

Fields of the Future

A Podcast by Bard Graduate Center

Episode 4: Marc Vermeulen—Data as Storytelling

Recorded: September 2, 2020 | Released: December 2, 2020

Transcript

**Introduction:** This is Fields of the Future. An interview series by Bard Graduate Center that highlights the work of scholars, artists, and writers who are changing the way we think about the material world. In this episode Jennifer Mass speaks with conservation heritage scientist Marc Vermeulen about the link between art and science, the wealth of information carried within the sample, and the micro histories contained in data analysis.

**Jennifer Mass:** My name is Jennifer Mass and I'm the Andrew W. Mellon Professor of Cultural Heritage Science at Bard Graduate Center, and I'm thrilled today to be talking with Marc Vermeulen, who is Associate Scientist at the Northwestern University Center for Scientific Study in the Arts. Marc, hello.

**Marc Vermeulen:** Hi, Jen. It is great to be here.

**Jennifer Mass:** It's wonderful to have you here and I think I'm going to jump right in. What can you tell me about your relationship with objects?

**Marc Vermeulen:** That's a very interesting question because I think everyone's relationship with objects is somehow different. In some way, we look at the object just like a parent looks like to a child. But at the same time, you care for it just like a doctor would care for his patients. We examine it in every possible way, firstly by looking at it to see its condition and then if we see something that might not be right, we take samples to go a bit deeper just like a doctor would do with a biopsy or something like that. It's a fluid relationship that I have with the object. It also depends on the project you're working on. If you work on a project for a few months, you don't have the same relationship with the object as if you were working on the object for three years.

**Jennifer Mass:** I understand exactly what you mean. I think as I approach antiquities, I feel this almost religious connection, like this tremendous reverence for the age of the object and the culture that surrounds that object. But I find that even when I start to work on objects that I might not initially have had any connection with, the more that I uncover about the technologies of manufacture that were used by the workshop to make the object, it really becomes a very intimate relationship. I feel like you are sort of on the same wavelength as the artisan who did the original work.

**Marc Vermeulen:** I agree. I do create this connection with the object. At the same time, when I take a sample, I do also create a connection with the sample, which is at the end almost

nothing, but I care about it the same way I would care about any art object when it's just smaller than a grain of salt in a piece of resin.

**Jennifer Mass:** I love that you're saying that because I feel the very same way when I have to transport samples between two countries, for example. If I'm taking samples remotely and taking them back to the laboratory, I feel just as careful as if I had the entire work of art with me. Again, you develop this relationship even with this microgram sized sample from a work of art because we know that the information that they hold is so precious.

**Marc Vermeulen:** I remember in the first year of working in the field, I think I over polished a cross section, so I lost a sample and I think I didn't sleep the night after that. I was like, "What did I do?" Just like if I had broken the actual work of art.

**Jennifer Mass:** Oh, it's so true and something that I really try to get across to the public is even though these samples might look like a spec of dust on a microscope slide, for example, that we might be able to do up to six different scientific studies of that single sample and then after all of those studies are done, we still have that sample remaining so that in the future, if new technologies are developed, we can go back to that sample and still get more information about how the artist was working.

**Marc Vermeulen:** I did that during my PhD. I feel like the people before us, before me when I arrived in my PhD cared about the sample the same way I care about them. So it's kind of like a grandparent that has passed along heirlooms almost.

**Jennifer Mass:** I worked on a number of samples from the Munchmuseet in Norway that were removed from the painting when I was two years old and I got a tremendous amount of data about this material. So, that's one of the reasons I think it is part of the code of ethics of our field that we are so very careful about how we archive these materials so that scientists in the future can study them. And this is actually a good segue to the most pressing societal issue we're facing today, climate change. How can the scientific study of cultural heritage contribute to addressing some of the important issues that are coming up here?

**Marc Vermeulen:** I think linking climate change with what we do is also adding a layer of concrete evidence to whatever is happening in society. For example, when I did my PhD, one of my colleagues was actually studying the influence of particulate matters on the decoration of pigments, so those particulate matters are actually produced by the industrialization that releases gas and dust in the atmosphere that will have a lot of impact on many parts of the society. And one of those is works of art by making some very sensitive pigments degrade faster than they should because of pollution that is created with climate change. Even though it is a very, very small piece of evidence of how pollution will influence art, is a good way to show that this has impact.

