

December 7th, 2015, oc120715.mp3
Plastic in our Seafood; Keeping Plastic off the Streets
Jennifer Stock, Dr. Chelsea Rochman, Jeff Kirschner

Welcome to another edition of Ocean Currents, I'm your host Jennifer Stock.

On this show we talk with scientists, educators, explorers, policy makers, ocean enthusiasts, adventurers, archeologists, children, authors and more, all uncovering and learning about the mysterious and vital part of our planet, the blue ocean.

I bring this show to you monthly from NOAA's Cordell Bank National Marine Sanctuary, one of four National Marine Sanctuaries in California, all working to protect unique and biologically diverse ecosystems. Just offshore of the KWMR listening area are the Greater Farallones NMS and Cordell Bank NMS, which together protect 4,581 square miles.

Jennifer Stock: On past episodes of *Ocean Currents* we've discussed the alarming growth of trash found in the ocean globally. The infiltration of plastic and debris into aquatic habitats has become a global environmental problem. And studies are expanding globally as well as sharing of information and advocacy efforts to reduce plastics that are harmful to marine life and maybe even essentially, human life. On today's show we will discuss two aspects of the problem. And the first topic of today's show I welcome Dr. Chelsea Rochman, a marine ecologist and ecotoxicologist in the aquatic health department in the aquatic health program in UC Davis. Her studies range from documenting microplastics in marine life to a cocktail of contaminants that come with ingesting plastic. If you're a seafood consumer you're gonna want to stay tuned for this part of the program. And on the second half of the program I welcome Jeff Kirschner of *Litterati*, a tech-entrepreneur that is engaging in national and international audiences with social media by building a relational database to capture the who, what, where, and when with litter. So stay tuned, we're talking about trash, talking about seafood, talking about a lot of cool research happening on *Ocean Currents*.

(Pause)

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Jennifer Stock: And welcome back, you're listening to *Ocean Currents*, I'm Jennifer Stock. On the first half of this program we were talking with Dr. Chelsea Rochman. And Chelsea, I believe I have you live here on the air. Chelsea you're live on KWMR.

Chelsea Rochman: Hi thanks for having me!

Jennifer Stock: Thanks for calling in! I'm side lighted to talk with you, I've been reading a lot about your work for a few years. It's great to finally have you on *Ocean Currents*. You've been working on plastic, trash research and microfibers and a lot of different topics for a while. What's the current focus of your research right now?

Chelsea Rochman: Currently, I've been working on two different things. One is how to quantify contaminants that are associated with plastic and how they move up the food chain, including up to the food that we eat. Also, looking at the sources of the microplastics, really small plastics, less than one meter, into the watershed. But, into urban watersheds which are the land based sources of the microplastics debris going out into the ocean and into lakes.

Jennifer Stock: Which there are lots of sources. Why don't we start with the smallest stuff; I know you just recently published a report about microfibers showing up in fish and shellfish that are sold in our markets. Can you tell us a little about this study?

Chelsea Rochman: Sure. So, I guess throughout the time I've been doing research on marine debris and plastic debris. The question I often come back to is what does this matter for our own species? Does it matter to human health? So, the first part of that question is; is our plastic waste entering into our own seafood? So is the mishandling of our own waste coming back to haunt us? So we first just wanted to see, is this even there, before we can go and start looking at how elements are moving into our own food. So, a group of colleagues and myself did a study where we just simply went to fish markets in both Indonesia and an island in Sulawesi and also in California in Half Moon Bay. We just went there and simply bought fish and some oysters, so some shellfish, so we can see if there's a presence of microfibers in the fish.

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Jennifer Stock: And what were some of the findings? Or actually, what were some of the species you got here in California?

Chelsea Rochman: Good question. The Pacific oyster was one of them. And we also sampled some mackerel and we sampled tuna, salmon, different types of bass and other fish.

Jennifer Stock: And what were some of the findings?

Chelsea Rochman: So, one of the things that surprised us in terms of what we found. There were differences in the frequency of occurrence of plastic debris in both locations. We found anthropogenic debris and I say that because some of the fibers, we're not 100 percent sure if they were synthetic, it could be cotton. But they are from human textiles. We found anthropogenic debris in 1 of 4 animals we sampled. So, 25% of everything we purchased had plastic or some kind of debris in it. The striking difference in the two locations is the type of debris. So, the markets in Indonesia, we feel pretty confident that everything we found was plastic, and were fragments or broken down pieces of larger material. But, in California, 80 percent of what we found was the fibers, so that goes back to what we mentioned before, starting to look at fibers in the marine environment because we did find quite a bit in the fish in California.

