13 ‘Japan: 2060’

13.1 Overview

This speculative fiction explores the possible resilience of Living Architecture in the face of natural disaster and considers alternative outcomes. This piece was written for my TEDBook ‘Living Architecture: How synthetic biology can remake our cities and shape our lives’ (Armstrong, 2012d).

13.2 Japan: 2060

Nearly 50 years had passed for Yomo Yanobe since the last tsunami devastated the Sendai region. He was a young rescue volunteer in the clean-up operation after the 2011 events. It was almost unthinkable that he would find himself facing the same situation that had shaped his life.

Back then, his youthful indifference to mortality had spared him a little from the full emotional impact of the tragedy. Yet he had been deeply affected by the experience. Yomo had not rescued a single person in two whole weeks of searching, and he could not shake the feeling that someone was still buried under rubble, waiting to be found. Over the intervening decades he suffered many sleepless nights wrestling with the bitter guilt of a survivor. At night it twisted and clawed its way into his dreams, and during the day it taunted him with a profound sense of uselessness. So, when the early-warning systems and media channels screamed that a devastating earthquake had just struck the north-eastern region again, reaching a shocking 9.2 magnitude, Yomo knew that a swell of tsunami white water would gluttonously churn its way inland to engulf its prey. He wanted to resume his rescue duties, even after this long intermission. He hoped it would be different this time. Maybe he could save someone.

Clad in protective white overalls, Yomo waded ankle deep in sludge with his spade poised, looking for signs of life where traditional building fragments lay scattered like broken bones. Regenerated Sendai appeared mostly similar to how it was before the 2011 disaster, although there were some notable differences. Many buildings were designed to withstand even greater assaults from Nature. A 12-metre tsunami wall along the shoreline was raised, which had taken 20 years to complete and had initially been very controversial. Most locals were in favour of its construction, as it brought employment to the recovering city, but many objected to the visual impact and its potential damage to the recovering tourism industry.

The government had also invested in a wide-ranging disaster-survival strategy. This included the introduction of unusual coatings and fabrics that could be applied to the exteriors of homes with resilient lifelike qualities. The researchers called them

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living paints, and they were designed to create buildings that could respond, at least in part, to the devastation of powerful earthquakes with regenerative activity, such as growth and self-repair. It was not long after the first living paints were released that the creative local gardeners recognized their potential for growing unique sculptural features in traditional Japanese gardens. The novel coatings grew thicker with time, since they were able to lay down new material by extracting carbon dioxide and other pollutants from the air.

The bizarre gardens started to draw tourists into the city again, but some residents complained about the scruffy, rugged appearance of the earthquake-resistant buildings. Living materials also didn't respect property boundaries and transformed orderly neighbouring surfaces into strangely shaped building substrates. Mosses that traditionally grew in Japanese gardens now became entwined with living paint nodules and crept over lightweight materials to seek light, minerals and moisture. But these weird surfaces had other benefits. An emergency feature called 'survival bubbles' was woven into the roofs of houses. These inflatable capsules were made from a ropey biopolymer fabric with a coconut fibre-like texture that was activated by a simple mechanical launch device or by vigorous seismic shaking. The survival rafts floated like polystyrene by virtue of tiny pockets of air that were metabolically pumped into their walls. When expanded fully, they were incredibly tough and could protect a person like a nutshell. The capsules would split open to release their contents when they were washed up and exposed to the drying heat of the sun, like newly hatched eggs.

As Yomo combed the ground, he began to notice how the living materials adjusted to the post-tsunami landscape. Odd sprouts of bioscaffolding appeared through the rubble. Some fragments appeared to be reaching for each other to bridge gaps between shattered structures. Different species of living materials entwined together and he wondered whether the survivors could shape these regenerating pieces into temporary shelters. Where the ground remained soggy, the capsules swelled with water and filtered it within their molecular meshworks, providing survivors with a ready source of drinking water. The spongy material also processed nitrogenous waste from sewage and turned it into food for stringy biofilms of denitrifying bacteria. These glutinous skins trailed their hungry tendrils over many tens of metres through the putrefying wasteland. Yomo knew these membranes were edible but wrinkled his face at the thought of ingesting the wilted lettuce-like substance. Yet, he conceded the idea of eating the slime might be appealing – if he was starving.

