SHAPEWAYS

Case Study: Dana-Farber

3D Printed Zebrafish Reflect a Decade of Teamwork in Funding and Research

Credit: Dana-Farber

477 zebrafish are featured in 3D print at Dana-Farber, embedded with the latest in high-tech innovation for illumination from within.

A massive school of zebrafish line one very unique wall at the Dana-Farber Cancer Institute in Boston, Massachusetts. Originally installed by Small Design Firm, the display pays homage to a freshwater, tropical minnow known for a stunning connection with the human genome. While it may seem puzzling to consider the similarities between a person and a tiny fish measuring around 3 centimeters, it is indeed true that the zebrafish shares 70 percent of the same genes as a human, making it an extraordinary symbol of hope for fighting cancer and inspiring many other types of biomedical research too.

Today, 477 zebrafish are featured in 3D print at Dana-Farber, embedded with the latest in high-tech innovation for illumination from within, replacing sensors that were previously activated by touch. Each 3D print has been updated in materials, finishing, and coating, and has also been imbued with the power to interact via mobile devices. Once a 3D printed zebrafish is 'activated,' the wall's patterns begin to transform, reflecting the messages on the smartphones of visitors.

“The Zebrafish Display has been an evolving, collaborative relationship.”

“We created numerous early prints, tested the NFC tags, and more, working in sprints and offering a product for the client to review every two weeks.”

- Sadiya Akasha, Co-founder and Director of Product Development, Sitara Systems

Credit: Dana-Farber

3D Printed Zebrafish Revitalized After a Decade on Display

Shapeways worked with Small Design Firm and Dana-Farber ten years ago as the 3D printed Zebrafish Display was coming to life for the Dana-Farber small donors initiative. They were looking for something outside the typical fundraising format, seeking donors who may not have been old enough yet to accumulate wealth but would be interested in donating amounts from a mere $1 to $5,000. This concept melded intuitively with the Zebrafish Display, as the project teams considered the parallel between a lot of people coming together with small donations to make a big difference, and so many tiny zebrafish studied for research to make an enormous impact in fighting disease.

Shapeways Called On Again to Collaborate

Shapeways was called on for the installation reboot, along with Nathan Lachenmyer, Director of Technology at Sitara Systems. As an MIT graduate who has continued to specialize in combining digital strategy, human-centered design, and human-computer interaction, Lachenmyer was asked back specifically to help select the new technology, execute the vision for the project, and act behind the scenes in bringing the Zebrafish Display to life.

“Shapeways was really great when we worked together before, which led us to reach out again,” said Lachenmyer. “It’s been so helpful to talk with them about what we could do in every aspect of 3D printing and finishing, and it saved us a lot of time in experimentation.”

The original installation was constructed with the intention of allowing donors a chance to translate their support for cancer research into personal messages. A decade later, the emphasis was not only in making some fresh changes to the Zebrafish Display, but also in placing extra priority on cancer patients constantly at risk from germs—leading to the novel, touch-free design and technology.

Sadiya Akasha, Co-founder and Director of Product Development at Sitara Systems, works closely with Dana-Farber in terms of customer management, helping others understand the vision at Sitara, and overseeing all that it takes to ‘bring it to fruition.’ She also performs other types of research and prototyping for Sitara Systems.

“The Zebrafish Display has been an evolving, collaborative relationship,” said Akasha. “We gave Dana-Farber a proposal early on about the touch sensitivity and wanting to convert it into a touch-free installation. From there we met every two weeks, starting with ideation and talking about where we wanted to take this project overall.”