Jennifer Stock: So, we were hearing a lot about microplastics in products, from facial products and the work of what the 5 Gyres is doing, beads that are associated with those products. But fibers are different, they come from clothing. How new is this in terms of a finding in the ocean? Have we quantified the types of fibers in the ocean itself? This is the first time I'm hearing about it, in terms of finding it in fish.

Chelsea Rochman: Yes, that's a great question. So, I think in the beginning when people were starting to look at microplastics we were looking at pieces that were less than 5 millimeters in size and that was the definition that was actually coined from NOAA's Marine Debris program. And as the technology got better, methods improved. We were there and able to identify smaller and smaller pieces including the ones in the micron and the nano size range. Now, we're starting to find

smaller things and fibers have been a lot of samples. And, now, you get to see often a lot of papers reporting the presence of fibers in deep-sea habitats and coastal sediments and open ocean samples and samples of water from bays and lakes and also fish. Our study is not the first to show it in fish. It was just the first to show it in fish that were in markets. But many have found fibers in many different sets of marine mammals even freshwater species.

Jennifer Stock: Now obviously, presence of a plastic fiber in fish might be a cause of big concern. What are the health risks associated with this? We know some of the impacts on birds and mammals and maybe larger fish. But, what are some of the potential impacts on fish that they might receive when ingesting plastic?

Chelsea Rochman: Yeah, so, some of the work I've done, laboratories have raised this question specifically but not really in regards to fibers but to plastic fragments that are similar to the micro beads you mentioned earlier. And basically, it's two fold. Plastics in the ocean can have both a chemical and physical impact. Physically they can get lodged inside, they can actually perforate the gut, cause an animal to feel full, or even if the digestive tract is ruined, it can cause harm in mortality. Those are kind of the physical effects, even though these microplastics are so small, when ingested by a plankton they are relatively large. On the other side of it, which I've looked into a bit more, is the chemical toxicity. So, microplastics or plastic debris in general is associated with a cocktail of chemicals which ends up in the aquatic habitat. And half of that story is ingredients that are associated with the material through manufacturing. The other half of that story is that they are like magnets for a lot of the other chemicals that are out there; the industrial flame retardants, pesticides, some metals like mercury, lead, etc. And so then, the question becomes is plastic another source of these chemicals to animals? And the research has shown that these chemicals can transfer and is it enough to cause the toxic effect? And I think that question specifically is the important one in relation to human health because we don't often eat the gut where we are finding the plastic, we eat the meat. So we are wondering if those chemicals are being

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transferred into the meat, with large enough concentration to be in effect, that's where we have concern of effecting human as well as wildlife.

Jennifer Stock: Interesting. So, has that research started up? It seems like that would be a tough one to tackle. But in terms of the bioaccumulation into the tissues that might be digested by humans?

Chelsea Rochman: Yeah, so, people have looked at bioaccumulate ions in cod fish. So sampling fish in the middle of the ocean or in an area where plastic has large concentrations has correlations with the amount of plastic in the area and the amount of chemical in the fish. So, we found a correlation between that and the South Atlantic with flame retardants. But with the seafood, species are sampling from the market that hasn't been published yet but I know I myself am taking that research and I know there are other researchers doing that as well. Cause it is really one of the questions people often want answers to.

Jennifer Stock: I bet. For those tuning in you're listening to *Ocean Currents*. This is Jennifer Stock and my guest on the phone is Dr. Chelsea Rochman. We're talking about microplastics studies in fishes that are taking place. And reports published this past year. So, how about shellfish? Cause a lot of times we eat the entire shellfish. I know for me, I have no problem sucking down those oysters and that's the whole thing; the gut and everything.

