

Situated Computations

An interview with Vernelle A. A. Noel

GALO CANIZARES: As an introduction, let's speak a little bit about your entry into the world of computational design and digital fabrication. I think the way you have described your work is quite unique. For example, you say that your goal is to build new expressions, new tools, and methodologies to explore the social, cultural, and political aspects of making technologies, computational design, and emerging technologies. This suggests that there's a lot of sides to your work and academic interests. How did you get here from your education and training?

VERNELLE A.A. NOEL: I initially studied civil engineering at home in Trinidad & Tobago. I always wanted to study architecture, but unfortunately, it was not immediately accessible to me, so I studied civil engineering instead. One of my teachers recommended that I study civil engineering since it would give me more options in the construction industry. So that's what I did. I worked as an engineering surveyor, architectural technician, and engineering technician while working on my diploma. I worked as an architectural technician for several years, including my own private projects, and thought that that would quell my desire to be an architect, but it didn't. I knew there was so much more I wanted to learn. It was my brother who seriously suggested that I pursue my studies in the US. I could not see that as an option because I knew my family could not afford it. I am making a long story short here, but I eventually got the opportunity to join the B.Arch

program at Howard University in Washington, DC. While at Howard, I was still practicing and working. After my graduation, I chose to work with Burt Hill (now Stantec) in DC, then after a year, moved to Gujarat, India to help establish their new office there as a BIM Manager and Project Architect. When the economy crashed in 2009, I went back to Trinidad and Tobago. I did some consulting for a firm there, then a friend put MIT on my radar. The computation program looked quite interesting as I was working in BIM at the time and that's what I thought I would focus on, but it became something different.

Digital fabrication was quite new to me. While at Massachusetts Institute of Technology (MIT), I took a few classes in the Media Lab, and a formative one for me was Neil Gershenfeld's famous "How to Make (almost) Anything" class. In this course, we explored different fabrication techniques and combined engineering, design, and programming. The making part was easier for me than programming – which was a whole new world to me. A second was working with Larry Sass who also does research in digital fabrication. These two experiences were formative in my understanding of computational design and digital fabrication (Figure 17.1).



Figure 17.1 Vernelle A. A. Noel conducting a wire-bending workshop at a high school in Trinidad & Tobago (2017).

GC: Now you are the director of the Situated Computations + Design Lab at Georgia Tech. What kind of projects and research do you engage with in that role?

VN: Building and reconfiguring computational design frameworks, methodologies, tools and more that critically engage in hi and low-tech ways of thinking and design, and how our work actually touches the ground and those we claim our work is for. Architecture is much, much broader than the profession – it is a way of seeing the world, making the world, and interacting with the world. I want to broaden and expand concepts, definitions, practices, participants and more in our field and ground it in ways that question: who participates or not in computation, what we call computation (or not), how we theorize and conceptualize computation, and how we create space for those currently absent from the field.

GC: In your description of the lab there are a lot of mentions of interdisciplinarity. This goes along with your desire to go beyond (or pop) the disciplinary bubble. Can you elaborate a little bit on how you approach interdisciplinarity? Do you collaborate with others from different disciplines or do you yourself learn different techniques and methods from other disciplines?

VN: My perspectives and experiences have been honed by many things: engineering, architecture, art, traditions, etc. My way of seeing the world is multiple and varied. I am also inspired and excited by the ways other fields do things. My interdisciplinarity comes from my experiences and an interest in cool things other people are doing in other fields. Again, the goal is to get out of the bubble. Multiple perspectives are necessary to address the issues and problems that press us today. It's also important because it shapes how outsiders understand what we bring to the table.

