



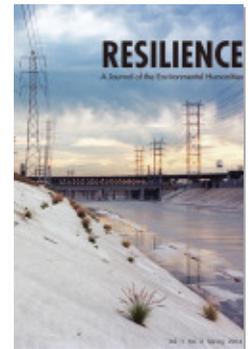
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On Drawing the Line against Climate Change— The Santa Barbara Saga

An Interview with Bruce Caron

STEPHANIE LEMENAGER

Transcription by Stephen Siperstein

Bruce Caron is an active online community architect who helps virtual organizations build community governance and achieve their promise. His most recent project is the NASA Science on Drupal Central effort, which is building collaboration and collective intelligence capabilities for NASA earth science Drupal developers and site maintainers. Bruce is the founder and current executive director of the New Media Studio and the New Media Research Institute in Santa Barbara, California. Trained as a social anthropologist and an urban cultural geographer, Bruce helped create a public awareness action in Santa Barbara, lightblueline.org. [Lightblueline.org](http://lightblueline.org) proposed to paint the seven-meter elevation contour on Santa Barbara's streets, to mark the vulnerability the community faces due to human induced climate change and, explicitly, sea-level rise. In 2010, Bruce was awarded the Martha Maiden Lifetime Achievement Award from the ESIP (Earth Science Information Partners) Federation. A few years ago he published a novel, *Junana*, which outlines an alternative present in which the promise of educational gaming turns the world on its head as hundreds of millions of teenagers know more than their parents, teachers, and the marketplace. Bruce's work has been supported by the NSF, NASA, NIH, the Paul G. Allan Family Foundation, the John D. and Catherine T. MacArthur Foundation, the Alfred P. Sloan Foundation, and Google.

Stephanie LeMenager: Bruce, thank you for agreeing to do this interview. For our readers who might not know about the Light Blue Line Project in Santa Barbara, California, I wonder if you could tell us about the genesis of the project—how it came into being.

Bruce Caron: The project originated on the night of the showing of Al Gore's movie, *An Inconvenient Truth*, at the Arlington Theater [in Santa Barbara]. There was a capacity crowd. And I would step back and say that I've been working as a cultural anthropologist with earth science folks since 1999, just as one of these little pivots that happen in careers sometimes. So I had already been at meetings hosted by NASA and other places where people were talking seriously about climate change and sea level rise.

But I thought it was very interesting how the movie tried to take climate change—which is this incredibly long-term, global phenomenon—and make it more real to people. And I thought, "That's a pretty good example of effective communication." I thought they did that well. So I walked out of the Arlington, and we were walking down Anacapa Street past Santa Barbara's City Hall, and I was sort of looking down the street. And I said, "Well, where is the seven-meter line in Santa Barbara? *Where is it?*"

Then I went online and looked at topo maps, but they weren't very revealing. They didn't offer nearly the high resolution that we would need. At that time Keith Clarke was chair of Geography at the University of California, Santa Barbara. Keith was on the board of the New Media Studio. So I sent him an e-mail and asked, "Do you guys have a really high-resolution digital elevation model for Santa Barbara? And if so, could you map out the seven-meter elevation on that and just send me an output?" So he said sure.

A few days later, this map shows up. I thought, "Well, that's sort of cool—and troubling." The seven-meter line goes all the way from the cliffs over by Hendry's Beach and then skirts around the Mesa and then comes up above Gutierrez on State Street, and then it keeps going up, up, up, and reaches to the edge of Santa Barbara High School, and then it hits upper Milpas Street and meanders around, and then it heads out towards Montecito. And I thought, "Wow, that's quite a bit of territory of the town that is below seven meters."

I was thinking, "Well, what can we do?" I've been to Earth Day sev-



Fig. 1. Volunteers at Light Blue Line added a seven meter level to the Google Earth map of Santa Barbara. Image by Darren Hardy and Frew available at New Media Studio website, <http://nms.org/2012/08/31/google-earth-layers-for-santa-barbara-sea-level-rise>. Base map data copyright © Google, Navteq, DigitalGlobe, and Europa Technologies.

eral times, and I've worked on the board of the Solstice Parade in Santa Barbara. I was a little tired of events that already have their audience. So I was thinking, is there any way to make something that other people could see, that you don't go to Earth Day to a booth to see. That—

Stephanie: That you can't help but see.

Bruce: That you can't help but see. And so I knew Ginny Brush. She's the executive director of the Santa Barbara County Arts Commission. I e-mailed her and I said, "Ginny, how do we go about doing some kind of an art project? We don't know what it is yet, exactly. It could be an event. It could be something visual." So she got me in touch with the city. The city has a whole public art committee that you have to go through. That's step one.