**Jennifer Mass:** You brought up a very interesting point about this research with respect to particulate deposition on objects of art. And this is also something that I think the museum

going public doesn't really understand about cultural materials, that we can analyze an object that's been in a museum collection since the beginning of the 19th century, for example, and see all of the heavy metals that are precipitated onto that object because they were in a building with a coal fired furnace, which would have been very popular in the Victorian period. And so I think in our career, we are very used to seeing how materials have changed because of the environment of the past and now it's time to be studying the environment of the present and thinking about the future and how these materials are going to be affected by the new types of particulate depositions that we have now. Microplastics have of course been in the news so much when it comes to pollution in the oceans, but we haven't thought much about how they are affecting cultural materials, although we know that they are included in, for example, rain drops, and that they are landing on cultural materials all the time.

**Marc Vermeulen:** I think in order to be able to address that very well, we need to also cross paths with people working outside of the cultural heritage field. Making connections with the museum world and the university world where we can actually hopefully involve more people doing fundamental research into the more applied research that we actually are doing.

**Jennifer Mass:** I think that's incredibly exciting. I remember when I first started in graduate school, one of my professors telling me that they thought that the most interesting research is being carried out at the boundaries of the disciplines, and so the more disciplines that we can bring to a problem, I feel like it's always for the better. One of the things that I've been thinking is the possibility with repatriated objects whether we're talking about Benin Bronzes or what have you, that the scientific studies of these objects are going to go back to their home countries in addition to the objects themselves and that this is going to bring up the possibility of more collaboration with, for example, conservators and scientists in Africa in terms of further understanding these objects than it's possible for us to understand them in a Western museum, where the object is completely out of context.

**Marc Vermeulen:** I think having the object and everything that was studied around the object as one package deal is very, very important.

**Jennifer Mass:** I envision conferences in our field in the future that would hopefully either be taking place at some of these new African museums or at least bringing our African colleagues to work with us and maybe tell us where we've gotten it wrong, for example, in the interpretation of these objects that are displaced from their cultures of origin.

**Marc Vermeulen:** I'm hoping that in the future, we'll be able to have a better representation of Asian scientists or conservators or African, South American. I'm hoping that this consciousness of having a more global representation of everyone is going to continue in the future and hopefully soon.

**Jennifer Mass:** I wanted to have you talk a little bit about something that you've done in your research in terms of looking at Europe's relationship with the Far East in the second half of the

19th century and the significance of preserving, for example, the Panorama du Tour du Monde in Belgium, and what did your research reveal about its history and state of preservation?

**Marc Vermeulen:** First off, I just want to say that I'm certainly not an expert on Europe's relationship with the Far East in the 19th century, however, I studied this Japanese tower in Brussels, which was part of the Panorama du Tour du Monde, which was a Paris 1900 World Fair attraction, which was aimed at seducing the spectator through a stimulation of the senses by making them travel from Europe all the way to Japan, and showing them the various architecture that you can encounter going from Paris all the way to Tokyo or to Edo. But also living scenes from faraway lands. They brought people from China, India, Japan, and they were living the same way they were living in their country. So there are many things that are quite inappropriate, but it also shows how people at this time were intrigued by a foreign nation that they never really heard of. I think Japan is probably much different from any other Eastern Far East country, like nowadays Vietnam or Cambodia, because Japan has not been colonized, and it wasn't actually close to any foreign country for almost 200 years. So when it opened its border in the mid-1850s, you have an influx of works of art and culture that was foreign to a lot of Europeans, especially London, Paris, which were two big places for culture at the time. The Japanese tower in Brussels it houses a remarkable variety of decorative elements with techniques and materials that are worth conserving because very different from what was done in Europe at the time. I looked at the arsenic sulfide that was used in the panels in two of the floors of the tower to figure out what it was. So one of the most interesting findings was to see that it was an amorphous arsenic sulfide, which is a mineral rock that you get through mining. So you find it in the earth when you mine. And so that was unexpected because natural orpiment was a very used pigment in Egyptian antiquity. It had a little revival up until the Italian Renaissance, but then after that, it was considered to be an obsolete pigment and had many other very good alternatives, like Naples yellow, cadmium yellow, chrome yellow, so finding it in a late 19th century, early 20th century didn't make any sense to us, especially in that great amount. I'm talking about panels that are four feet by four feet and they are fully covered with arsenic sulfide pigment. So we thought it had to be price related. It had to be something that was much cheaper than any other alternative or something that was mass produced in Japan at the time. However, because I was doing my PhD in chemistry, I never really had the chance to dive into the society part of it, like looking into the price of that pigment at the time. And then to continue on the history and the state of conservation, what was very interesting is that another floor of the tower was fully covered with mercury sulfide, like all the panels instead of being yellow were all red. But then when we ended up starting to analyze those panels, we realized that the mercury sulfide was very degraded, like some of the panels were basically gray, white-ish gray, because we had some oxidation that happened on the surface of the panels. But the arsenic sulfide on the other hand, which was one floor below with the same sun exposure did not show any major sign of alteration, which was unexpected because arsenic sulfide is supposed to be a pigment that degrades very easily when exposed to sunlight. So we started doing more in-depth study about the decoration and the stability of artificial arsenic sulfide and natural arsenic sulfide to figure out that the artificial form is actually more stable

than the natural one, which would explain the state of conversation of those floors in the Japanese tower.