My interdisciplinary positions are based on methods, concepts, theories. Whether they are representational methods or quantitative/qualitative methods from STS (Science and Technology Studies), I try to create bridges between traditional and high-tech practices. I also teach an interdisciplinary studio which I enjoy very much. One year, I collaborated with faculty and students in computational media. Another year, I chose to collaborate with a faculty member in aerospace engineering whose expertise is also in lightweight structures. I'm also working with an anthropologist on another project. I love forming relationships with people from different areas of expertise. It exposes me to not only different research and teaching topics and methods but also to different perspectives and values. Apart from expanding my network of collaborators, I try to instill in my students the notion that the world is best experienced in an interdisciplinary way. Once you get out of your silo, you gain so much more richness from the world. It also allows students to learn different ways of communicating and understanding different contexts. This is the most important part of stepping into roles that are different and unfamiliar (Figure 17.2).

GC: If we look at the work that you've been doing with the Trinidad Carnival, that seems to be a good example of you wearing a lot of different hats. You talk about your work as part ethnography and part historical research on the history of Trinidad and



Figure 17.2 The Infinite Line Active-bending pavilion – designed based on material behavior and fabricated using techniques from wire-bending on exhibition at International association for shell and spatial structures (IASS) in Barcelona, Spain (2019).

Tobago. Then there's obviously computational design, which is your expertise. How do you switch between these modes when you're doing design research? Is there an organizational technique that you require to do this?

VN: I wouldn't call it a switching, but there's definitely a lot of contexts that must be unpacked before engaging in design; a lay of the land that I feel that I need to get before thinking of design possibilities. I never go into a project thinking: "Oh I want to try out this cool computational design." No. The work is always grounded in a site. I must really know the site; I must know the people; I must know their values. There's a reality that must be uncovered first, and then have discussions around research questions, project ideas, and computational design that are based on that reality. As designers we're uniquely used to jumping around and wearing different hats, so I don't think this is anything new. We must always investigate the whys and the why nots. And this takes time. It is possible to build something in a semester but developing relationships and trust with the people takes more time. It is important to be aware of the time, trust, and all that informs the potential of a project. It's never as simple as just writing a script and executing it (Figure 17.3).

GC: It seems that this approach forms the backbone of your idea of Situated Computations. Could you describe a little bit what that term means and maybe how

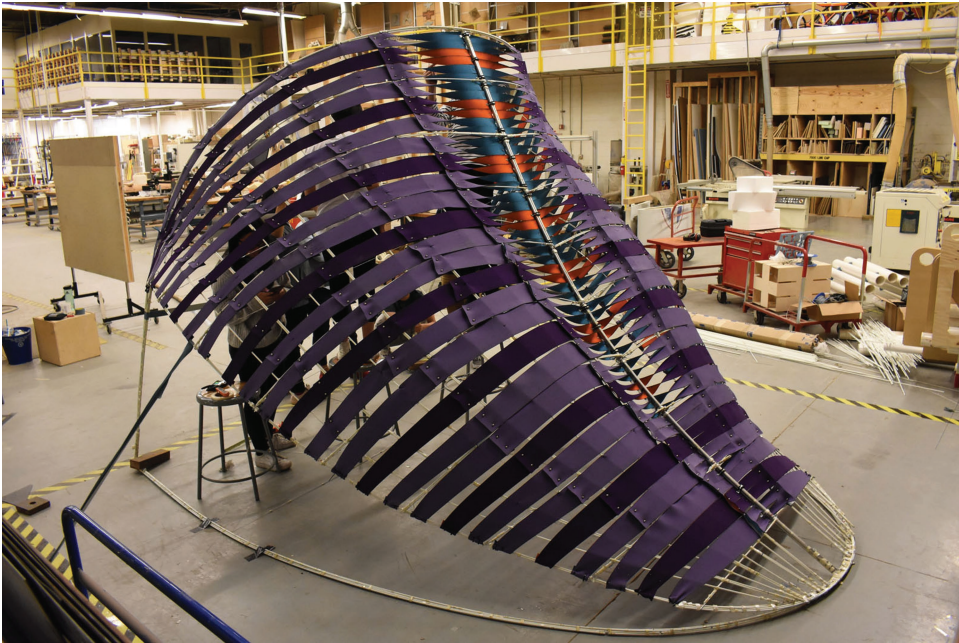


Figure 17.3 “From Dusk to Dawn” – designed and constructed using wire-bending materials, techniques, and steps extended from the Bailey-Derek Grammar (2019).

you arrived at this concept? Was it something that you felt was lacking in design disciplines? What is the ongoing history of Situated?