Chelsea Rochman: Yep, exactly. And also, in other parts of the world they eat the entire fish and the entire sardine. So, yes absolutely, there's a high chance we are also eating plastic. I also eat oysters, even after I did this study, I went on and did some research on microplastics in the Chesapeake Bay and I think that I had oysters 3 times in one week. Because the jury is still out with how harmful this stuff is and so yes, there could be pieces of plastic in our oysters and mussels, etc. There have been other researchers that have found this with shellfish in markets and not just in the ocean. But, these pieces are so small, so the question is what harm does it cause? And do these plastics move straight through our

system like something else we make that we eat that has particles? Or do those plastics translocate or transfer outside the gut into our body. I think there's an awful lot to learn. But, at the moment, I think I'm still operating on the fact that the benefits of seafood outweigh the cost of decontaminant for now.

Jennifer Stock: Great. Well it definitely opens up another area of research that is much needed, especially because it's not necessarily going away anytime soon. In terms of waste management, how are water treatment plants receiving this information knowing that we now have something that is potentially harmful to wildlife and potentially humans, getting through the water management systems of the filtered water that goes out?

Chelsea Rochman: Yeah, I'm glad you asked that question. I think the findings of our research, people want to go directly to human health. I think the real finding is led to waste management and treatments. Knowing the source of the plastics we are finding are fibers coming from the wastewater treatment plant system. That's the same for microbeads. So far, microbeads, I think for the wastewater treatment plants, it's a new contaminant on their radar. For fibers, there's actually publications that date back decades showing that fibers are a signature of sewage flood. For these treatment plants they know that these things get into their systems and they know that the sizes keep it from getting caught into the grates. And so, they get it in the treatment that they are putting into the environment. And the final product that comes out to the oceans, lakes, etc. So, they are not surprised that it is there. And I think one of the wastewater treatment plants that do stress them is that to think about ways to stop it upstream before it enters the plant. Because it is really difficult for them to filter up very small particles and when they do, a lot of what they're filtering is going into the bile salt. And with wanting to recycle that material, so that flood isn't being put back into the environment. Yeah, so just like with the microbeads, the legislations with taking it out of personal care products but the fibers, there's talk about filters in washing machines that will keep the material from entering the water treatment plants in the first place.

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Jennifer Stock: And then where would it go if it's filtered at the washing machine?

Chelsea Rochman: Exactly, where the laundry goes. There's really no difference in these fibers and the lint in our dryer. But, in our dryer we have a filter that traps it but it's a fire hazard. There's no hazard to humans in our households for those filters not being trapped in a washing machine. So, there's no filter there because it is inconvenient to clean it out. So, we take an extra step in washing our clothes where it is to clean out that lint in the lint trap and throw it away in the trashcan. Just like we do the lint in our dryer

Jennifer Stock: Wow, that's interesting. So, in terms of the fibers themselves, I'm very curious about, I love the term you coined from chemical cocktail, because it's so interesting. But, there are a couple different types of fibers that may be more toxic than others, that could accumulate other pollutants in the ocean differently. Can you talk a little bit about those? The high-density polyethylene vs. PVC or low density polyethylene and polypropylene.

Chelsea Rochman: Sure. So, plastics are made out of a number of different types of polymers. Based on my own research and others, you see what are the differences and that absorption capacity of these chemicals amongst the different polymers. So, you know that polyethylene and polypropylene and polystyrene have a high affinity of chemicals and the PEC and PET. But, a lot of the fibers are made out of a lot of, so, PET is polyester. Which we know of that one. But a lot of these fibers are made out of acrylic and nylon, things that we really haven't looked at their capacity. These textiles have a very unique chemical cocktail added to them during manufacturing which is different than let's say, a water bottle, detergent bottle, etc. So, I think, when we start thinking of the toxicity of these, we need to consider this unique chemical properties of the fibers. The other thing I point out that is interesting about fibers is the shape. So, the shape is the reason of its toxicity. The reason for those, for example, is the shape of fiber. So, it would be really interesting to see what's leading the toxicity of these fibers if there is any. Is it the chemicals, the shape, or is it a mixture?

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Jennifer Stock: Interesting. Gosh, you really get into the small stuff. You like to look at these really tiny things. Well, tell us a little bit more about the other applications in your research. You kind of go across different amount of disciplines with plastic; I know you've done a little bit of work with 5 Gyres. Who are studying different regions of our ocean planet?

