characteristics that divide us.

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## KEYWORDS

virtual reality, embodiment, telepresence, installation art

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## 1 INTRODUCTION

*Star-Stuff: a way for the universe to know itself*<sup>1</sup> is a hybrid virtual reality experience that transforms immersants' bodies into abstract constellations, allowing them to play with the stars together. Star-Stuff reimagines what is possible with immersive technology by prioritizing abstraction and embodied sensation over realism. It moves beyond replacing reality through simulation and reproduction towards expanding reality by realizing the possibilities of our shared imagination.

<sup>1</sup>See a video of Star-Stuff at: <https://youtu.be/eRukMyGcVcI>



**Figure 2: Two immersants touch hands at a physically distanced installation of *Star-Stuff*. Photo Julia Read, 2021 CC BY-SA 4.0.**

## 2 THE EXPERIENCE

This hybrid experience can be used either telepresently from the comfort of home, or in a shared physical installation. Immersants' hands are tracked using built-in hand tracking and transformed into constellations. The system estimates the position of immersants' bodies using Final IK<sup>2</sup> inverse kinematics. Stars are generated from their heart and orbit around their hips forming a beautiful spiral galaxy that can be reshaped through playful movement. Using Unity's VFX Graph<sup>3</sup>, stars' entire lifetimes are simulated—red dwarfs smolder endlessly while blue giants expand rapidly as they grow old, collapsing into bright flashes of supernovae. Time seems to stand still as eons flash by in this meditative experience.

Immersants begin the experience by playing with the stars alone, discovering their ability to splash them around like water, gently catch them in the palm of their hands, and shift gravitational forces with their body. These fluid interactions were chosen to provide an ethereal and meditative experience while providing a sense of the stars' enormous mass.

## 3 ENCOURAGING CONNECTION

When a second immersant joins the experience, they are automatically networked together using Photon PUN2,<sup>4</sup> displayed as another constellation in each other's view. While immersants can only see their hands, they see their partner's entire body to draw their attention towards each other and their capacity to interact collaboratively. Their relative positions alter the stars' orbits allowing them to create more elaborate and complex stellar structures than they could alone. They can splash the stars towards each other, dance, play, and touch each other's ethereal bodies.

<sup>2</sup><http://root-motion.com/>

<sup>3</sup><https://unity.com/visual-effect-graph>

<sup>4</sup><https://www.photonengine.com/en-US/PUN>



**Figure 3: Left: two children playing in *Star-Stuff*. Right: the constellation matches the immersant's body through inverse kinematics. Photos Julia Read, 2021 CC BY-SA 4.0.**

The telepresent version randomly connects two people from anywhere in the world together, creating an element of anonymity and surprise. In the in-person installation, pairs of immersants enter the installation together, allowing them the option to do the experience with a friend or connect with a stranger in line while they wait.

## 4 HYBRID EXHIBITION

The telepresent version is available on Oculus App Lab<sup>5</sup>. The in-person version incorporates high-resolution projections allowing onlookers to witness the beautiful forms generated by immersants. The in-person installation can be set up with the two virtual spaces synchronized to allow for physical connection and interaction, or can be offset to redirect immersants and allow for social distancing. This hybrid approach allows the installation to adapt ranging from completely telepresent, to completely co-present physical interaction.

Star-Stuff is an immersive artwork that allows us to see the stars from a perspective we could once only imagine. It realizes a dream of playing with the stars like the seafoam atop waves crashing onto the shore of a cosmic ocean. It inspires immersants to see new possibilities, reframing the superficial and divisive into an ethereal and unifying aesthetic. In this way, it simultaneously reframes the way in which we see each other, ourselves, and the universe. While it facilitates learning about the stars' actual lifecycles, it leaves room for immersants to perform their own narrative and find their own meaning.

## ACKNOWLEDGMENTS

Music by Dale Nichols: "Upon Return"<sup>6</sup> "Gravity + Sleep"<sup>7</sup>

<sup>5</sup>Free on AppLab: <https://www.oculus.com/experiences/quest/3367089710082568/>

<sup>6</sup>"Upon Return" by Dale Nichols is available on Spotify and Apple Music

<sup>7</sup>"Gravity + Sleep" is available on Spotify and Apple Music