**Jennifer Mass:** That's fascinating how the local environment really informs the preservation of the material and it's counterintuitive for me. I would think that the amorphous material would be less stable than the crystalline material.

**Marc Vermeulen:** Actually, it is more stable in the initial stage but then when it starts to degrade, it actually degrades much faster.

**Jennifer Mass:** And so in this environment, which is a fascinating building, I hadn't really known the history of the building and that it was actually used as a human zoo that people were brought over in order to, in a sense, reenact their cultures, which we've seen in many other locations in the 19th century. So given that history, was true urushi used as the binder for the orpiment and the vermilion?

**Marc Vermeulen:** That's where that building is very complex because this building was designed for the World Fair exhibition, so as part of a bigger structure. So when the king of Belgium visited the exhibition and saw that, he was like, oh, I want that to create this neighborhood of Brussels that will show the various architecture styles of the world. So he hired the architect to create a tower that's similar to the one that was in Paris, but the architect actually brought some materials straight from Japan, asked some Japanese to create some new elements, and then they asked Europeans to create some more elements. So it's a mix match of objects from very different time periods and very different locations. So when we analyzed all of the various pieces around the tower, we realized that some of them were real urushi lacquers and that was a case for the orpiment.

**Jennifer Mass:** One other thing that this makes me think about when we're talking about the future of cultural heritage preservation is how this building will be displayed in the future. This seems like a good candidate for, for example, augmented reality that would allow you to see the interiors as they would have looked at the time versus how they look now. What do you think about that as a possibility?

**Marc Vermeulen:** The issue is that it's a building that was made by the king, for the king, and so it's actually located on the royal domain in Brussels. So it has a lot of issues that makes its access not very easy for the visitors. So I feel like virtual reality would actually be a good thing because you would be able to recreate what it's supposed to look like when everything is open with a view which is not actually the real one, so it would be very interesting. But I think, and especially after what we had, like the COVID-19 situation we had where a lot of museums started to do virtual tours of their collection, I think and I hope that this will foster a new implementation of the virtual reality for places like this.

**Jennifer Mass:** I think that one of the things that this crisis has highlighted is really the educational opportunities that we can do with the augmented and virtual reality. Not that

these weren't understood somewhat before the crisis, but I think the crisis has made this even a more pressing consideration that giving people the opportunity to see things that they have no access to any other way is going to be critical for education going forward. So I wanted to talk a little bit more in-depth about your research. You've done all of this beautiful and important research on, again, these arsenic sulfide pigments in woodblock prints, this time, when you were at the Metropolitan Museum, specifically Hokusai, and looking at the earliest manufacturing of synthetic orpiment and their use in the Edo period in Japan. I was wondering if you could tell me a little bit about how this sheds light on the Edo period in terms of Japanese trade and industry and material culture.