Chelsea Rochman: Yeah, I did some work with 5 Gyres and also the Institute of Oceanography around 2009 and 2010 which was looking in the gyres. And I think some of the work that's been happening in the garbage patches and subtropical gyres, is that in the beginning, when plastic research became a theory assignment and issue or research topic, people were doing research in these subtropical gyres mainly going out, myself included, with Marcus Erickson and Anna Cummins and sampling the plastic out there, chemical toxicity, and what chemicals are in the middle of the ocean. And what I'm seeing is that a lot of these groups are now starting to come back to land, just like I have. Marcus, Anna, and 5 Gyres are also focused on legislation of microbeads and doing work on island communities, etc. I think those two, 5 Gyres, and outside marine research foundations really led the pack on getting people interested in this topic. And, now we're seeing all of us shift to land. And, I was actually talking with Marcus earlier today about the microbead legislation, which he authored some of the bills. Also, some of the work they're doing.

Jennifer Stock: That's fantastic! I totally agree. They've been doing some great work. And, you know I'm curious with the research perspective, as a scientist, do you feel, we know enough now through research about the problems that are caused by plastics of all different sizes. Are there any other questions out there we don't know about in order to work harder in legislation and changing land based management practices?

Chelsea Rochman: Yeah. I want to say that I love that question because a lot of times we will do as researchers will do whatever to push a policy to make a difference. We need more research. We need to understand more. So, yes, of course, we always need more research. Every time we learn something new we have new questions that fascinate us right? So, I can give

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you a laundry list of things, no pun intended, but I think towards studies on plastic debris, there are an awful lot we still don't know. But, I do think we know that this material put into an aquatic environment; freshwater and marine. We know it's in animals, the different species of wildlife eating it, interacting with it via entanglement. I think there is absolutely enough science to drive the sea moving forward. I think we're starting to see it happen which is fantastic. So, I think now what we need is both policy relevant research to test the efficiency of somebody's mitigation strategies. Also, more research, just to help us understand better. I think now the mechanisms drive the state of plastic debris and also the toxicity.

Jennifer Stock: It seems like once the human health connection is verified with science, that's going to be the driver.

Chelsea Rochman: Exactly, so, I think that's huge. Because I've always been interested in applying the focus which is my research is moving in that direction. And also, the work of many others which are analytical and environmental are taking on that kind of responsibility to look into that.

Jennifer Stock: Well, as researcher who studied the microfibers, the microplastics ingestion and how some species, like the fishes you've been studying, react. As a consumer what are your thoughts and recommendations to consumers about products that are safe to eat and not eat or be cautious about or to ask questions about?

Chelsea Rochman: Yeah, I think in the terms of seafood in general, often were told not to eat top predators. And that often relates to mercury and PCP. And I think in the same way we're thinking about contaminants because of how they move through the food chain and magnify or there are larger concentrations in top predators. We can think about the same with plastic debris. So, in a lot of ways plastic debris isn't any different than other organic contaminants. If they concentrate at the surface of the ocean, they concentrate in the sediment, and in animals, they move up the food chain. So, I think when we look at warnings for other chemicals that may be a first indicator before we know and think about asking questions on the safety of seafood in regards to

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plastic debris. And, I think when we're also think about our seafood, another important thing to think about is sustainability. So, those seafood cards that are available can actually be really helpful to understand what to purchase with seafood.

Jennifer Stock: Are there any specific organizations you recommend for folks to follow regarding porting funding for the human health connection? Or anything else?

Chelsea Rochman: Supporting funding for it? You know, a lot of organizations like EPA, is interested in contamination issue cause of toxicity, and the seafood that is being affected. So, they are starting to do some research. And I think some other research -the Monterey Bay Aquarium policy program- and they started this safety in their food. So, I think that's good in regards of plastic debris. So, I would say follow them in terms of places locally, since they are based in Northern California.

Jennifer Stock: Excellent. How about you personally? I'm sure with your work you're one of the folks that are really trying to reduce plastic use. What are your top recommendations for folks to really think about reducing the amount of plastic that they are using on a daily basis?

Chelsea Rochman: So, the tricky thing with plastic is that I would never be the person to tell you the material. There is some application, so a lot of durable goods that are made out of plastic is great. But, I think, in a lot of those single-use items, what are things that may be convenient for the things you don't need? So, maybe thinking before you grab that Ziplock bag, to put things in a tupperware or have a reusable water bottle. And, buy products that don't have microbeads in them. One of the things I've learned on this process, because I'm a scientist - I'm not a policy maker- but I've gotten involved with policy around microbeads. I don't think I understood the power of humans, citizens, in influencing legislation. So, if there is something about plastic that you think should be brought down in a legislative perspective, email your local policy maker or local government, because they can think more about what we think. So, getting involved with policy is

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actually really beneficial and it shows us how powerful we really are.