VN: Situated Computation comes from a reflection of my own work in craft, technology studies, and digital fabrication. It pulls from digital media studies and the contexts in which I work. I have essentially sat back and reflected on my research projects, with an emphasis on aspects that have worked well. The purpose of Situated Computation is, again, a way for us to ground our field and make visible the faces, the people, and labors in our work. Aspects that are often made invisible when we focus on artifacts or technologies or the objects we make. We rarely see people in the work of digital fabrication. You might see someone standing by their work, but we don't really see people *in* the work. We see things, we see technologies, but technologies don't exist without people. The concept also addresses the apolitical attitude of many design professionals. If politics is about power relations, then there's nothing that is apolitical, especially in computational design and digital fabrication.

Situated Computation also questions what “technology” might mean in other contexts. In the context of Caribbean practices, for example, there are no big grants or millionaires funding your projects. This is not how we make projects. We are innovative and we make diamonds out of the simplest things. So, the question is how do we talk about computation in the context of other abundances and values that may not be solely technological or economic? One answer might be to look at



Figure 17.4 Handout showing a snippet of the Bailey-Derek Grammar being used by participants during wire-bending workshop (2017).



Figure 17.5 Workshop participant engaging with wire during wire-bending workshop (2017).

traditions. In the Caribbean, we innovate with what we have; we “bricolage.” This could be considered a kind of computation, a way of making a whole out of parts according to some rules or logics. Thinking in this way, with an expanded definition of technology, is how we can create connections with real people in the real world. Getting feedback from the people out in the world is also important. This is another way we break the bubble. We should ask what is computation in the streets. How can we compute without huge computing resources? We should be imaginative enough to be able to think outside the notion that technology and digital fabrication can only be done with expensive machines (Figures 17.4 and 17.5).

GC: I love that phrase, “computation in the streets.” It’s a really powerful statement. Let’s go a bit deeper into the Situated Computation concept. In one of your papers, you outlined 8 points for a *Situated Computation approach*. It reads almost like a manifesto and follows the tradition of design theorists outlining bullet points for specific principles that should be followed. Can you talk a bit more about those principles and why it was important for you to outline those in such a way?

VN: The principles of Situated Computation are: (1) be built on an ethnographic study, (2) be situated, (3) build on existing skills and knowledges, (4) facilitate sensory, perceptual interaction, and physical manipulation of materials and tools, (5) build communities, not individual isolation, (6) cater to experts and non-experts in CAD and computer programming, (7) do not require large amount of computational power and infrastructure, and (8) narrative.

Number 1 addresses what I mentioned earlier regarding context. We must be aware of what is happening on the ground, and we must disregard any assumptions we might have. This is where ethnographic studies come in. Ethnographic methods allow us to unpack the complexities of a site: its politics, its social values, its culture, and its environment. All of these elements inform our relationship to technology, and so they must be taken into account when starting a project somewhere. Designers should not be scared about doing ethnographic work. It might feel a bit outside of design work, but it is crucial for gaining a solid understanding of a site. Number 2 emphasizes this: we, as designers and researchers, need to be on the ground asking questions. We need to be listening to people and understanding exactly what is happening in these communities. Number 3 is all about designing for specific contexts. We shouldn’t design things that people within a particular context don’t have the skills or resources to use. We should position ourselves more as learners than experts and become familiar with the skillsets of the people we are working with rather than impose one way of doing things. If we learn what the existing skills are, we may be able to support or augment them. In order for computation to happen, first we must understand what kinds of knowledges exist there. Can computation emerge out of dance, singing, or handcraft? I think so. Number 4 addresses materiality. Situated Computation resists structures of separation and purity; it aims to reveal sensory effects and material interactions beyond the abstract. The tools that I make foster active engagement and intermingle with sense, bodies, and materials. Number 5 reinforces what I’ve already mentioned about community. It is critical to build communities around technologies to foster participation and shared learning. Number 6 is also related to community building. We should prioritize the mingling of experts and non-experts so that fruitful collaborations can emerge. We are all experts and non-experts. Both can complement one another and arrive at totally unexpected outcomes. Number 7 asks computational designers to think beyond the resources of Western contexts. Not every client has millions of dollars to fund a computational project. Nations have lost economic power through wars, colonialism, slavery, and other forms of domination which persist. Designers should be mindful of the

