MATT RATTO

INTERVIEW BY GARNET HERTZ

Hertz: So, how did you initially come up with the term critical making?

Ratto: For a few years I'd been exploring the relations between sociality and technical systems, using a variety of material semiotic theories and people like Haraway and Latour as starting points. And I was finding it difficult to, you know, articulate truly critical positions and engage with the social thought of philosophers like Heidegger or the scholars from the Frankfurt school within my studies. I had a sense that this difficulty was somehow related to a kind of linguistic bias that I was surprised to find within material semiotic theories. I was trying to come up with some evidence for that linguistic bias or at least create a research program through which I could constitute another way of studying technology. And I was just kind of idly thinking one day and I thought, oh, critical making - that sounds so weird, that's a very odd convergence of two words. That got me thinking, why was it that *critical thinking* as a phrase sounded so OK, sounded so normal, sounded so kind of common-sensical but *critical making* sounded so odd! So that was the starting point and really, my work on critical making has been to try to figure out the conceptual distance between critical thinking and critical making.

The starting point has to do with what we count as critical?

Yes, exactly. My reasoning is basically this; most people consider thinking a linguistic practice — an internal monologue in which we use conceptual categories to make sense of the world around us.

Similarly, we tend to think of criticality as a particular form of thinking, one in which we pause to reflect, and step briefly away from action in the world in order to reason and consider these actions. Therefore, the activity of being critical we mainly think of as one that is bound up in language and to some degree outside the actual world. Critical thinking as it is theorized and as it is taught is first and foremost a linguistic practice. But when we think of making, we have a tendency to consider it as the opposite of thinking, and to consider it a form of habitual or rule following behavior. Making in this light looks a bit like assembling something from Ikea – put this piece here, cut this out, nail this together. There is a strong tendency to consider making as aconceptual and programmatic.

So this is the source of the cognitive dissonance that one feels where hearing the phrase 'critical making' — critical we see as conceptual, and making which is seen as not conceptual, creates a kind of lacunae between those two terms. But that's obviously quite strange if you're at all a maker, if you've ever made anything at all because, of course, making is a deeply conceptual activity, and deeply reflexive, though not necessarily in the same way as critical thinking. So, critical making for me, in the beginning, was an attempt to figure out why making is considered by many to be a noncritical activity and starting from there to find ways to recover, study, and teach the criticality of making.

Right, right. OK. And so at that time that you had come up with that term, was it a response partially to Make Magazine or

Both in a sense. I was aware of Make and the Maker movement more generally, and saw the work being done under these labels as providing enabling conditions for what I wanted to do. But my work was really a response to critical technical practice and to a lesser degree critical design. I like the work that uses those labels, but wanted to focus more explicitly on linking material modes of engagement and critical reflection on our technical environments. Really, my goal was to explore actual making practices and to try and come up with ways to link deep reflection and critical theory within technical activities. Here, its important to see the origins of the term 'critical' in 'critical making' as coming from the notion of critical scholarship defined by Frankfurt School scholars such as Adorno and Benjamin. Central to their work was the idea that criticality entailed not just reflection but also intervention in society. And, Garnet, I'm talking about this from a very academic perspective because when I was first talking and thinking about this, my goal was to create innovative scholarly practice. I wasn't thinking about critical making as a more general form of social engagement. But this was back in 2007 – I now see a lot more connections with some of the things that you and I have talked about before, like tactical media and other forms of material intervention. I now see critical making as a more general practice than just something academics do in some far off castle on the hill. Critical making as a larger category allows us to connect up a variety of practices and see them in some sense as similar. Design practice, art practice, tactical media practice, academic practice, engineering practice. So that critical making becomes a kind of a common hub around which a whole set of material interventions seem to circulate.

I see the term of relevance to people who are making projects who come from the art world, activist world, even the designer world, like the critical design angle, like Dunne & Raby. They are disenfranchised or are questioning the agenda of Make Magazine and an apolitical, gee-whiz kind of perspective that it tends to bring to developing things. That's where I see

people responding to the term of critical making – where they were doing this stuff all along under the banner of electronic art but now Make has done a lot to promote the scene in popular culture but at the same time has thoroughly sanitized it and removed it from the streets and being tactical or controversial.

