

# Disrupting Architecture: An interview with Virginia San Fratello

By: Anna Tweeddale  
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‘Disrupting Architecture’ is how Rael San Fratello Architects describe innovative approaches to architectural processes and materials. The practice has a history of developing refined and playful methods to ubiquitous material technologies, notably the use of straw in the Hay-bale House (2003) and Straw Gallery (2011), and earth in Box Box House (2000). In 2010, Ronald Rael published *Earth Architecture*, a survey on new techniques to building with earth. Objecting to the cost and limitations of the proprietary materials available for 3D printers, the practice has more recently investigated hacking the technology to develop 3D printing in a growing array of alternative materials including clay, paper, salt, cement polymer, porcelain and wood. In discussing these experiments, San Fratello described the practice’s ambition to make architecture in which “the material source and the building itself are seamless”. This trajectory merges their research into the oldest global construction materials such as earth, translating them for the digital age.



Sukkah City project (2010)

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Yet in the hands of Rael San Fratello, material is understood as more than just a question of technology or aesthetics. The Sukkah City project (2010) used cardboard signs made by the homeless – collected from across the United States – as a politically and socially-charged architectural material. Further, in the Sol Grotto project (2012) they took 1,368 of 24 million Solyndra tubes – glass rods that had been developed with US Federal grants as an alternative to solar panels but then slated for destruction after the company went bankrupt – and created a luminescent site-specific art installation in the Berkeley Botanical Gardens. The controversial economic and political history of this particular material resulted in a brilliant twist to the usual reception of such a small work when Fox News presenters called for its destruction.

Virginia San Fratello presented at ‘Material’, the 2013 AIA National Architecture Conference held in Melbourne, illuminating the audience with an articulate and highly engaging insight into in the practice. Anna Tweeddale met with San Fratello to discover more about their work.



Sol Grotto (2012)

Anna Tweeddale: In relation to 3D printing, there’s currently much discussion on additive manufacturing, yet the type of material used is not often discussed. Could you explain as to how you came to begin to experiment?

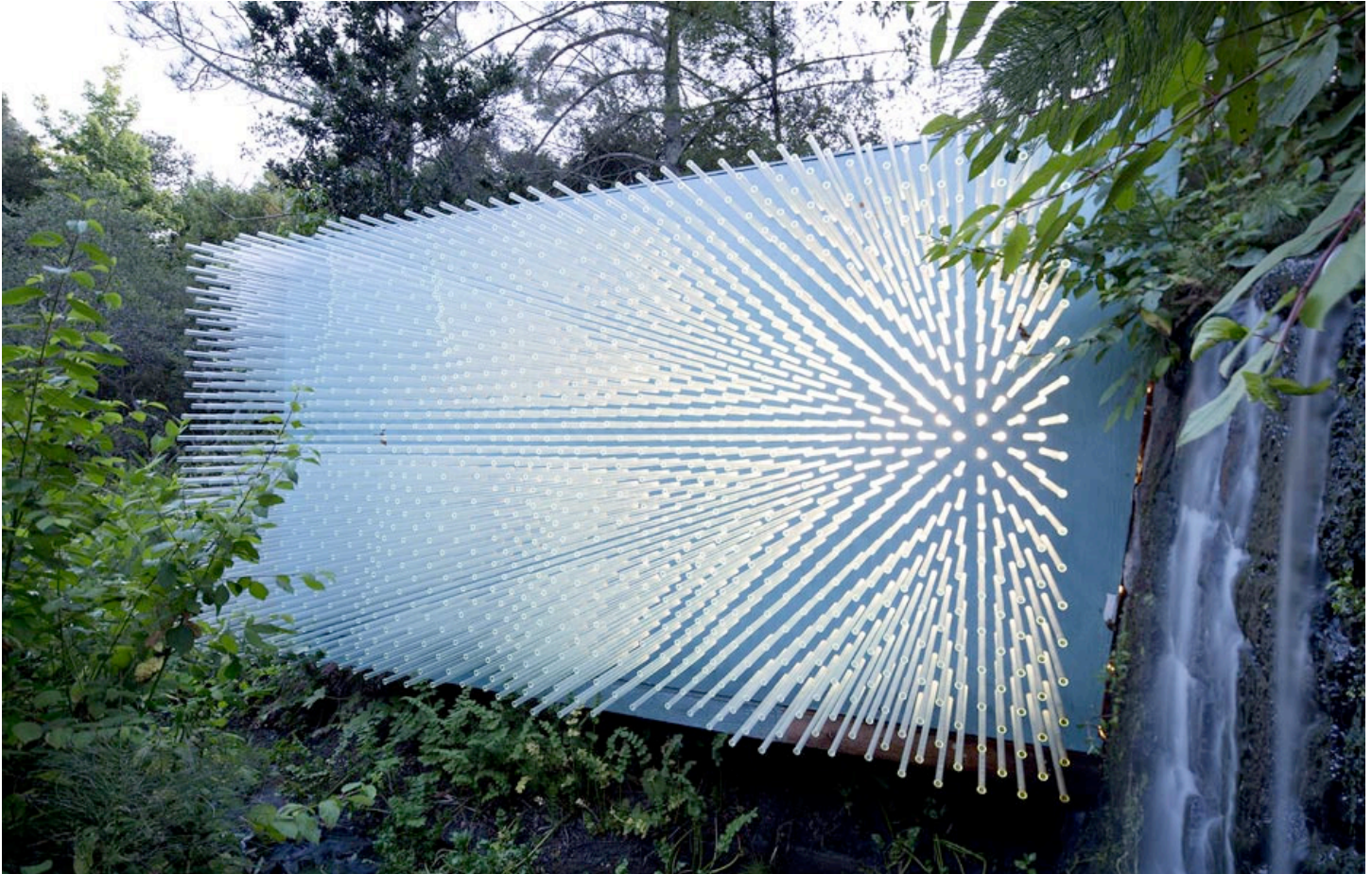
Virginia San Fratello: The first time we used a 3D printer was back in 2006, one of our first questions was “why can’t we use other materials in this printer?” Because of warranties, etc., we were unable to experiment with other materials in those machines. However, more recently, in 2009/10, Ronald acquired a 3D printer in conjunction with the ceramics department at [University of California] Berkeley and he decided to test clay in the printer. That is how it started. On the heels of those early tests we were invited to participate in an exhibit called The Nature of Things for the Biennale of the Americas [2010] and we decided to print everything in the exhibit using a sand-based material. Because of our inherent interests in building made with earth-based materials, that seemed like a logical choice. The sand prints were displayed on the sand material itself

