Angelo Vermeulen’s title is tricky to fit on a business card. He defines himself as an even combination of visual artist, scientist, and community organizer. Vermeulen completed his first Ph.D., on the deformation of teeth of nonbiting midges, at Belgium’s Catholic University of Leuven in 1998. (He is now at work on a second Ph.D. in starship design.) He also graduated from the city’s Academy of Fine Arts with a degree in photography. This combination of art and science has taken Vermeulen around the world—and nearly beyond—speaking at the TED conference in California (www.ted.com), developing a community art project in the Philippines, and experimenting with food on the (simulated) surface of Mars. He chatted with Dimensions about his multifaceted career and endeavors, and how they someday might help sustain humankind.

**Angelo, usually I introduce interviewees with their title, but I don’t know that you have an official title. How would you define yourself?**

Yes, it’s a pretty good question. I’m actually active in different fields. I’m both an artist, I’m a visual artist, but I’m also a scientist and I’m a very active community organizer and honestly, those three things are equally important for me. My title is a bit of a mash-up.

**Hard to put that on a business card, I guess.**

Yes.

**Well, perhaps I’ll start with one of your more recent projects. In August, I know you finished a four-month stay in a small dome near the Mauna Loa volcano in Hawaii. Can you tell us what you were doing during that time?**

It wasn’t actually near the Mauna Loa volcano; it was actually on the flank of the Mauna Loa volcano. The HI-SEAS [Hawaii Space Exploration Analog and Simulation, hi-seas.org] research program is a program that started last year; it’s a NASA-funded research program that is carried out by, or rather coordinated by, the University of Hawaii, and for the very first mission—it was a collaboration with [Cornell University], and we were living in a Mars base as—it was a kind of a, how to put it, a simulation mission, a Mars simulation mission. We were practicing living on the surface of Mars for four months with a crew of six, focusing mainly on food and developing a food system for future long-term space exploration.

**So the flank of that volcano is the closest approximation on Earth to the environment of Mars?**
I wouldn’t say it’s the single one closest environment that looks like Mars—there are many places on Earth which kind of look like Mars in one or another aspect—but it has been established that when you analyze, for example, Curiosity—I think it was Curiosity, but it might have been the former rovers that NASA sent over—they’ve been analyzing the soil of Mars and the location on Earth that looks closest to that composition of soil is actually Hawaii, and it’s actually that specific location on Hawaii. So geologically it is very close to Mars. There’s also some other advantages of using that specific location to test Mars scenarios. It’s that the location—you can use it the whole year. There are also Mars analogs in Antarctica, for example, but obviously you can’t use that throughout the whole year. And also the location in Hawaii is easily accessible, but still isolated enough to do proper scientific research.

Can you tell me what a day was like during that four-month stay in the dome?

We actually—we got a relatively large amount of autonomy. Of course we had some research goals that we had to reach, but overall we got a lot more autonomy than is currently typical in the world of space exploration, and that’s because for long-term space exploration we’ll have to let go of trying to control every single minute of the astronauts’ life, simply because the communication is not possible. It takes a long time for a message to reach Mars and to go back; it can take up to 20 minutes one way. So we got a lot of autonomy and were allowed to design our own schedule, which is very motivating actually during an isolation situation like this. So with the whole crew we designed our own daily schedule, which started with a breakfast at a certain time, so everybody would share breakfast, and that would be followed immediately by a daily morning briefing, where everyone would share what their plans were of the day, so as such the whole crew was constantly aware of all the different things that everybody was doing, and then we would roll into our research. And then all the meals were usually shared, and then in the evening as a commander, because I was crew commander of this mission, I had to write my commander reports, so I would do a little round, and I would just have a short chat with every crew member, I would make my report, and then basically the day would be over. And the evening quiet hours started around 10 at night, and then people could do whatever they wanted in their room or read a book or watch a movie.

So from this experience what would you say were your key takeaways? What did you learn?

There are quite a few things that I learned and quite a few things that I didn’t expect to learn about. First of all, the importance of food was something that was very obvious and very clear right from the start of the mission. Being able to create your own meals, to be creative with food has
lots of benefits. It stimulates crew creation because the system that we set up was basically every day two different people would be responsible for the food, so people would collaborate on creating food. So that’s of course interesting because people start talking in the kitchen about food (and about many other things, of course), and it’s also an ideal outlet for creativity. You just come up with interesting meals that are experimental. The thing is that when you share food that you just came up with, like a new recipe with a limited set of ingredients you have, and you share it with the crew, it immediately becomes a topic of discussion, of conversation. So all in all, this whole food culture is incredibly healthy, not just on a physical level but also psychologically, it’s very advantageous for crew morale. So that’s definitely one thing that was pretty obvious right from the start.