Yeah, I have a bit of a distant relationship to the Maker movement for some of the reasons you just stated. Like many technologically-inflected movements, it has a tendency to be fearful of politics or, really, of being seen as political which is a bit of a different thing. But it's important to recognize that a lot of the innovation, innovation is a strong term, development, let's call it, that has occurred because of toolsets, technologies and communities really comes out of this great groundswell of interest in material practice. Whether it is knitting, or electronics, or 3d design and printing, or any other types of making, it serves as an important ground for a more critical material practice than what has previously existed.

I have to say it wasn't until very recently, in part through some of our previous conversations, that I started to really think about the sanitization of making you just described. I did note that the maker movement struggled with being political, in the same way the Free/libre/open source software movement did before it. And I do wonder if we will end up in the same place. I mean, how many people know about the history of the terms free software and open source, and the fierce debates that accompanied those terms. Heck, I saw a fist fight break out at the 2002 Open Source Convention in San Diego. But the Maker Movement seems to care much less about these issues and almost ready to discard any sense of being a form of social critique.

It will be interesting as making becomes a more dominant cultural activity and trope, to watch and see what kinds of activities are considered "maker" activity. Right? That's kind of a really fascinating thing that's going on right now. You can certainly see that some people really want to hold on to something other than just the label 'maker.' I mean, Natalie Jermijenko, for instance, who we both know, she told me that she really liked the term 'critical maker'. I think she wants that label

'critical', her work is 'critical'. It's not just maker work, right? Though others might see it – see some aspect of it – and say, "oh she's a maker," and leave out that other critical part. Just as an example of that, people might looks at her 'one tree' project and say "oh look, she made these clones of trees. Isn't it interesting that she was able to clone these trees?' And by focusing on the technical task – as interesting and difficult as it probably was – completely miss the point that Natalie's work served as a way of making material relations between genetics and environments. And then there's all these issues concerned with environmental sensitivity and so forth and so on. To think of 'one tree' as maker work and ignore the critical statements that are being made is to sanitize the work.

So how do you see critical making in relationship to something like critical technical practice? Do you see those two things as related? Is critical technical practice historically coming out more from technology and physical side? Is critical making as you've defined it as coming from more of a scholarly angle?

I think there are a lot of similarities in all these terms – critical making, critical design, critical technical practice, participatory design, and so forth. They all emphasize forms of material engagements as important processes for social intervention. But in my conception of critical making – and I should say that I am not of course the only person who gets to define that phrase – but in my conception of it, I think critical making differs from the others in its broader focus on the lived experience of making and the role this plays in deeping our understanding of the socio-technical environment. I'm turning these other practices into straw men in saying this, so take it with a grain of salt, but I do see the other practices as focusing in on improving technologies by uncovering nascent values, bringing relevant stakeholders into the design process, or by showing alternatives. I've never really thought of critical making as being about the final object, about making functional technologies at all. Instead, I see critical making as first and foremost as a way of learning and exploring the world.

But especially, I mean, I see critical design as being clearly being targeted towards product design. It's really targeted at production design, but also, I think, its limitations are that it's focused and that it often doesn't go beyond that.

That's right. I think of critical making as broader than critical design. With critical design, there is an object that sits out in the world, and, through our witnessing of it some critical reflections of the designer are revealed to us, the observers.

Critical making, I think, is more focused on process than on that final result. And in my own critical making practices, I actually create a bit of a firewall between the object that is created and the process. I've resisted doing things like exhibiting the objects that emerge from critical making courses and workshops, mainly because I'm not quite sure how to stop the idea of exhibiting from overly structuring what we do as we go through a practice of critical making. I assume that this is something that good artists and designers figure out how to do. But for me, personally, because I don't know how to ignore that reality, I worry – I've been worried – that thinking too much about finality and display would reduce participants ability to explore, learn, and reflect.

But, that being said, I do think that critical making is the first step to then doing these further steps, which have to actually do with improving the status of our environment. But critical making could reveal an insight that is not captured in the final object. In fact, I'm sure and I've seen it do that, where through critical making participants come to understandings that really do not get embodied in or even connected to any kind of final object that could move outside of the context of that original making.

But isn't it important to disseminate the projects that people make? It seems like if you are only interested in just – for lack of better terms – the workshop component. I do understand the hesitation to go into the art scene and exhibiting these projects as sacred things apart from the activity of making them. But how do you disseminate the work? Do you host a bunch of workshops, or how does it work?

Because from my perspective making a project is a process with some attributes of the knowledge gained in building it residing in the object. In an art context you're able to display that object and perform with it or even do workshops in a public form, like in a festival or an exhibition.

What's your key hesitation with the art world? Or is it just that you haven't really worked in that field before?