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reinforcing [our] idea of geomorphologist-as-architect.

AT: And has this research developed mostly through trial and error?

VSF: It is very much trial and error; with every material and even on a day-to-day basis. For instance, if it rains we have to change the saturation levels of the binder. So even the humidity affects the way we make it.



1,368 Solyndra glass tubes are used in the Sol Grotto project

AT: You are testing 3D printing with many naturally occurring materials. Does that potentially make the final product of your fabrication processes biodegradable or recyclable?

VSF: Our process includes the use a polymer to strengthen the material. There are many different types of polymers and we're certainly experimenting with more ecological ones versus the cyanoacrylate that typically is sold by proprietary vendors for 3D printing, which is basically superglue – it's really toxic. I'm not sure to what extent the polymers we are experimenting with are biodegradable, it's a good question and one that we continue to research. Some of the materials we're using to print with are also industrial by-products like the wood. We also just started 3D printing with rubber last week. The rubber material is from recycled tyres that are frozen and broken up into clumps and then pulverised. So those materials are potentially already seeing a second life in our products. Now when we infiltrate them with the polymer, I don't know if those materials are recyclable again or not, or to what extent that is possible. It's just not something we've had a chance to look into yet.

AT: It seems that this manner of working allows you to continually elicit some really interesting and specific questions for further exploration. What would be some of the key questions arising from recent explorations?