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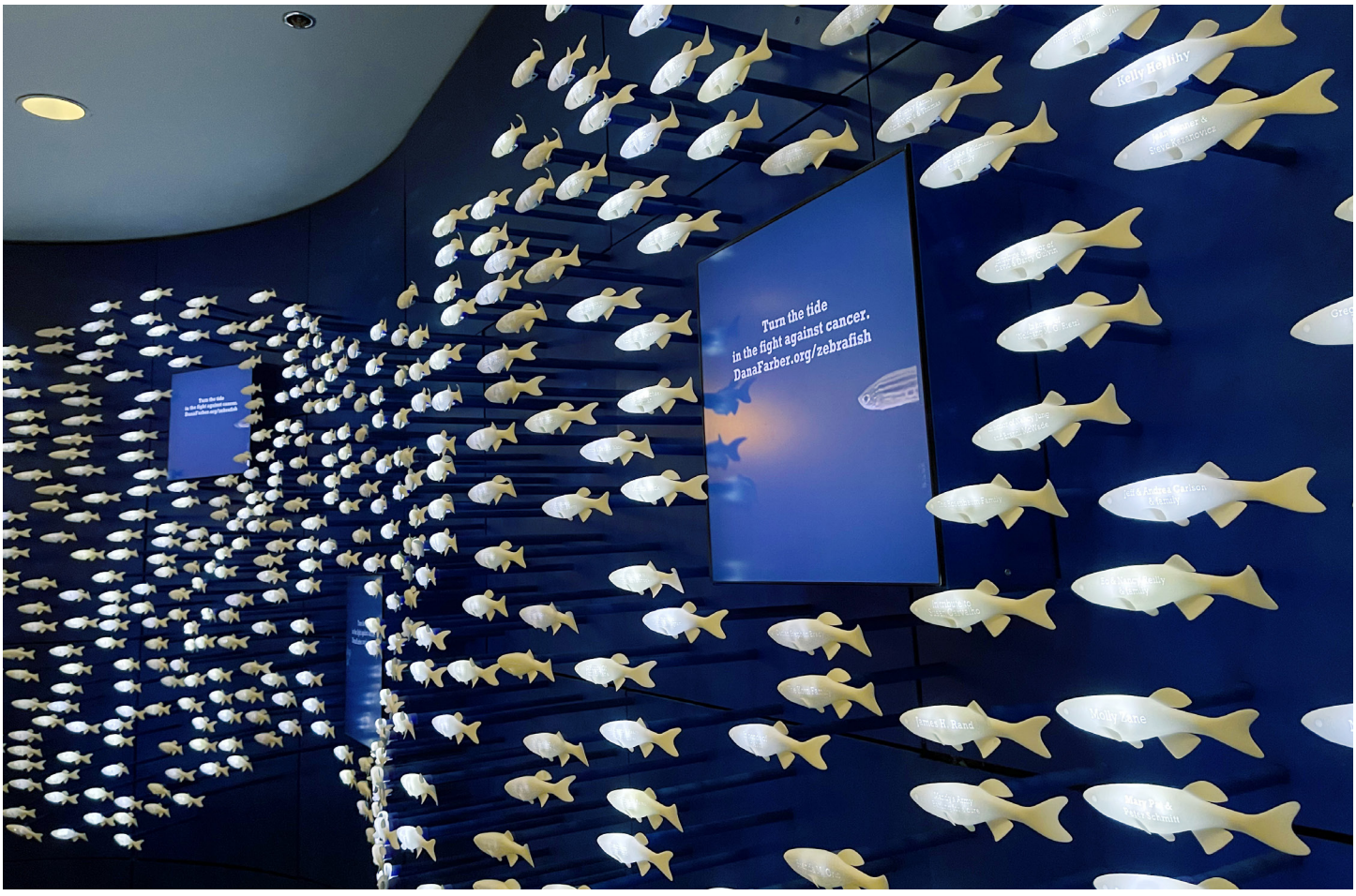
Both Lachenmyer and Akasha — who are married and actually even created 3D printed wedding rings through Shapeways for their nuptials—are well—acquainted with the design freedom available through additive manufacturing. Taking time to research changes in materials, considering the depth of the lettering on the installation pieces, and planning ahead for any possible challenges in manufacturing were all built into the product development process as they conferred with Shapeways.