Jennifer Stock: Fantastic. That's great a great recommendation. And I think some follow up on organization that folks can get in touch with to learn more as well. But, Chelsea, thank you so much for coming on Ocean Currents today to talk about your work. It's really great to hear you and sharing these results for what you do. Because it is really pertinent for consumers, people who enjoy seafood, and I really appreciate the work that you are doing.

Chelsea Rochman: Thank you. And thank you so much for having me. It was really fun.

Jennifer Stock: Thanks again. And have a great holiday.

Chelsea Rochman: Thank you. And you, too.

Jennifer Stock: I was just talking with Dr. Chelsea Rochman, a marine ecotoxicologist and marine ecologist. We've been talking about the work that's been done, the research about microplastics and digestion by fish, fish that we typically eat here in California as well as Indonesia. And still some more lessons to learn, still more research to be done about the human health action, but something to know, that is the fish that you eat potentially have plastic in it. So very interesting to think about those things when we go to the market. There's so many organizations to follow that are inspired by our work to reduce plastic debris. And as Chelsea mentioned the things we don't necessarily need in our daily lives, the things that are single-use. So, it's really up to us to demand these solutions, in single-use plastics. The most ambiguous plastic out there. And, to purchase as smartly as we can and teach our children and get engaged with a proposed legislation. And keeping trash off the ground. Which is a good part for our next segment today on *Ocean Currents*.

One of those organizations we touched on earlier, 5gyres.org, is a non-profit that really led the way for some of the global research that has happened around the world about quantifying plastic in the ocean. And, now working to help legislation, marinedebris.noaa.gov, our federal agency

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that worked on marine debris issues, part of NOAA. And plasticpollutioncoalition.org, and this is a group of organizations, including 5 Gyres, working together on all of these things. So, check them out and consider all of that this time of year, when there is a lot of shopping and gift-giving. We're going to take a quick break and come back in a few minutes. And we'll be talking with Jeff Kirschner of *Litterati*.

(Pause)

Jennifer Stock: Welcome back to *Ocean Currents*, I'm Jennifer Stock, and today we are talking about plastics. I'm thrilled to welcome Jeff Kirschner of *Litterati* to *Ocean Currents*. Jeff, you're live on the air.

Jeff Kirschner: Hi, thanks for having me.

Jennifer Stock: So, just a preview here. We've talked about marine debris, trash that ended up in the ocean, a good portion of it has made it's way to the ocean watersheds from land, to streams, to river, and to the ocean. And, every time you step across a piece of litter on the ground, it's likely to end up in the ocean. Unless, someone like Jeff, comes on it. And, Jeff Kirschner, he's a writer, tech entrepreneur, and he has a vision of a litter free world. He's the founder of *Litterati*, and Jeff, it's great to finally have you here on *Ocean Currents*. Let's start from the beginning, how did *Litterati* come to be?

Jeff Kirschner: I was walking in the Oakland woods with my kids and my daughter, who was 4, noticed that someone threw a plastic covered cat litter into a creek. And she looked at me and said, "Daddy, what is that?" And I know this may sound like a cliché, but that was an eye opening moment for me. I've lived in the Bay Area for a while and I looked at that and thought wow, I'm surrounded by litter. And when she said that, it reminded me of when I was a kid growing up and I went to summer camp and in the morning of visiting day, before they can come in the camp director would ask each of us to go out and pick up 5 pieces of trash. And now you put together a bunch of kids picking up trash together and within a few minutes we had a cleaner camp. So I thought, why not apply that model to the entire planet. And that was really the inspiration of *Litterati*.

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Jennifer Stock: So what exactly is *Litterati*?