But also what I learned, and I just talked about it, is the importance of autonomy. Like I said, we got a relatively high degree of autonomy: We got to decide on our own foods, we got to decide on our own schedule, but we also got to decide on our own research programs, which is totally unusual. Astronauts never do their own research; they’re operators. But we got to do that, and this once again proved to be highly motivational. We basically worked a lot simply because we had our own stuff that we were trying to figure out—once again, very motivational.

And last but not least, there is really a clear role for arts and creativity given these situations. That’s what I noticed. I mean, many of us had some sort of connection with the arts. Kate Greene, for example, she was the crew writer, she’s a journalist, but she’s generally interested in literature so there was a lot of talking about writing and sharing ideas about storytelling and literature in general. Yajaira Sierra-Sastre, who was our Puerto Rican crewmember, actually has a background in acting and in theater apart from being a hardcore scientist. She’s not currently working on stage, but she definitely has this background. So everybody had this kind of interest in experimental movies or in different things, and just having moments during the week when you’re talking about it and organizing movie nights and sharing favorite books and stuff like this is definitely really important. And I also created my own art project actually, created a photo series that I’m hoping to publish this year.

And of course you have plenty of experience combining art and science, particularly through the Biomodd project [www.biomodd.net]. Could you tell me a little bit more about that?

The Biomodd project is a community art project that started in 2007. And it essentially tries to combine two different worlds, the worlds that people generally see as being completely opposite, even enemies: the world of computers and the world of living biology. And what we do is, with communities in different places in the world, we recycle e-waste, we check the components, we open up computers, we check the components, and we
assemble them into functioning computer networks in an aesthetic sculptural manner, and then we install living ecosystems inside those networks that use the waste heat of the electronics and the computer components to grow and develop. So it’s really harvesting the waste energy of electronics to boost biological growth in the electronics, inside the computer network. So this generates very interesting visual installations, of course, where people are a little surprised that these worlds can actually physically, conceptually, and functionally live together.

But the thing is, the whole—the structures that we generate are actually accessible. They’re actually interactive and they’re used as networks for multiplayer environments. So people can log in to these systems and can engage with other visitors in computer games and in virtual worlds, and by doing that they actually heat up the system and as such boost the growth of the internal ecosystem. So everything gets connected: people, technology, and biology. And I’ve been doing this in many different places, in America, in Asia, in Europe, and the latest version was in the New York Hall of Science in New York City.

**Do you think these projects tie in to your experience in Hawaii? Could they potentially address the issue of growing food in space or in inhospitable environments?**

It’s actually the *Biomodd* project that led me to the world of space exploration, because this was never a plan. I actually rolled into that world because a professor that works with the European Space Agency, Professor Max Mergeay—he basically saw a talk of mine and then invited me to connect with his team, and that’s how everything started rolling in, one thing led to another. And currently I’m really in the middle of working in the field of space exploration. And the reasons are definitely the combination of biology and technology in very integrated systems, but also being resourceful, like using wastes, like computers are literally thrown out on the street, and using them, giving them a second life is going to be really important for long-term space exploration. Astronauts will have to be super-handy, the astronauts that go on voyages for multiple years will have to be very handy and whenever something breaks down they will have to be able to think, “How can we reuse these components?” because there is no resupply, so you have to deal with what you have.

And last but not least, the fact that I am a community organizer and I’ve been doing community arts in places like Indonesia, the Philippines, the United States, and different places in Europe, of course it’s also important for space exploration. You have to be a team player; otherwise you’d never make it to space.

**Do you have plans to head into space? Do you think you’ll actually apply some of these technologies on Mars or elsewhere?**
Well, I think that it’s pretty obvious if you participate in a mission like HI-SEAS, I think all six of us really want to go space. I mean, there’s no way around it. But as a European, it’s a little difficult because the European Space Agency currently stopped recruiting new astronauts, they’re training six young astronauts and they have enough with that, and I’m not an American citizen so I can’t really apply for NASA. I would love to but I don’t think so. Maybe through commercial space flights. Who knows? We’ll see.

