

Randie Silverstein / Alex McDaniel

“We Are Stardust”

Randie Silverstein / Glass Artist & Alex McDaniel / Astrophysicist

The Art

I chose to use glass and its spectrum of color for this project, to represent two concepts of vastly different scales; one that exists at the sub-atomic level of particle physics, and the other which is cosmological. I am holding in balance, the idea that glass is equally fragile as it is strong -- the delicacy of a wine glass, the strength of a window pane. Similarly I wanted to express the underlying symmetry between that which is unimaginably minuscule and alternatively unimaginably vast. It is my goal to bring this concept into a more human scale, and to interpret these ideas in a very abstract way.

My astrophysicist collaborator, Alex McDaniel, is studying dark matter; an elusive particle which current theories conclude makes up most of the matter in the universe. Scientists have yet to see it directly, or understand its underlying properties. They know it is invisible, and doesn’t interact with light. Physicists are using astrophysical observations, earth-based experiments, and particle collisions in super colliders in an attempt to observe and record it.

Alex showed me some photos taken by satellite telescopes, of galaxies and nebula with their beautiful and colorful array of emissions. Much of the emissions we detect in the universe, is the energy left from particles colliding out in space, transforming matter into photons, into light, releasing radiation outward in all directions. These glass discs represent that transformation, be it in the form of black holes, or supernovae in the far reaches of the universe, or particles colliding in a super collider here on earth. The negative space in the discs represent this invisible mass while the bright colors emulate the emission that helps us understand the fundamental nature of the dark matter.

The process used for creating the discs is commonly known as fused, or kiln-formed glass. They are created using many different glass components, which are assembled, placed in a kiln and “fired” to a temperature of nearly 1500 degrees F. At these temperatures, all the parts of the assemblage melt together, forming one solid piece of glass.

This project and collaboration with Alex has been a fantastic experience. It has inspired me to create a new body of work, to find new techniques through experimentation and happy accidents, and has helped me to see the universe around me in new ways. New discoveries about the universe are being uncovered every day! Much of the science I know is what I was taught in high school. What is known about the unknown has changed drastically since then! This collaboration gave me a little courage to explore my own, unknown.

The Physics

My research focus is in high-energy particle astrophysics, which is an area of research that combines the study of particle physics and astrophysics. Specifically, I use astrophysical observations to study the nature of dark matter, an invisible component of the universe that makes up roughly 85% of the matter content. Thus far we are only able to indirectly observe the presence of dark matter through its gravitational effects. However, some theories for dark matter suggest we may be able to observe radiation from the annihilation or decay of dark matter particles. Under these theories, when dark matter particles annihilate the result is a variety of standard model particles that produce emission in the form of radio waves, x-rays, or gamma-rays. We then should be able to observe this radiation with ground or space based telescopes, allowing us to probe the fundamental properties of the dark matter.

It has been a great experience sharing my research with my artist Randie, and in turn learning about her glasswork. In our several meetings at her studio we would discuss astro and particle physics, while she shared her creative process and ways she could interpret the topics through her art. The work itself has been a fascinating experimentation; it seemed that each time I visited the studio Randie had come up with some new creative element. Teaming up with an artist for this project has shown the ways in which the excitement of physics can be interpreted through a much more approachable medium, and in doing reach a greater audience. Certainly it has given me a new perspective on how I think about the relationship between physics and the artistic community.

“The nitrogen in our DNA, the calcium in our teeth, the iron in our blood, the carbon in our apple pies were made in the interiors of collapsing stars. We are made of starstuff.” ~ Carl Sagan