Touch-Free Models Highlight Cancer Research Donors

The concept behind the installation is not only touching but brilliant, featuring the 3D printed fish backlit against a wall as if they are swimming ahead—allowing visitors to illuminate the pieces individually to read the messages left by donors. While one fish may feature just a single word such as "Hope," others have longer, inspiring inscriptions also bearing individual donor names or those of their families. As the viewer scans a fish, the corresponding message shows up on their smartphone screen.



Credit: Dana-Farber

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> - Nathan Lachenmyer, Director of Technology, Sitara Systems

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"Dana-Farber Cancer Institute acts not only as a research center, but also as an active cancer treatment facility with a large number of immunocompromised patients coming into the building every day. It made sense to transition the original installation away from touch-sensing technology, given the real health concerns," said Lachenmyer.

"NFC technology has been around for nearly ten years, serving as a contactless technology built into nearly every modern phone, and it can be easily embedded into objects in a non-visible way too."

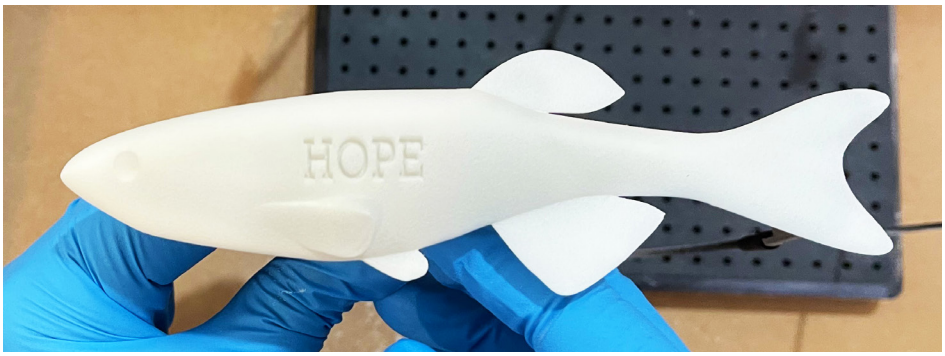
Nylon 12 [Versatile Plastic] 3D Printing Material Prevailed

Ultimately, the project team chose Nylon 12 [Versatile Plastic] in Natural, Processed, and Premium finishes for prototyping, but settled on Premium for 3D printing the end products with Selective Laser Sintering (SLS) technology. Upon receipt of the 3D printed fish at the team's studio in Las Vegas, they applied three layers of a UV-blocking clear coat finish to help the fish retain their bright white color and repel dust over time to avoid constant cleaning and touching of the pieces that could lead to degradation.

The installation was completed in December of 2021, with each of the 477 fish bearing a Near Field Communication (NFC) tag facilitating the wireless communication of donor messages. The installation is mounted on an undulating wall with steel rods acting as the fixing points for the 3D printed models, with wiring running through the fish and connecting to individual circuit boards for each one.

The reasons that Lachenmyer and the previous team chose 3D printing for the installation ten years ago still stand strong today as they reflect on the installation in its final state:

"We've been aware of 3D printing pretty much since the beginning, and I was surrounded by the technology while I was at MIT," said Lachenmyer. "Even in 2012 when we were first creating this installation and thinking about making a project with 500 unique parts, 3D printing allowed us to do something that was impossible with traditional manufacturing techniques."



Credit: Dana-Farber

About Shapeways

Shapeways makes world-class 3D printing more accessible to everyone through automation, innovation and digitization. Our purpose-built software, wide selection of materials and technologies, and global supply chain lower manufacturing barriers and speed delivery of quality products.

Shapeways' digital manufacturing services have empowered more than one million customers worldwide to produce more than 20 million parts using 10 different technologies and 90 different materials and finishes. Headquartered in New York City, Shapeways has ISO 9001-compliant manufacturing facilities in Long Island City, N.Y., and Eindhoven, the Netherlands.

Contact us at www.shapeways.com to learn more.