**Yeah, give it 10 years! So along with your photo project, what else do you have in store this year, what’s coming next?**

This year I’m actually—there’s actually two major things that I’m working on right now. First of all, I’ve started a new Ph.D., I made a Ph.D. in the late ’90s in biology, but now I’m doing a new Ph.D., which is at the University of Technology at Delft, and it’s a Ph.D. in starship design. So it’s a Ph.D. that deals with coming up with concepts for starships. Obviously I’m not going to build a real starship, nobody can build a real starship, but my focus is not so much on propulsion technologies, because there is currently quite a bit of starship research, which is mostly focused on propulsion technologies, but I’m not a physicist so I’m not really focusing on that. I’m more focusing on how we can use concepts from biology and embed them into technology to develop technologies that can last for a very long time. Because that’s what you need. If you want to send out a technology that has to travel for 100 years, you need to develop a technology that is resilient. And biology, nature can teach us how to be resilient. So instead of developing something along the lines of Apollo time engineering, like a fixed engineering structure—I don’t think that’s going to get us there. I think we need to rethink aspects of technology and basically develop a technology that can adapt itself, that can evolve. And so I’m working around those ideas by both working on—it’s an arts and technology Ph.D., so on one hand I’m creating art projects that are inspired by these ideas, but I’m also doing engineering research together with colleagues at Delft University of Technology, and we’re building—planning to run computer models. And recently I’ve been contacted by Arizona State University and I’m also going to do part of my research there; we’re going to develop a physical prototype of a biorobotic system that can actually evolve and regrow its own body. So that’s the kind of research that I’m currently involved in.

On the other hand, apart from the Ph.D., I’m also running a new community art project, the follow-up of *Biomodd*, which was started just a few years ago, and last year, in 2013, we built three versions of that—it’s called Seeker. Seeker is actually an invitation to communities to build starships, starship prototypes. And there’s currently one on display the Museum of Modern Art in Ljubljana, in Slovenia, and these are very elaborate projects. We bring together engineers, artists, gamers, hackers, programmers, and we just create large-scale big sculptures that you can actually inhabit because they’re the inside of the starship is actually habitable, and then I run isolation experiments in these art spaces with the people that worked on the project.
So it’s really bringing what I learned with my work for space exploration, I’m bringing it back to the art. So that’s basically the summary of my story, it’s like what I learned from working with space exploration during missions like HI-SEAS, I bring that back into the world of art and the ideas that I pick up in art and the freedom that I have in art enables me to come up with concepts that I think might be interesting for science and engineering.

I’m also a TED senior fellow, or a senior TED fellow, and one of the first things that I’ll do this year is go to the TED conference, which now has moved from California to Vancouver. TED 2014, so I’m obviously very much looking forward to that and, yeah, those things bring me all over the place. Actually the Seeker project is now being developed—we’re basically bringing people together and looking for funding in many different places around the world, we’re looking into Kosovo, India, Puerto Rico, and Chile, so those are the locations that we’re currently developing the community art projects in Seeker.

I know the last time you did a TED talk you spoke about Biomodd. What do you plan to speak about at your next presentation?

I actually gave a TED talk right after my HI-SEAS mission. It’s been recorded but hasn’t been published yet because TED doesn’t publish all the new talks straight away, they kind of spread them out, so I’m not sure yet when it’s going to be published, but I gave a talk about my HI-SEAS mission. And I think my next TED talk is going to be about starships, I’m quite sure.

Sounds very cool. Is there anything that I haven’t touched on that you think readers should know about your work with particularly agriculture since that’s the focus of this issue?

Yes. Let me backtrack a little bit. So the last version of the Biomodd project was developed for a group show, an art show at the New York Hall of Science in New York City, and was basically their first contemporary art show. So different artists were invited to work around themes of ecology, sustainability, and community building, and that’s why Biomodd ended up there. We built a large community—we collaborated with a whole group of people in New York City, it was really a community project, it’s actually not my personal project. And one of the things that we changed in that particular Biomodd version was we moved entirely to agriculture. So all the plants that were grown inside the computer system were actually edible. And so one of the things that was set up because we collaborated with artists in New York City, but we also specifically worked with the local community living around the museum, which was mostly a Hispanic community. And so Jason Gaspar and Marco Castro, two of my team members, actually worked with the local community for several months before we started developing the Biomodd project, and introduced them into urban agriculture, which was a beautiful project, so basically growing your own food in a very limited space inside or
outside, and being more food independent within a city context, and those lessons learned were partially taken into the final presentation of *Biomodd*.

**It sounds like you have a lot that can offer potential solutions for the future.**

I hope! Yes. I’m a bit of a futurist, there is no way around it, but instead of just being a utopian dreamer I prefer to create things hands on and to try to find solutions hands on, and to connect with communities all over the planet and just really build stuff. I think the future is built not just by dialogue but it’s this combination of a maker’s attitude, just building stuff, even if you fail, it’s not that much of a problem, it’s a combination of building as a group and discussing things. I think that’s really the key to developing the future.

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