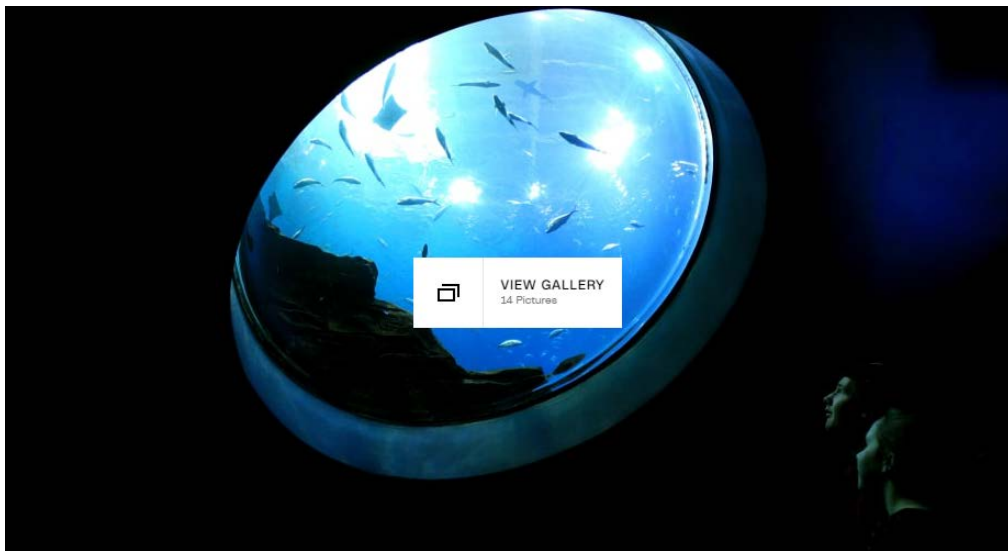


Design

# The secrets behind immersive aquarium design

Updated 22nd June 2018



Written by **Oscar Holland**, CNN

**A**t the Tennessee Aquarium, visitors pass through a series of changing ecosystems inhabited by river otters, salamanders and brightly colored sunfish. The experience has been specifically designed to replicate the route taken by the neighboring Tennessee River, which flows from the Appalachian Mountains down to the Gulf of Mexico.

The attraction, located in Chattanooga, was once the world's largest freshwater aquarium, though it now pales in comparison to the gargantuan oceanariums of China and the Middle East.



Tennessee Aquarium

But the secret to good aquarium design is not all about size -- it's about telling a story, according to one of the architects behind the project.

"The Tennessee Aquarium is really the story of the Tennessee River," said Peter Sollogub, associate principal at the architecture firm CambridgeSeven, in a phone interview.

"We look for stories that can take a collection of animals and orchestrate them into a larger experience. It's like a film, a piece of music or a book -- you progress through it and, when you leave, you've feel as if you've gone on a comprehensible journey."

## Curating experiences

Having started out working on the New England Aquarium -- a building now considered emblematic of Boston's concrete architectural legacy -- in the 1960s, Sollogub is a veteran in the aquarium world. He has since helped create public facilities across the US, as well as in Italy, Portugal and Japan.

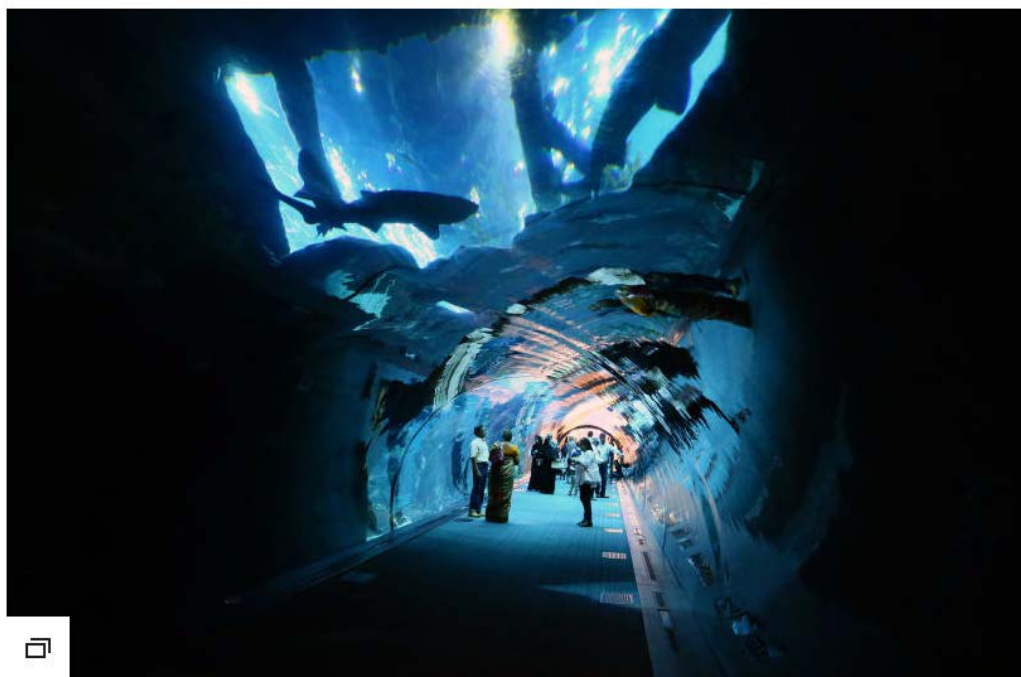


Courtesy CambridgeSeven

The first priority is always, he said, the fish themselves. But when it comes to visitors' experiences, the design process revolves around how -- and where -- people encounter them. Most aquariums are built in a "linear" way, meaning that visitors rarely deviate from a set path. So architects and designers instead see their role as curating a series of moments.