technological infrastructures of a site and region, especially when working on a digital fabrication project. The last point, Number 8 is simply “narrative.” Situated Computation tells the stories of the people involved in our world, their histories, and their innovations. There’s a saying that goes something like “until the lion learns to write, history will always be the story of the hunter as a hero.” We know all too well that there are many people whose stories are never told or even erased. We should be giving a voice to marginalized and disenfranchised groups because their knowledges and practices are beneficial today.

GC: Storytelling is a type of knowledge, too.

VN: Yes, oral histories are very important in African cultures – it is how knowledge became codified. You have carvings, illustrations, songs, and other ways beyond words and text that people have theorized on life and explained phenomena. We should be actively making space for these multiple ways of expression.

GC: Maybe we can talk a bit about aesthetics and form. Many of your projects involve lines and splines. Obviously, the wire bending projects follow that line of thinking. It’s almost like your interest in computational geometry is centered around: what is the most one can do with lines and curves. It reminds me of old ship-building and aeronautical techniques where draftspeople would use physical wood splines to draw curves. It’s no secret that before a spline was a computational line, it was bendy piece of wood. Are you connecting to that history in some way? Why are you so fascinated with lines and curves?

VN: I really love lines. I think they’re so malleable, they’re so present in real life and in digital life. I often just draw lines as doodles and sketches. Of course, there’s a problem with that because in architecture we need planes and other solid geometries. So, there’s a wrestling that I have to engage with and figure out when it comes to building architecture. But I don’t know why I’m so obsessed with lines, I just am. Maybe it comes from my focus on making. Meaning that I’m able to see the line as a physical thing before it’s a digital thing. Whether a line springs, whether it dances, whether it bends, whether it is a hard straight line, I look at it as a material object. What I genuinely love about lines is their interaction with light and shadow. How they look when light is cast on them. That’s the most exciting part for me in making these line structures. There are also so many other kinds of lines: the lines of the body, the lines that trace movement, lines that are woven. There’s so much that can be unpacked with just lines (Figure 17.6)!

GC: It’s interesting because it feels like it’s really leveraging some very fundamental components of software, which is the spline itself, a basic element which is typically used for constructing something else. But many of the projects that I’ve seen come out of your work and your work with students at workshops and conferences physicalize those lines in some way. It’s almost as if the negotiation between physical and digital is at its most tenuous in these line-based projects. Can you talk about that?

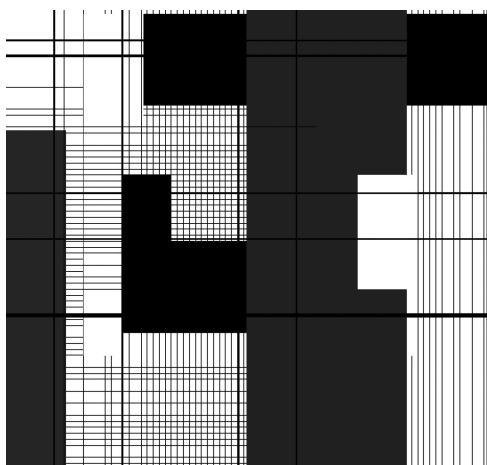


Figure 17.6 Web-based drawing application “Naladrian” plays with shapes and lines (2021).