Jeff Kirschner: Well, we're really a community, that is collaboratively cleaning the planet with one piece of litter at a time. And, through technology we're building a global database of litter. The way we started was actually on top of Instagram. We had people who were photographing individual pieces of litter, adding the hashtag "litterati," and throwing out or recycling whatever it is they found. And you can imagine with each of those photographs, they understand quite a bit. So, we were able to see who was picking up "what," "where," and "when." So the "what" is shown by the hashtag, whether it's a Starbucks cup or plastic bottlecap. There's a geo-tag with every photo which provides a pinpointed location where the litter is found. And there's also a time stamp and that alone is really how we launched. And once we started building a community, and figured out that the data could actually be really valuable to lots of different people. We built our own mobile application. We recently launched one for the iPhone and iPad, android is in development. But that's how it works.

Jennifer Stock: So, now that you have launched an app for it, which I downloaded, of course I'm a user. Does it all feed together? It's still uses Instagram and provides the same data to you? So the folks still waiting for the android app, they can still participate?

Jeff Kirschner: Absolutely.

Jennifer Stock: What are some of the types of patterns you've seen as the community has grown, overall?. In terms of people, the types of photos you see, the hashtags?

Jeff Kirschner: That's a great question. So, in terms of the litter itself, and what our community has found, and some of this will come in as no surprise. So, in terms of category, plastic is the by far the largest group that has been picked up and found by our community. Cigarettes are a distant second. In terms of brand, it's a lot of the consumer packaged goods stuff. Like Starbucks, McDonald's, cigarettes, and rarely Snickers, Trident, and Red Bull. It's the stuff that's often found in

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convenient stores, corner stores, and things that are consumed on the go. In terms of individuals, I think we really have seen a great awareness that's being created. People who have may not been aware of their surroundings. And whether that's students, we have a lot of work with schools, students have gone through an entirely new filter. Whether that's your everyday individual cares about their surroundings, people are starting to wake up a little bit more. Then there's the fact that, because we are applying data, you see the problem in a pretty unique way. People are starting to connect the dots and say, you know what this problem may be huge, it is solvable. The way we can start to solve that problem is by becoming smarter about it. And data is really the foundation to get that solution.

Jennifer Stock: Have there been communities that have approached you asking how they could use this *Litterati* tool figure out solutions for their community?

Jeff Kirschner: There has. There have been a few, and they have come in a variety of shapes and sizes. So, I'll give you 3 quick examples. This morning, we received an email from 2 environmentalists in Poland who will be traveling down a river in Poland this coming summer. Their objective is to collect litter along their path and they will be using *Litterati* to document each and every piece of litter they pick up. And they will be documenting, geo-tagging it, time stamping it, and it is to provide them with a platform or tool that takes a traditional river clean and makes it a little bit more informative. Now they'll have a set of information that they can look deeper into and try to build evidence based solutions through the data they actually gathered. They'll be able to share that data with others; so that's one example.

We've also worked with cities. The city of San Francisco, a few years back, had conducted a litter survey to understand what percentage of litter on the streets were cigarettes. The reason the city of San Francisco wanted that data was they used it to create a tax on cigarette sales. This is a meaningful revenue stream for the city of San Francisco. So, they have put a couple people on the streets with pencils and clipboards and collected data around different street

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locations. They came up with a number and that number translated into a current 20 cent tax on all cigarette sales.

Jennifer Stock: Holy cow! The work that they did through *Litterati* ended up with a tax on cigarette sales?

Jeff Kirschner: Not exactly. They started the work before we existed. They had people just with pencils and clipboards, visually spot checking if it's a cigarette or not. From that information, they got the tax on cigarettes. Unfortunately, for the city, the city then got sued because the tobacco company said you can't be taken seriously with that, with pencils and clipboards. So, the city called us, asking if we could help them out. So we worked with San Francisco last year and we picked up 4,752 pieces of litter. And we were able to give them this real evidence based data driven number, that when it was used in court it could be upheld. The tax could be upheld, and it was just one way we were able to work with the city. One of the works I'm most proud of is the work we've done with schools. We went to an elementary school and these kids picked up and calculated all the litter that was in the school. And these 4th and 5th graders went to the principle to show him the information they collected.

Jennifer Stock: That's awesome! I want to ask, it's really interesting with the clipboard and pencils to this geo-tagged photo, what aspect of the photograph, itself, do you feel lends to this movement as supposed to just data?

Jeff Kirschner: Well, there is an artistic component. And that is how we started on Instagram. I can tell you it was by design but it was a happy accident. I think when you look at a piece of litter in the environment and add an Instagram filter to it, it can really create a piece of artwork. In fact, we have a *Litterati* art exhibit that's been traveling the country. And I think that's the thing that gets to people. So, yes there is the data aspect which is incredible valuable. This artistic aspect is a really nice and even gentle way to get people to notice their environment in a way they hadn't before.