"Take the splendor of jellyfish or the wonder of penguins -- things that are spectacular unto themselves," Sollogub said. "What we try to do is enhance them by developing encounters in which you pass through them, or see them swimming over and under you, or at different levels."

For architect James Hampton, whose firm James Hampton Design Partners specializes in public and private aquariums, a crucial element of design is what he calls the "wow factor." This seems like an apt way to describe the walk-through tunnel at Dubai Mall's 2.6-million-gallon aquarium -- a project Hampton was involved in -- a 157-foot-long passage with 270-degree views of fish in the surrounding water.



Tourists look at fish in a viewing tunnel at the aquarium at the Dubai Mall on June 1, 2016 in the Gulf emirate of Dubai. Credit: MARWAN NAAMANI/AFP/AF/Getty Images

"I tend to start with a 'wow,'" he said in a phone interview. "It's the midpoint that normally has the biggest quantity of water, usually a predator tank. Then at the end you might have a meet-and-greet opportunity -- with an otter, for instance."

While Western countries have traditionally housed the largest and most elaborate aquariums, China and the Middle East are a growing force in the market, said Hampton, who has worked in both regions.

In 2014, Chimelong Ocean Kingdom in China's Guangdong province became the world's largest aquarium, its 12.87 million gallons equivalent to almost 20 Olympic-sized swimming pools. Meanwhile, the Grandview Mall Aquarium, also in Guangzhou, holds the current record for the world's largest aquarium window, with its 134 feet by 27 feet acrylic panel.



The aquarium at the five billion USD Chimelong Ocean Kingdom holds a stupendous 49 million litres of water. Credit: MARK RALSTON/AFP/AFP/Getty Images

But a "bigger is better" mentality, as Hampton puts it, is not necessarily conducive to good design.

"A large exhibit won't necessarily have (a high density of) fish in it, because the tank is so big," he said. "When a client says to me 'I want it bigger than x or y's tank,' I tend to tell them that -- rather than saying it has to be a certain size -- they need to ask what they want to exhibit."

"You don't need a tank that is too big, because (fish-like) sharks and gropers won't necessarily be (visible) swimming in an exhibit that size."

## Total immersion

Creating naturalistic environments, whether through rocks or artificial coral, is central to the art of aquarium design. Keeping out sunlight is also a priority, as it can produce algae and unwanted reflections. These considerations not only provide marine life with more realistic habitats, but they encourage people to enter an all-important state of suspended disbelief.

But, in recent decades, it has been the advanced engineering capabilities of clear acrylic -- a material strong enough to withstand the water pressure produced by millions of gallons of water -- that has set designers on a quest for total immersion.

Since the first so-called "shark tunnel" was built in Auckland, New Zealand, in 1985, walk-throughs and large viewing screens have become an industry standard.



People look at a hammerhead shark while visiting the Georgia Aquarium on April 2, 2007 in Atlanta, Georgia. Credit: Streeter Lecka/Getty Images North America/Getty Images

"With the 'old-style' aquariums, visitors would pay their 10 dollars, have an hour or so looking through these 'picture frames' at the exhibits, and then they'd walk out," Hampton said. "Generally, they've had a good experience, but now it's much more immersive.

"When you walk into a cinema, you want to be wowed by the big screen and intense color right there in your face -- and that's what we try and do, with as much acrylic as possible, so you really feel the environment that you're in."

## Education through design

With physical immersion reaching its limits, virtual reality and augmented reality are playing a growing role in modern aquariums. As well as offering visitors information about different species as they travel through the exhibits, technology opens the possibility of digitally displaying animals that are difficult or unethical to keep in captivity.

"We're using VR as well as augmentation on walls and projecting over panels," Hampton said. "We can add 4K high-definition screens behind acrylic panels, so that when you first walk into a shark exhibit, it feels like there's water in front of you (on the dry side).

"When you look in the background, you see virtual sharks swimming. Push a button and it tells you how big, how much they eat, where they swim -- it gives you detail about sharks that we can't keep in captivity."



This 9-Foot Sandbar Is One Of 25 Sharks That Encircle Visitors Walking Through An 85-Foot Underwater Tunnel. The \$40 Million Aquarium Includes A Million Gallons Of Water, 11,000 Animals And Five Of The Only Seamless Tunnels In The World. Newport Aquarium Is In Kentucky, Just South Of Cincinnati. Credit: Getty Images/Hulton Archive/Getty Images

Both Hampton and Sollogub see these tools as a means to an end. The ultimate goal is to create an emotional connection between humankind and nature. This in turn, Sollogub said, informs the educative approach that underpins aquarium design.

"The greatest part of working on aquariums is bringing guests to places they have never encountered before," he said, recalling the satisfaction of seeing inner-city school children enraptured by a Baltimore aquarium he helped design. "They were as wide-eyed as you can imagine, and that's really what it's all about.

"I think aquariums are education at it's purest. You're not telling people what to think, you're allowing them to feel it and experience it -- to become part of it."

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