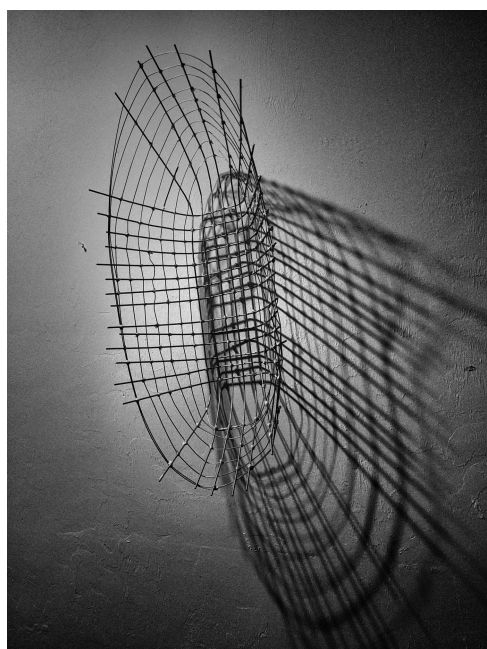


Figure 17.7 Wire-bending structure for “the boat” for Mathemalchemy.org – 24 mathematical artists and artistic mathematicians (2021).

VN: My exploration of lines whether in light paintings, sketches, or sculpture, are embodied things that I explore physically. They are real things. I draw them by hand, I bend them by hand, I move my body around them. They’re physical things that also become digital things, and digital things that become physical things (Figures 17.7 and 17.8).

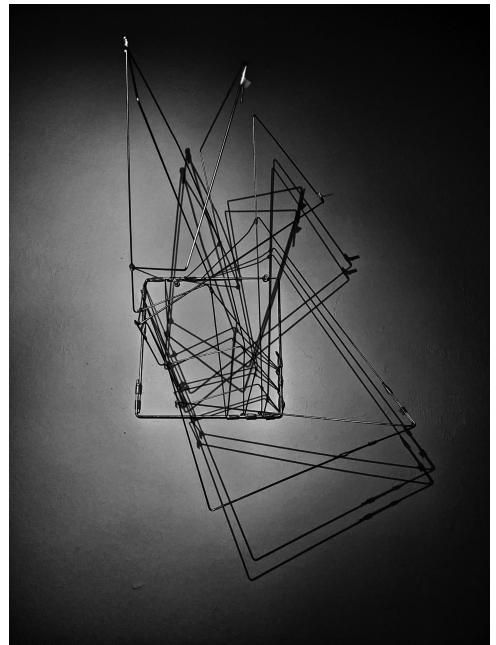


Figure 17.8 Wire-bending sculpture – “Explosion,” (2021).

GC: That negotiation between physical and digital also seems to be centered on an idea of craft. Craft is a curious word in architecture because it is something we often avoid talking about. I think there’s a common misconception that craft is different from technology or that traditional craft is at odds with high design or high-tech design. But in your work, you talk a lot about craft, and you engage traditional craft in conjunction with computation. The term craft is also gendered at times, associated with the feminine. That may be one reason why it has been isolated in discussions of technological disciplines. Can you talk a bit about why you’re interested in craft?

VN: My interest in craft came about during my graduate studies. I knew I wanted to do research in/ about Carnival in Trinidad and Tobago, and in the early stages of research, I found out about a particular craft that was dying: wire bending. My ethnographic work involved interviews with wire-benders and other designers and makers in Carnival, observations, etc. I began looking at the tectonics of it and its experts. There was a strong sense of humanity in this craft. Of course, I also had to find some way to bring computation into it, as this was my thesis. I used computation to document and make the largely undocumented practice of wire bending more explicit. There was a gender component to it as well. Wire bending is traditionally a male-dominated practice. My goal was to use the computational tools I developed to bring women and children into the conversation. It became a project about accessibility and access to knowledge, all revolving around this unique craft (Figure 17.9).