**Marc Vermeulen:** As I mentioned before, Japan has been closed to trade with the rest of the world for about 200 years ending in 1853. And so while I was at the Met, I analyzed the entire collection at the Met from the *Thirty-six Views of Mount Fuji* and so I did everything noninvasively. So one of the beauties of the Met is that they have a Raman spectrometer where you can just slide the print underneath and do analysis of every pigment you want without touching the print, without having to take samples. So I did a full survey of the arsenic that has been used in the yellow, in the greens of the print, and early on during my fellowship, I realized that the orpiment, which everybody thought was a natural orpiment, was actually a semi-amorphous arsenic sulfide. So this shows that the natural pigment that was used was actually not fully transformed. So it was very good information that in the 1830s, they were actually producing the artificial pigments using natural ones. However, Japan is not known for mining orpiment, so having that in mind, this probably means that the natural orpiment that was used to create that, to create the artificial one, was probably either imported from the Netherlands, which was one of the only nations that was allowed to trade with Japan through a single port. The Netherlands is not known as being a huge producer of arsenic sulfide. It's usually in Europe, Germany, being one of the producers of natural orpiment, but the other option would be Japan to turn to China to import some arsenic sulfide. So having all of those possibilities in mind, we looked into some Japanese literature, we were able to find some texts that had been translated showing that in the mid-1800s, Japanese were producing this artificial arsenic sulfide onsite in the mountains in Japan. So that shows that they were producing it then when Europe was not producing it anymore. So it was interesting to see the time difference between when people were using it and producing it in Europe and when they were doing it in Japan with this 300 years gap. However, when we extended a little bit the study on arsenic sulfide in Japanese prints, we also analyzed prints from Kunisada, which is about 30 years after Hokusai, and we realized that all of the artificial arsenic sulfide is fully artificial. There is no more traces of natural pigment in there, which means that the production processes actually evolved very quickly and much quicker than what we saw in Europe back when Europe was doing it. So it's nice to see that when they opened the borders, they probably had some input of the Western world to guide their production and then they very quickly after that, they kind of not used it anymore. They turned to other pigments. So the whole kinetic of production and use is much more concentrated than what we've seen in Europe at the time.

**Jennifer Mass:** That's really a fascinating case study on the evolution of technology and using it to understand international trade and also the relationship with technologies in other time periods in other countries. One of the things that I think about a lot when I'm looking at these questions is what did people know and when did they know it? And so when people were first making the synthetic orpiment in Japan, is it because they understood that it had better stability properties than the natural material? I mean, what was the reason behind the innovation.

**Marc Vermeulen:** That's difficult to know because I've never really read any evidence saying that they knew it was more stable. But it could be one of the reasons. Another reason could be that they had bad quality orpiment that they tried to make better quality. When they started to create fully amorphous, it's created from arsenic oxide and sulfur and arsenic oxide is actually a byproduct of the mining industry. So when you purify some copper ores and stuff like that, you actually end up with a whole bunch of arsenic oxide that you don't really know what to do, so if you mix it with sulfur and you heat it at high levels, you actually create this product that you can actually use as a pigment. So I feel like a lot of the processes behind the creation of those pigments is probably to maximize production cost or whatever materials you actually have.

**Jennifer Mass:** This is particularly fascinating to me because when I think about what Japan is bringing to the west during this period, I think about the spectacular metallurgy that's going on there and Shakudo and Shibuichi and all of these incredible alloys that ultimately become imitated in the west. And of course, if you have this wonderful metallurgy going on in Japan, then you're going to have these byproducts of these metallurgical processes as well. So what a wonderful use for that kind of byproduct.

**Marc Vermeulen:** I mean, yeah. As I said, I never got the leisure of cross linking metallurgy and the production of the artificial orpiment. I feel like it's something that is probably a very good master thesis subject for technical art history for whomever wants to do it and I think linking those different studies is going to give us much more answers to the question we're raising right now.

**Jennifer Mass:** You've done all this amazing work on artist pigments and their chemistry and have you considered using it in order to inspire students to think about careers in the arts and the sciences?

**Marc Vermeulen:** One thing that I love to do in my day to day life is to talk about what I'm doing. And I think people are very responsive to what we do because it's a field that is not very well known. I think they see the science at the university and the curators and conservators at the museum, but they don't really see that you can actually mix the two of them as a museum or heritage scientist. So people are very fascinated when you start talking about what you do on a daily basis, which is looking at works of art and trying to understand their history and where they are going to go and how they are going to age. And out of all the people you can talk to, I think students, like high school students or freshmen or sophomores in college, where they still

try to figure out what they want to do in their life, they're very receptive to this. I hope one day I'll be able to meet someone who works in a museum and be like, "Hey, I'm so glad I can see you because I've seen the lecture by you when I was in high school and you inspired me and I decided to continue in that field." I remember back when I was in middle school and high school, obviously we have science and everything, but we also have mandatory art classes all the way through middle school and high school. We were introduced to mineral pigments, artificial pigments, so early on, we have this little thing behind that says science and art are actually kind of linked, and so I think it's something that I hope can be done at a much broader levels everywhere to be like science and art can work together and think about pursuing that.

**Jennifer Mass:** Fantastic. So I want to say, Marc, how grateful I am not only for your wonderful contributions to the field, but your willingness to take time to speak with us today. I'm one of your biggest fans and I'm looking forward to keeping in touch and seeing what comes out of your laboratory in the future. Thank you so much for joining us.

**Marc Vermeulen:** Thank you very much, Jennifer for interviewing me.

**Jennifer Mass:** Thank you so much

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