Up ahead, a cluster of gas-filled survival bubbles caught his attention, but he sadly observed that they had already split open. The only signs of life were germinating seeds that had been deliberately embedded in the bioscaffolding capsules. They took longer than bacterial films to become established, but could be used as stock for rice or maize crops, in case the recovery of the region took longer than anticipated.

Then Yomo noticed that one of the half-buried pods was sprouting a twist of fibres with cherry-red-tipped shoots. He instantly recognized this unmistakable colour and

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knew exactly what it meant. When the availability of living materials had exploded into the DIY market the most popular products were a range of living paints that had been engineered to 'eat' carbon dioxide and change colour when they were 'full'. These were liberally applied to new buildings to help residents manage their carbon footprint responsibly.

Although people had been safely using paints with seasonally fashionable indicator hues for years, there was widespread concern when a particular formula was introduced. This product contained a vibrant cherry-red change indicator that was coupled to a powerful carbon-fixing metabolism. The resulting paint was so sensitive to carbon dioxide that it was possible to tell from the exterior patterns and colour whether someone was home or not, and sometimes even where they were in the building. This led to a host of news bulletins and late-night current affairs features linking the application of the paint to a rise in burglaries. Rapidly, the distinct colour became synonymous with crime.

Yomo stared at the unmistakable cherry-red tips of the biopolymer shoots that were gradually unfurling under the heat of the sun. They confirmed that carbon dioxide must be present at a high concentration. Something in the capsule was breathing. With his heart racing, he called over urgently to his younger, stronger colleagues to help him break open the tough fibrous coat of the capsule with their spades.

'Are you OK?' he shouted to the capsule. 'Help is coming!'

But he heard no reply. Perhaps an animal such as a family dog was inside. Yomo was determined to rescue whatever came out of the survival bubble. As his coworkers repeatedly struck the structure, he spoke calmly and reassuringly to the breather, 'Nearly with you!'

Then the capsule split open suddenly with a resounding crack, and Yomo reached inside.

'Help me remove these fragments, everyone! We need air!'

A small child squinted up at the open-mouthed rescuers as the light spilled into the cradle of tightly wound bioscaffolding fibres. She was filthy and clutching a ropey twist of fabric for comfort. Her bio-blanket was covered with bite marks, as she had been chewing on it. She would have derived a little moisture and food from this strange umbilical cord. Yomo reached inside the capsule, and the child instinctively recoiled. As he tried to reach her, he could feel the fleshlike textures of the carbohydrate-rich walls against the back of his hands. They were dry on the outside but soggy below the surface, rather like the inner lining of a child's nappy. He was relieved that there was no odour. The spongy interior had absorbed the girl's bodily fluids so that she had not suffered the unpleasantness of living in her excrement during her brief incarceration. The life support and rudimentary comfort wouldn't have lasted forever, but it had

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kept her alive. Yomo stopped trying to coax the frightened child and suddenly ducked into the capsule and swept the girl into his leathery arms, holding her tight. Her little body started to shake against him as she wept soundlessly.

Now, Yomo knew exactly why he had come to this disaster scene – to bear witness to how one small child had somehow survived all that Nature had to throw at her, against all the odds – and she had won! Now they would share a common dream and the blood bond of survival. Choosing his steps carefully, Yomo reached an ambulance crew and placed the child in their welcoming arms. He continued to pick his way pensively back to the desolate scene over fragmented structures that were superficially bigger and tougher than the child he'd just rescued.

Under the weakening daylight he noticed more unfurling biopolymer tendrils that were just visibly crimson tipped. 'Maybe', he wondered as he raced to examine them, 'there are other survivors!'

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