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Young UCT innovator wins big at prestigious global competition



PhD candidate Emma Horn

Photo: Lerato Maduna/UCT

University of Cape Town (UCT) PhD candidate Emma Horn won second place in the [Falling Walls Lab](#) world finals with her 'green' bio-tile innovation.

The [Falling Walls Lab](#) is an international network and forum for young innovators in science, technology, medicine, and other fields. It includes top academic institutions from more than 60 countries and is a platform for creative thinkers to introduce their "breaking walls" ideas to the public. The link is to the Berlin Wall, which fell in 1989 after separating East and West Berlin for nearly 28 years.

Horn's bio-tiles are set to shake up the fossil-fuel-reliant ceramic tile and construction industries. She has developed innovative, energy-efficient tile production methods that have a minimal environmental impact.

Three-minute pitch

With only three minutes to pitch their innovative ideas to the judges and audience, contestants can't put a foot wrong. This was Horn's three-minute pitch:

"Ceramic tiles: 16 billion m² were produced globally last year. That's enough to tile the whole surface of Berlin almost 20 times over. Cured at temperatures of more than 1 000 °C, ceramics can eat up almost 2% of all energy used in a country. This industry has barely changed in thousands of years.

"Natural gas is commonly used in the global ceramics industry, while in countries like South Africa energy is derived from coal. Both are finite resources; neither is ideal. Either way, carbon dioxide is released into the atmosphere. Therefore, we require innovative methods of producing tiles that utilise less energy and have a lower impact on the environment. To achieve sustainable cities and communities, we need to disrupt this industry. The solution? Bio-tiles.

"I use a process inspired by nature, where particular bacteria catalyse a reaction to form bio-cement. Fundamentally, bacteria are fed a solution of calcium and carbonate, causing them to combine as a calcium carbonate. This is what seashells are made of. I use this technology to grow bio-tiles for interior and exterior walls and floors. A substance called nacre, also known as mother of pearl, can be formed on the surface of the tile for enhancing the aesthetics. But there's more. I have developed a novel 3D printer to automate the overall process, making it flexible and highly scalable.

"In addition, instead of the sand or clay commonly used, waste resources, such as unrecyclable, glass or plastic, or even mine tailings, can be used to make up the base. You name it – if the particles are of the right size, it can be bio-cemented together. After two years of dedication, I have made tiles as strong as conventional tiles. And there's no reason to stop here. This technology could disrupt the greater construction industry and replace bricks, cement and other ceramics.

Exceeded expectations

Horn said that the Berlin experience had exceeded her expectations in every aspect.

"It was phenomenal, stupendous, overwhelmingly inspiring!" she said from Berlin.

"Falling Walls is a place of big, fresh ideas from all over the world with massive potential. It was flawlessly executed. From nano-thick magnetisable sheets, large-scale water quality data gathering and photosynthesising t-shirts, to floating seaweed farm carbon sinks that navigate like sea turtles, and nuclear waste batteries – it has left me with a profound feeling of hope.

"All these people are dedicated to making a difference; that we can invent and collaborate towards a brighter future. I truly feel like anything is possible after this and that I have made connections for a lifetime."

"This speaks volumes for the standard of research and vision we have in our country. There were so many incredible ideas. I am still amazed that the judges managed to choose just three pitches and that I was one of them! This means that there is a good chance that bio-tiles will make it to market and actually disrupt the construction industry – and that I'll have the support I need to get them there. This is such an exciting prospect."

Horn's co-supervisor, Associate Professor Dyllon Randall of the Department of Civil Engineering, said, "I am ecstatic and immensely proud that Emma won second place at such a prestigious event. It shows that the innovative work we are doing is globally relevant and impactful."

Story by: Helen Swingler, UCT News

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