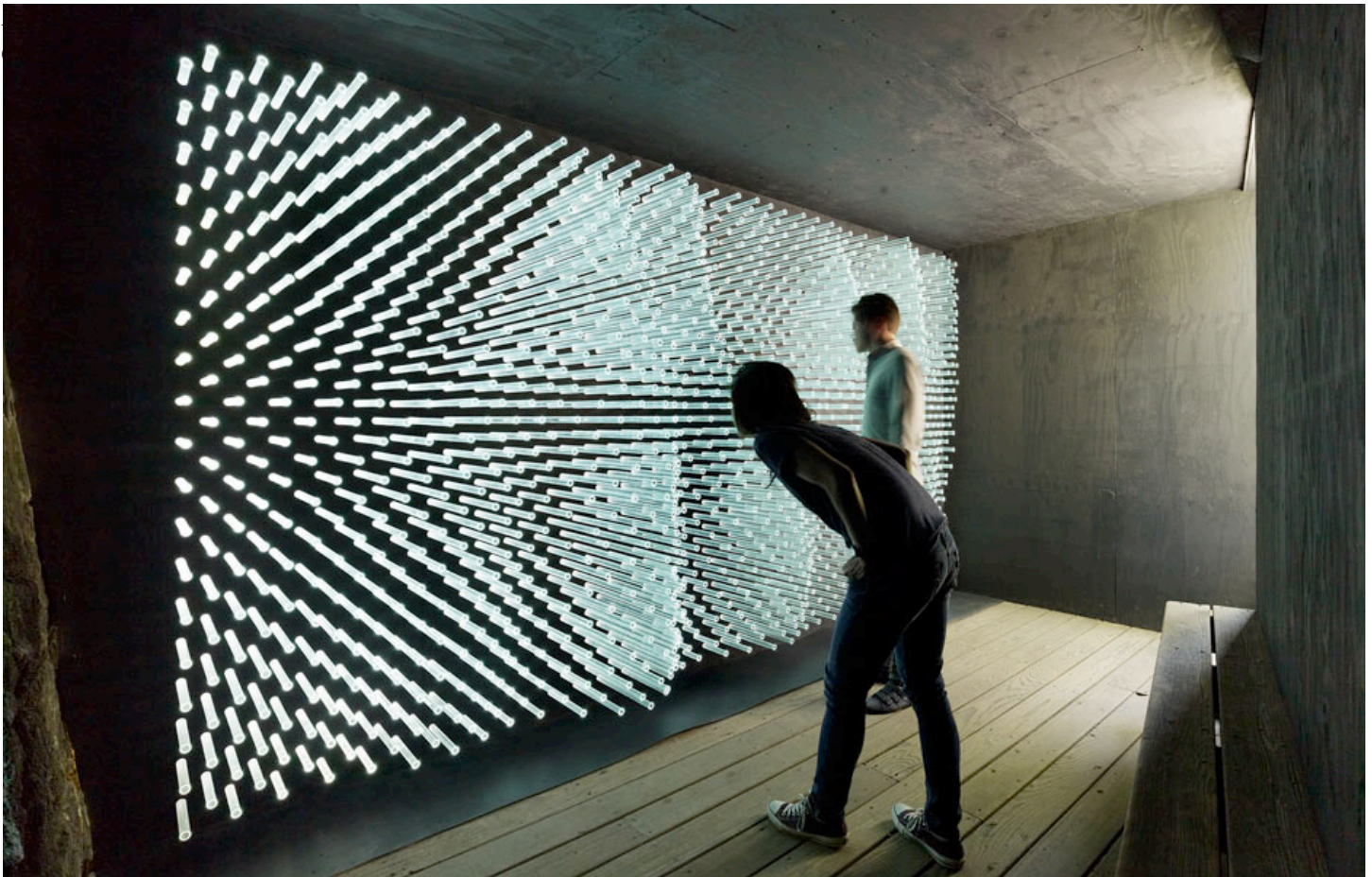
VSF: There are a million questions that we still need to answer. Take the cement polymer as an example: we

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feel really confident about the material's strength and our ability to print with it. Because we've only had it for a short time, however, we don't know what the longevity of the material is when exposed to natural UV light over the course of many years – so that's a technical question that still needs to be explored.

We are also increasing the scale of our designs. Thus far, the largest thing we have printed is the seat slug, which is 11 inches long and made of 253 parts. We're currently 3D printing a room out of salt, which is made of approximately 500 parts that you'll be able to occupy; and this summer we're designing a 3D printed dwelling. Because we would like to print at the scale of architecture we are trying to address issues of scale in terms of the bricks or units that we print. For example, do we need a printer farm so we can print thousands of 'bricks' at one time, or could we print larger bricks? What does it mean to dig something, or excavate something larger out of the printer? Is that possible, or is it going to break before we can strengthen it? When we jump scale there's a whole new set of questions that needs to be explored.

We're continuing to refine our materials and develop new ones and are still exploring the necessary layer thickness, the saturation levels and what the other things that we mix in with the material can be to activate the materials in some cases. So this exploration is going in a couple of different directions.



Sol Grotto interior

AT: So would that also mean going down the road of approaching venture capitalists in order to become manufacturers?

VSF: Yes, that's what we're doing right now. We've also talked about developing software so that people can design things online, so they're designed with appropriate thicknesses and dimensions for 3D printing with our materials.