No, I've never worked in the context of art. And in my naive understanding of it, at least when I first started doing these activities, I saw art and design objects being seen as having value because they were considered novel, or innovative, or aesthetically pleasing, or similar valuations. Just as I want to avoid the normative values associated with technologies from engineering perspectives – values of labour-saving, rationalization, instrumental – I also want to avoid the judging of critical making objects through the lens of novelty and aesthetics. Not that either of these types of valuations are necessarily bad when applied in the right context, but I do find them overly limited for the kinds of deep materially-mediated reflections I want to do. I wanted to make sure, for myself and for others that I was sheparding through the process, that our focus didn't shift, that we didn't get captured by the traditional ways of valuing the objects that we are making.

And again, this has all been a process of figuring stuff out, right? Figuring out what it means to make critically. You know, what does that actually mean? There's a couple of commitments that I said to myself when I first started this and one of the first ones was that it had to involve a material engagement. That it couldn't just be any kind of engagement; there needed to be an engagement within the process of critical making where the material substrate that you were working with helped to determine the final form of whatever you were making. In other words, that the world pushed back on your own thought of what the world could be. So it couldn't be a purely imaginative or as Tim Ingold puts it, a purely hylomorphic practice. That was the first commitment. And the second one was that any engagement with the objects of critical making had

to remain active engagements of shaping and production. This means that rather than creating passive moments whereby people would experience the objects that others had made, there had to be a way to construct an engagement between the person coming to that object and the object itself that was real, that actually was transformative for the object as well as the person.

Sure. See, I see that what you're describing right now has a lot in common in contemporary art with movements like Fluxus and other action-oriented, process-oriented type of work.

Or even like happenings, right? I mean, in some ways I think of happenings as almost more kind of model, or the kind of games the surrealists used to play. In some sense that's the kind of way that I've been thinking of the events.

Or situationism...

Or situationism. Absolutely. But I haven't really explored those connections, focusing instead on the more pragmatic details of it all. I guess you could say that my most important critical making is the making of critical making! And I felt and still feel that it would be hubris to link the often quite mundane work I do with terms such as art or design. I just didn't think that critical making would be a label that would resonate for artists and designers. Though in many ways what I've been doing is appropriating the practices of artists and designers as well as those of engineering.

Sure. I think that the term has become more relevant now that a lot of undergrad students are very interested in Make Magazine, they all have an arduino that they've maybe made an LED blink with, they like to go to Maker Faire, it's like they are a sort of Burning Man type of community, or they're a Woodstock kind of community that they have identified with. And I think for a lot of faculty that have been doing this stuff for decades, kind of like shake their heads and go like, "OK, well that's great that you can make an LED blink, but let's try to get you to

think about some bigger issues in culture." And so I see the term being of relevance to groups like that.

For me, that's very exciting, and makes me a little nervous as well. When I was just off in my little world, doing my little critical making stuff, I really felt that I could push the scholarly and conceptual part a little further. You know, create a new academic form that takes seriously the idea of material semiotics I mentioned before. Many scholars hold to the notion that the world is both simultaneously a real material thing out there that resists our ability to control and describe it, as well as something that is deeply semiotic, deeply the result of our conceptualizations. And everyone tried to theorize their way to an understanding of this; the interfiliation of the social and the natural, the agency of objects, the in-formation of our built environments. But I wanted the materials of the world, the things and objects we engage with to not only be present in these arguments as linguistic artifacts, as textual doppelgangers so to speak, but to exist as key elements of our working throughs. Most importantly, I've wanted to create a way of working in which the materials of the world are a necessary part of critical scholarly work. And it remains fascinating to me how few scholars truly engage with these materials when it comes to social and humanities study of technology.

Sure, of course. I've had a similar reaction being through film and media studies, and new media studies with people who have never touched any sort of computer programming language. And it always seemed, it always struck me as very odd, that it's a completely valid argument to say that if you're studying Foucault that you need to understand French, but if you're studying new media art or technology, that you don't need to know how to program. And I think there have been a lot of other people, like Alex Galloway or other folks that have argued from this perspective, and some degree Kittler and others that have seen an importance in materiality and technology and have described the important of a deep understanding of the technologies

that one studies.

That is in fact one of the most interesting questions that emerges from this work - what counts as a deep understanding? The kind of critical making that I've been describing really troubles easy definitions of deep understanding – pure technical knowledge isn't enough, it's not just about getting close to the machine in Tracy Kidder's sense. You also need to have an understanding of the kind of ways that the materials might impact or relate to or engage with or co-construct the kind of social reality that we live in. You need to have an understanding that includes deeply technical as well as deeply social knowledge.