Jennifer Stock: That's such a great idea. I can totally relate to that. I was looking at the photos you see these beautiful places and then you see a squished cigarette bud in there, or a bottle

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cap. And it really does, it's on a whole other level for awareness around the data. How about some of the brands and companies? Have you thought of approaching companies yet like Starbucks or some of the other frequent offenders? And I know it's not that they are littering but what they are selling which is ending up in the streets or on the ground.

Jeff Kirschner:

You know, I'm glad you framed it that way because I completely agree. *Litterati* is not about shaming individuals or corporations at all. Our belief is that we are all in this thing together and we need to create an alignment of interests, so the solution works for everybody. In terms of brands, we have been very patient, hesitant I would say, in terms of reaching out. And that's primarily because I want to make sure before we go down knocking on the door of a Chief of Sustainability Officer or somebody in charge of marketing the brand, we need a really compelling solution to offer them. Not just, "Hey there's a problem so clean it up." We want to make sure that we can bring them an introduction to the problem but also a solution for their brand.

So, we haven't yet reached out coactively to any brands. We have, however, had certain brands come to us. And, we've done certain things like, during the California Coastal Clean-Up, we did a photo contest that was sponsored by Chipotle where they gave free burritos for a year. We ran an Earth Day campaign with Whole Foods. We've also had some interesting things happen where brands have reached out directly to our community members. And my favorite example was one person from the community picked up a Nature Valley granola bar and properly discarded it. Nature Valley reached out to that individual, just in the comments of the Instagram photo, and said, "Thank you so much for picking this up! We would love to send you a free case of granola for contributing to a greater good." And what I did was I screen-shotted it and posted it on the *Litterati* Facebook page and said to the community, "This is what it's all about. People and companies working together hand-in-hand, creating a benefit for the entire planet." I think this is a perfect way to work with brands, to position them as thought leaders going forward, and I'm excited to get there.

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Jennifer Stock: Are there areas you see as challenges of cleaning up on a daily, day-to-day basis? Are there types of communities you see where regionally based or age based that are a little bit more challenging than others? How do you think *Litterati* will be able to help in those kinds of communities?

Jeff Kirschner: You know, I do see a lot of challenges. I think cleaning the world is a very complex issue and it goes deeper than just people littering. So, if you find a Snickers wrapper on the ground, well, maybe it's there because someone actually threw it there or maybe it flew out of an overflowing trashcan or maybe it was flying out of a trash truck on the trash removal days. There are a lot of reasons on why and how things got on the ground. It's not just about changing behavior. To get to the bottom of that, maybe we need to redesign trashcans or redesign trash trucks. I think there is a whole design thought process that needs to take place. In terms of communities, clearly some communities are more blighted than others.

And, there could be a lot of reasons for that as well. It might be, there's a lack of resource in that community. Maybe one community just doesn't have the funding to put the necessary amount of trash receptacles and recycling bins that are as needed. Or maybe there's a deeper sense of pride which is absent in certain communities. Where the citizens are dealing with much more personal issues and they just don't have the care or pride for their neighborhood than other communities might have. So, I do think there are a lot of problems and challenges that we face on trying to clean up the planet and one of the biggest ones is probably cultural differences and how we educate our children. So, if you're born into an environment where they habitually recycle and compost and properly discard their waste, that's going to inform the rest of your life. And that is very different to someone who is born into a situation where those practices aren't fairly placed. And we think information, education, and data is really the right way to start and make sense of this problem because otherwise, the status quo will continue and clearly that's not working.

Jennifer Stock: And you can really break it down to the data. Two small

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communities, smaller problems, in workable chunks in a way. It's not just this whole big issue, it uses the *Litterati* data to frame it in aspects to problem solve.

Jeff Kirschner: Right. And you said workable chunks. I think that's a great phrase because if you were to drive on any US highway, it would feel overwhelming or if you walked down a city street, the problems seem really big. People feel overwhelmed and helpless. But if you break it up into chunks and give them the tools and the information to work with, then little-by-little, we can start making an impact.