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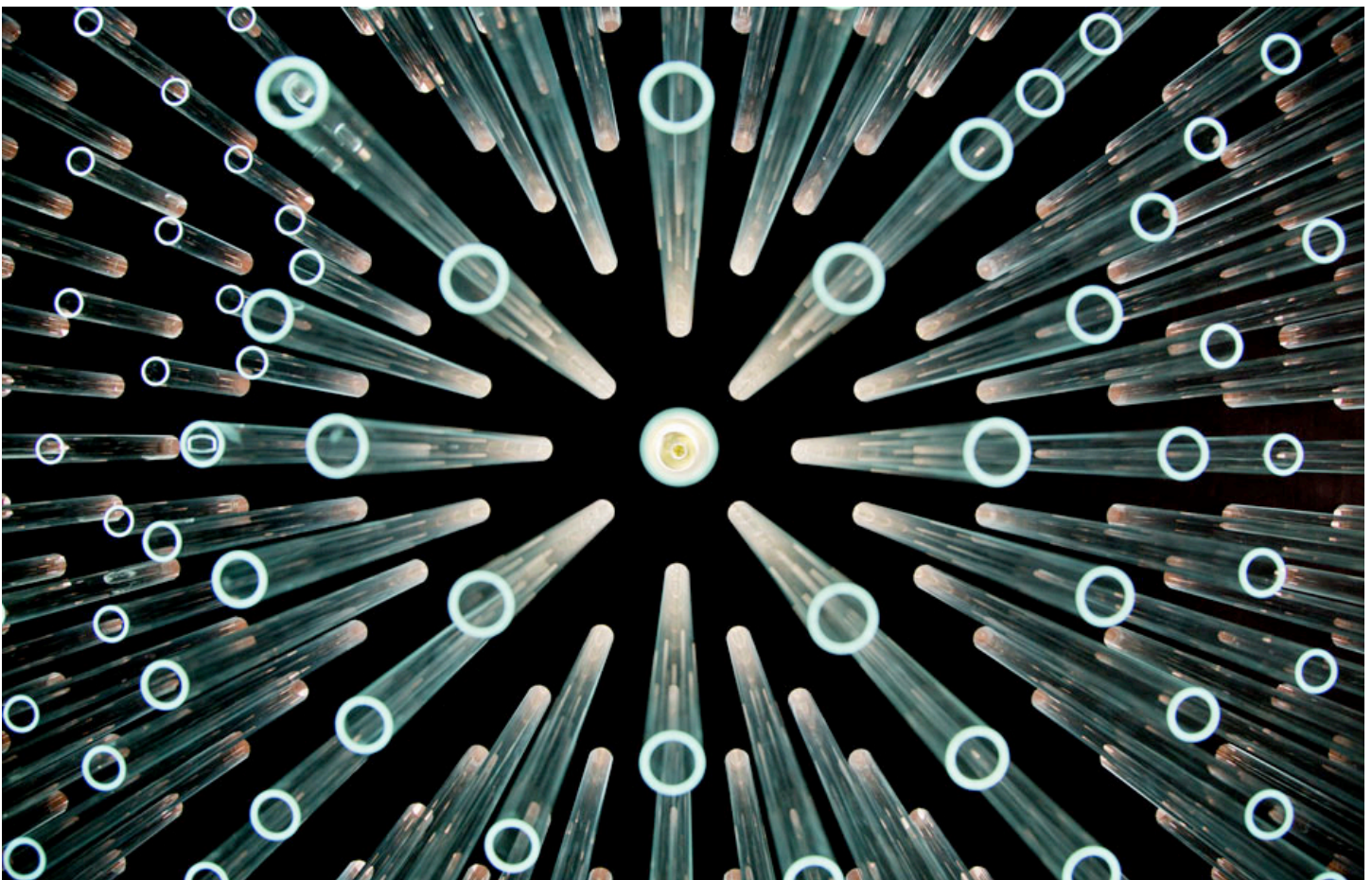
AT: In a project like Sol Grotto – where the interiors attracted large numbers of ladybugs and spiders, while algae formed on the exterior glass tubes – how is it that working with new and experimental materials might impact upon or resonate with wider ecological systems?

VSF: Those were things we didn't anticipate, we had no idea they were going to happen. We consider all of the projects [shown at the National Conference] to be basically full-scale study models, and they're opportunities for us to see how what we're making interacts with the environment. We didn't know, for example, if the glass would break in a storm. We didn't think it would because Solyndra designed it to be installed on rooftops, but there was a possibility that it could – it's not tempered, so what would happen in extreme weather conditions for example? We didn't know the algae would grow on that surface. And it was fine; we didn't have any problems with it changing colour. It was a good test; and that's what all these projects are. Hopefully for us there's the chance to realise these material systems again at a larger and more permanent scale.

AT: And would you then purposefully work with these unexpected qualities in the next iteration?

VSF: Hopefully, yes.

AT: Obviously the response of Fox News to the Sol Grotto project was another unintended consequence. Yet there's an interesting aspect of telling this story through a reception of the work by others that makes it very immediately engaging. You also talked about the Box Box House in terms of your client's response to the process of living with and maintaining the adobe structure as it changes over time and with weather. How important to you is the broader reception or impact of your projects?



Sol Grotto

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AT: It seems like your approach deals with architectural questions on a more systemic level, such as hacking 3D printing technology or engaging with the waste products from society. How would you describe where your approach comes from?

VSF: We see our projects as being very interventionist. All of the things that we do are interventions into existing landscapes: physical landscapes, technological landscapes, cultural landscapes, wherever we see a problem and we feel like we need to find a solution. Sometimes the solution is simply to make a commentary, sometimes it's to repurpose a material and sometimes – like with 3D printing – it's to change the material. So we're inserting our designs into an existing context to solve a problem, to address a problem, or to make people aware of a problem.