There are always deeper levels within any technology. Take computing for example: do you need to know how to use Scratch, do you need know how to use Java, do you need to know how to use C++, or do you need to know how to use Assembly? There are always lower levels of any technology. I mean, how low do you go and where does it end?

Exactly. Do you need to know how a computer works? Do you need to know how binary data is encoded on the hard drive? Do you need to know how to write the microcode that powers the processor at the heart of the system. Do you need to know how to build a computer? Do you need to know how functional programming languages work? So the problem here is to decide where it ends. In his book Designing Engineers, Bucciarelli tells this great story about being at a conference where people are bemoaning the state of technical knowledge in the US, saying that no one knows how their phone works. But then he started to think about it, himself, as a trained engineer, "do I know how a phone works?" And he goes down the rabbit hole - do I know how to use a phone. Do I know how the signal is encoded on a phone? Do I know how the switching gets done at the switching station? Do I know the political-economic decisions that have been made that allows this carrier to have X geographic area over this carrier that has a different geographic area? And so forth and so on. One of the things that he realized was that when you start thinking about

what ones needs the know, the line between social knowledge and technical knowledge gets increasingly blurry.

Sure, and what about somebody saying that inside each of these black boxes of technology that there are hundreds of "PhDs" of knowledge inside of each black box and there's a lot of black boxes inside other black boxes. Is it even feasible to think that everybody needs to understand everything? Or how many black boxes can you practically open? And furthermore, how does this process fit this into an educational institution, and how much should you expect a person to know? What's feasible and where's the payoff in terms of having a deeper understanding of technology?

Yeah, I completely agree. And there's a trade off here too, in that opening the black boxes of certain things doesn't necessarily help you use them, and in fact it might make it harder for you to use them. The kind of naturalization of technology to allow us to use them more efficiently, for example, means that we don't want to be constantly conceptualizing and focusing on a deep understanding of our technological environment. You know, if you had to think through the process of how you go about shifting a manual transmission car every time you pushed on the clutch, you'd never go anywhere, it'd be too hard. So there is a kind of need to make invisible the mediation of our technological environments, depending on what we're up to, what we're engaging with at that point.

I don't think that there's a single answer to the question of how much does one need to know. That's the main focus of the book I'm working on right now. I'm trying to develop an object relational framework to allow me to say: these are the attributes to the technological objects that are important for this type of question. So if you're looking at how do individuals use this object, then these are the material attributes that you might want to look at. If you're interested in understanding it from a culture perspective, then these are some of the attributes that you might like to look at. And if you're looking at it from an institutional perspective, then these are some of

the ones that you might like to look at. To tell you the truth, looking at any of of those three aspects that I just mentioned, is often pretty banal. And not particularly evocative in terms of our understanding of the socio-technical world. The really interesting questions start to emerge when we address the contradictions between social forms. How the attributes of an object that afford a particular individual use of it are in direct contradiction with attributes that make it institutionally acceptable, for example. And all you'd have to do is look at something like an MP3 file to start to unpack what that looks like. And this starts to get into the reality of tactical media and the other practices we were mentioning earlier.

Right, I think of critical making as coming from tactical media or the arts as emphasizing the thing that you've made as an object to intervene in social, cultural space. This sort of side steps the whole problem of how many black boxes you have to unravel to really know something. You need to unpack the black boxes and understand the technology enough to make your object so that you can put it out there and that a statement can be made through the object. I see that if too much focus is on just the process of unraveling the black boxes or understanding the technology it results in people learning binary, or going very "low" down which is only really useful if it's targeted in a specific direction. The lowness of technology never stops.

I think the more scholarly project of critical making is an attempt to scope out some of these dimensions, to better frame what one needs to know and when. It also emphasizes – and I think this is pretty important - that not all the knowledge is technical in the true engineering sense, but also involves perspectives that derive from social science and humanities scholarship.

Yeah, I mean, there's another perspective on this angle that asks why do you need to wrap up all these issues in one person, and why does one person need to unravel this? Why can't there just be artists that make

projects and cultural theorists that analyze those objects? What's the importance, or what do you get out of combining those things into one?

I think the most important issue here is to consider what is lost and what is gained when these roles are separated. One way to consider this is to think about how you, Garnet, feel about other people's descriptions and theorizations of your work, how evocative have been those writings in terms of what you intended or the value you saw in the object you've made.