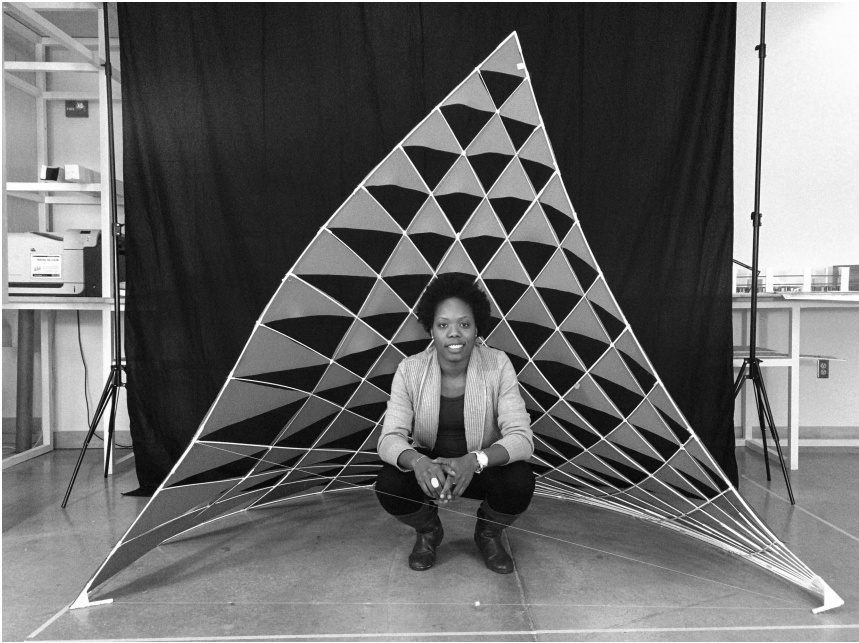


Figure 17.9 “The Sail” – designed from analysis and parametrization of traditional characters in the Trinidad & Tobago Carnival and digital fabrication methods (2016).

GC: Is this where you started to work with shape grammars (the theoretical computational design technique invented by George Stiny at MIT), which is in essence a kind of non-computer-based computation? How does this fit into the project?

VN: Shape grammars fit into the project because of its accessibility. I could use pen, paper, and pencils – the same tools as wire benders – to have a discussion about computation and wire bending. They can quickly assess whether something works or doesn’t in a very simple way. Shape grammars are very simple, abstract rulesets and do not really require advanced computation. It made it easy, accessible, and cheap to produce and iterate through designs. The rules that were developed could be communicated to the community without any software or hardware. It was exciting to be able to work at both extremes: the low-tech and the high-tech. It helped me realize that they are very similar ways of working, and that there is much richness to uncover when we map one on top of the other.

GC: Have you encountered any limits to the approach of Situated Computation? I’m thinking that there’s always more that can be done. There’s more to learn about the site, more to learn about the people, more about traditions, etc. And projects always have constraints whether its time or budget. Or both. How do you make value judgements about what should be part of the project and what you are not going to be able to include?

VN: Time and resources are the biggest hurdles. With more people, we could get more things done. There are experiments and workshops that I want to conduct in Trinidad & Tobago, and the entire Caribbean for that matter, but between a pandemic and the cost to run workshops, to ship technology, and travel there, I'm very constrained. These are the realities of research that are at times assumed, unknown, or just ignored. In terms of parts of a project that could be left out, it depends on the project. But based on the principles I mentioned earlier, there are some components that must always be there such as ethnographic research and conversations with people. My rule of thumb is that the ground and the people are what matter the most.

It is a tricky realm to navigate because as a tenure-track academic, there are parts of research that cannot be ignored. But my community isn't comprised of just people reading academic papers. I want people outside architecture and academia to know what I'm doing. I want the person on the street to be able to critique my work and for us to have a conversation about it. Any limits that I have encountered typically revolve around this negotiation between insider and outsider knowledge.

GC: Would you say that if a project had a lot of constraints, priority would always be given to the site and the people versus the technology?

VN: Yes, but, again, we should broaden how we think about technology. The shape grammar technique is a technology, too, for example. It's not a digital technology but it is a form of computation that can be done with very limited resources. We can still make progress by using these types of technologies that require little infrastructure. My point is that our research should make space for those who may not necessarily have hi-tech resources but are still interested in computational things. Like George Stiny and Terry Knight at MIT. They're not pursuing AI or advanced 3D printing. Yet, their theories of shape grammars allow them to reflect critically on geometry and fabrication at an abstract level.