Jennifer Stock: Absolutely. For folks tuning in, this is *Ocean Currents*. I'm Jennifer Stock and I'm talking with Jeff Kirschner, founder of *Litterati*, looking for a litter-free planet. Now, Jeff, a litter-free planet is the end goal. What are some milestones that you have in between where we are now to that end goal?

Jeff Kirschner: Well Jennifer, I think from a development perspective, we are continually improving the technology we've already built. So, whether it's an IOS application or an Android application or a web-based internet space that allows people to look at the data and consume it in a way that makes sense for them; that's one of the areas that's really focused. If we continue to build the technology we have already started, and listened to our community and asked a lot of questions: what's working for them? What's not? What features do they want? So that's one area.

We would also like to work more with cities. Proving the value of the technology and the data that is being collected. I firmly believe a city would be really better off if they knew what exactly was on the ground. Right now, cities have infrastructure in place where certain companies could buy and throw away or put into landfill or recycling centers. That's great that the infrastructure is working but it is everything in between it that is the problem. There is tons of litter on the ground. So, if we could build municable litter profiles with cities then, could they find new tax streams? Could they, from an educational perspective, know that these are the top 10 brands we're see on our streets, could we open up a conversation with them? Could those companies help fund the clean-ups? Could those companies pay for programs to inform people about litter and the

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environment that we can work with our public and private schools?

So, we would like to do more work with municipality, even at a pilot phase to try and prove out the value of the data itself. That's an area we are focused on. And lastly, certainly brands, if there is a way for brands to learn more about their packaging and the life cycle of their packaging. What happens to a Starbucks cup after it leaves someone's hand, if it doesn't end up in a trashcan? That, I think is something of interest to us as well.

Jennifer Stock: Let's walk through on how someone can participate with *Litterati* with people who don't know about it. There's an app you can use to engage with this community. Can you discuss how someone can contribute to the *Litterati* community whether they are an Apple iPhone/iPad type of person or an Android or other type of person? Can you talk us through how someone can start engaging and contributing to this community?

Jeff Kirschner: Absolutely. So, if you're on Instagram, it's this simple. You find litter, photograph it, put the hashtag, *litterati*, and throw out or recycle whatever it is that you find. If you're an iPhone user, we've now created an application that is really designed to give you a positive experience. And it works exactly the same way. Find a piece of litter, photograph it, and we've already made tags including Starbucks, Snickers, cigarette buds, plastic, etc. identify what it is and throw out or recycle what you picked up. In either case, we are collecting that data and over time we want to add additional features to really nurture the community and connect people and things like that. But, that is how simple it is.

Jennifer Stock: That's great. There is one key piece to that that is important for users to know, that they need to have their GPS turned on their phone. Right?

Jeff Kirschner: Yes, that is true. And one of the advantages with the application is that we are getting really precise with the latitude and longitude. So, we're really starting to zero in exactly, almost to the meter, of where a specific piece of litter is found.

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Jennifer Stock: It's really neat. I downloaded the app this summer and I've been playing with it around my neighborhood because I live in a tri-school area where there is three schools. And it adds a lot of fun for my walks. Although, if I want to go quicker, I need to keep going. But, I went back to your map online on the litterati.org website just to see. It was so cool to see where I picked up certain pieces of trash. I created a hashtag for one of the schools and my goal is to go to the school eventually. I also discovered that folks who are worried about their data use in their phones, you can just take all these photos and when you're on wireless network you can still upload them.

Jeff Kirschner: That's right. And if any of your listeners are interested, we created a private filter page. So, you can filter out all your data to your own page and I can provide that information if you just email us at support@litterati.org. And we can get you that login information.

Jennifer Stock: Excellent! Well Jeff, thank you so much! It's wonderful to hear the whole story and how people can get engage to be a part of a solution that starts very simply, by just picking up trash and building connections. And I, myself, think of ideas that bring me hope to a change. I'm looking forward to see the numbers continue to grow.

Jeff Kirschner: Thanks Jennifer for having me on here today.

Jennifer Stock: Of course. Thanks Jeff! We were just talking about *Litterati*, an app where you can get from the iTunes store and you can also use it through Instagram. And you can learn more about the overall community and effort that *Litterati* is working on at litterati.org. And, as Jeff mentioned, if you would want to be able to view a map that just shows your own findings to analyze you can email him at support@litterati.org.