And most of the time, it's terrible. And I think that many artists get into theory out of being frustrated at having their work misrepresented.

They dislike or disagree with the stories that others are telling about their work and they want to do their own conceptualization. So one benefit of bringing those two identities together would be to say, "that's an individual then who has a deep ability to conceptualize their work and to then articulate those conceptualizations in a variety of ways including linguistic forms." Because we do have to remember that part of what is going on here is that those commentators are skilled makers of their own. They're skilled makers in language, or not skilled depending on who they are. But that's their domain; that's, in some sense, their domain of expertise. So, bringing the identities together is not necessary saying, "oh now the artists need to conceptualize their works better." I think artists have always done that. It's about articulating those conceptualizations through a different material forms than most of them are used to working in, which is really the materials of language, or to be more restrictive, the materials of scholarly or art criticism language.

But I think the question of the deep knowledge thing is really an important one and one of the reasons why I like critical making and not just making. Within the maker identity, as its increasingly being performed by Make magazine and other venues, there's definitely a focus on technical knowledge, on people becoming as close to an engineer as they can get. I do think the process of training that I have seen articulated in Make often socializes people into particular ways

of thinking about the way technologies work and work in society. Technologies are made for a function, they're made to solve a problem. And although I don't think the artists follow such instrumental views on technology, the makers and the maker movement definitely has that in it, as I think is something that should be a bit resisted.

So do you see this following through in things like DARPA funding Make Magazine? That would tend to back up what you've just said how there's a normalization happening in the maker community.

Yeah, absolutely. Think about the notion of the post optimal object from Tony Dunne. So what the hell is DARPA going to do with a bunch of post optimal objects? I mean, that's not going to solve any of their problems. The real driver here is to create these nice "STEM-educated" bodies that emerge that will fit nicely into the, not to be too old-fashioned, so-called military industrial academic complex. Certainly the DARPA move is a great example of that. It's not mainly about military power, it's actually about maintaining a kind of a work force. That's the aspect that I am the most uncomfortable with. The idea that the maker movement becomes a nice feeder for a technical workforce that the powers-that-be see North America as no longer providing. It's not just that Make-DARPA guys are going to go make bombs. It's the slotting into an industrial machine that has me worried.

I see it as a fear of Chinese industrial culture eclipsing the United States. I see it very clearly as an anti-made-in-China mentality. And I think it is pitched exactly that way by Make Magazine to the White House. And I think it's true that North America has generally forgotten how to manufacture things. People don't pull engines out of their cars, hot rod them, or even change the oil in their vehicles anymore. There's a real forgetting of material making that has happened in North America over the last several decades, partially at the hands of the dot com boom and the spread of the internet.

In university I think students are interested in making because it's novel. I like walking into an undergrad class and giving them a lump of play dough on their desk and just saying, "OK, make something." Physically building things is novel in many educational settings. It can be a very immersive type of thing, and I think that Make Magazine has very cleverly capitalized on this.

I think you're right. For me the main goal of making, whether critical making or whatever you want to call it, is to reconnect people to the world. The most powerful aspect of making is the way it denaturalizes the built environment. Being a maker basically gets people to look around them, to look around their world, and say, "OK, somebody made this." This thing, this object didn't just fall from heaven; somebody made this, they made decisions about it, they made choices about it and those choices are impacting me. And then the next step is recognize those choices as political, as benefitting some people over others. And the final step is for people to find some agency in regards to this political nature of the built environment. That for me is the ultimate goal of making. Which is why depoliticizing the maker movement is so problematic. An a-political maker movement then requires that the objects that are made are equally apolitical.

Yeah, in terms of where the minerals are mined to make that thing, how it was manufactured, where it goes after it's obsolete: much of that is stripped away in terms of how it's represented through Make Magazine. It's often only communicated in terms of what gee-whiz thing it can do for me to do something whimsical to impress my friends.

Right. Part of what needs to happen is that people need to be aware of the trade-offs that occur in making things. Sometimes these trade-offs have to do with the environment as in the rare-earth example you just mentioned. Other times the trade-offs have more to do with social life. We have to be able to say "OK, well they chose a certain screen size which makes it appropriate for a particular user group and probably quite

inappropriate for another user group." Ultimately, people need to understand that ways our social and our natural environments are mediated through the choice-making that is part of the process of making. I think that's the most important thing that critical making should do – other than all the scholastic stuff that I'm interested in – it should help people see our environment as a made environment, made in particular interests, and serving particular interests. So to depoliticize it is to ruin this opportunity. Cleansing making of its politics takes away this amazing opportunity to better understand and exist in the world. It turns the making movement into just another way to create an industrial workforce.

Or just another, or just a sort of prosumer, or consumer type of group of people who now all buy open source hardware that they could maybe assemble on their own but they're too lazy and you know, to make something neat out of.

Yeah, the prosumer thing is a great example, as is user-generated content. I mean, basically a lot of the make stuff that I've seen coming out is basically the material equivalent to user-generated content. It's all so heavily constrained, that it basically provides the illusion of choice. Which is what we get when we go to Burger King, where they say have it your way, if they're still saying that. Have it your way. That means you can choose whether or not you can have pickles on it. But in the end, it's still a hamburger, right? So, you know, often times the prosumer thing is just a way of giving us the illusion of agency, in relationship to our built environment, but providing us so very little true choice.

Ok, let's switch into you discussing what you have in your critical making lab. So let's talk about this in concrete terms, in terms of sort of equipment, what sort of social structure, what sort of instructional methods. Let's talk about how you have made a critical making lab within a university...

OK, so that's a really interesting question from an institutional perspective. First and foremost, this

has been a very odd process, in some cases difficult, in some case surprisingly easy. I am lucky to work in the Faculty of Information at the University of Toronto, which is somewhat of a hybrid place. There is some technical work going on within the faculty, but it is also deeply embedded in a kind of humanistic interpretive social sciences frame. This creates the perfect context for critical making since it requires both technical and conceptual resources. There are aspects of this that do remain tricky; for instance, I have a laser cutter that I keep moving around campus since it requires external ventilation and my lab does not have access to this. I am in fact located in a library – the main Robarts library at U of Toronto – and this does reduce the kinds of equipment I can have online. Equally, being seen as a technical practice can encourage both students and other faculty to see what we do from that frame. So we kind of ride the wave between being a cultural, humanistic space and a technical space.

What sort of equipment do you currently have in your lab and what direction are you planning on going with it?

My current research focus is on the rubbing together of digital and physical worlds. Most of the critical making that I do in my lab and with students involves making wearable or environmental computing prototypes and using these to explore critical information issues. Therefore, we work a lot of microcontrollers like the arduino, lilypad, or jeenode platforms. We have a pretty complete electronics lab, with components and equipment directed towards both prototyping and, increasingly, fabrication. We just received an LKPF S63 which is a PCB mill, in order to play with creating our our PCBs on the fly. We also do a fair amount of enclosures, or small mechanical structures, so we have a couple of proprietary 3D printers – a Dimension 1200SST and an Object30Pro, a couple of Makerbots, and a Sherline CNC Mill. Probably the equipment that is used the most other than the soldering irons, is our Versa VLS3.50 laser cutter.

We've sort of upped the ante with our current equipment since we've been moving into high-end capabilities, like with the Objet printer. But I do want our main focus to stay on the process-side – in other words to continue to be focused on

exploring the materials of production through making as an important part of critical scholarly work.

So where do you see, where would you like to take the idea of critical making and what do you see ahead for either the term, or your own work, or maker culture, or where do you want to go with this?

I think it is a kind of egomaniacal craziness to pretend to own a term like critical making. It is however a very successful academic model – whoever becomes seen as the original definer of biopolitics or boundary object or whatever gets widely cited. I do hope that my work continues to grow in relevance and that others read it and see it as a stepping stone to their own endeavours. But ultimately, I believe lots of people will engage with critical making from their own viewpoint.

I will continue to work on pragmatic and theoretical frameworks to support such work. Critical making names a mode of engagement in the world that is about seeing and making a world that has somewhat different characteristics from the world that we live in now. I know this is old-fashioned to say, but critical theory spoke specifically of scholarly work that intervened in the world in ways that were emancipatory, that were ways that were freeing, that actually freed up people from these dominant social structures that theorists, artists, advocates saw as problematic. My worry about 'Making' is that it will lose its relevance and its alterity as it becomes more mainstream. I am glad to see more people making since I think practices of engaging materially, whether knitting or building a deck or programming an arduino, help us all see the constructed nature of our physical environments. But I think this work has to be connected to deeper analyses about why the constructed world is as it is. Without such analyses, making runs the risk of just reproducing the environments and constraints we already face.

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