First I had to figure out what the project was going to be. My very first thought was, "We can make a chalk line. We can chalk line the seven-meter rise." But then I thought, "Well, that's not very bold. You put a chalk line up, and it's gone in a day."

Stephanie: It can be adjusted easily.

Bruce: Yeah. So I said, “I really think we ought to paint this. Because paint’s going to be there for a while.” I sent out an e-mail to some friends, and I said, “This is my thought: we should paint the seven-meter line in Santa Barbara.” We started with seven meters, because that was Al Gore’s big thing—if Greenland melts.

But we were open to thinking of other contours. We came back to that because there’s the Antarctic ice sheet, and there are glaciers, and there’s thermal, and there’s all kinds of stuff. Trying to describe exactly what the ocean is going to do just wasn’t really—there was no website for this. [*Laughs.*] Interestingly enough, last month I submitted a proposal to build a website for NASA on sea-level change.

Stephanie: That’s really exciting. What would that look like? Is it going to be a layered map?

Bruce: Well, they are going out and getting much more detailed information data using *LIDAR* going through ice all over Greenland to see what’s underneath, and to start to be able to model the actual dynamics of the real ice sheets and to come up with much better estimates of how much ice there is, where it’s going, and what will happen in different scenarios. It’s basically a cryospheric and ocean data thing.

If funded, we’ll be setting up the website to hold a whole bunch of data and some modeling. Three years is not going to be enough to really do that work. I think it’s probably a ten-year project. In three years, they’ll know what they don’t know. And they’ll probably know what kind of data they need to collect, and they’ll probably have an instrument ready to do that. But it’s a good start.

Stephanie: One thing that I find fascinating about your work is the co-existence in it of high-tech innovative tool making and then something so accessible and hands on as the Light Blue Line Project. How do you reconcile these interests? Does the Light Blue Line Project integrate with or speak to new media?

Bruce: Well, let me just say one thing. The reason to do the line was very much like the reason to do Al Gore’s movie, only more so. It was to make something that is future and global in its orientation into some-

thing local and immediate. To make it visible on the streets, in place, right here. At the time we really expected to do that. We would make a splash. And we thought, “It will help a hundred other cities do it, too.” We had our website. It was our first Drupal CMS website, and we were ready to bring on as many other cities as we needed. There was a resonant loop between the website becoming a resource for local action—local action that then becomes amplified through the website. I think there’s a very natural combination.

Stephanie: Were you also working with the Canary Project (TCP) and the artist Eve Mosher in New York? I was curious about those connections.

Bruce: We were about a year getting through the process of planning the Light Blue Line. During that year we were of course scouring the Web to find out what else was going on, looking for similar projects. We found the Canary Project, and they were just getting going, and Eve hadn’t done her line yet. So we got in touch with her, and we had a long-time correspondence about this and that. And she said, “Well, why are you doing seven meters?” I said, “Well, this is why we’re doing seven meters.” And she said, “Well, I want to talk more immediately about storm surge.”

Stephanie: Which turned out to be timely, given Hurricane Sandy.

Bruce: The line Eve drew and the damage was right there. So that was really powerful. And we brought in Ed Morris [at Harvard’s School of Design and director of the Canary Project]. Did you see the little video about our exhibit with the Canary Project? Let me find that. Because this was made at the time before we did the line and when we were doing an exhibit in Santa Barbara’s City Hall, which used both images from the Canary Project and our own images.

[Bruce brings the video—the Inside Santa Barbara segment “Sea Change,” produced by Chris Bell, and televised by City TV-18 on April 16, 2007—up on his computer. For the next few minutes the video clip plays in the background, at times taking precedence over the live conversation.]

Rachel Acenas: A recent report by six hundred of the world’s top climate experts says if fossil fuel usage continues at its current

rate, the earth is in for some cataclysmic changes. Up next, Chris Bell takes a look at how drastic those changes could be.

Chris Bell: Can you imagine beachfront property on [Santa Barbara's] De La Guerra Street? How about an airport where the only planes that can land are seaplanes? Or what if to get from Carpinteria to Goleta you had to drive through a series of undersea tunnels? If you're having trouble visualizing this scenario, the Light Blue Line Project is here to help you. Its exhibit, now on the first floor of city hall, projects how different the coastline would be if some of the worst-case global warming scenarios come to fruition.

Bruce: The light blue line is being drawn on the streets at the seven-meter above sea level elevation. That's the amount of ocean rise you would get if Greenland melts.

Chris Bell: Caron doesn't contend that Greenland is the only place melting, nor is he saying that the ice sheet on Greenland is going to melt tomorrow. He is saying that the human-induced part of climate change has to stop in the next ten years or it's going to be too late.

Bruce: We really only have a very few number of years to prevent the climate from tipping into a situation that is unlike anything that we've seen in the past.

Chris Bell: Caron was inspired to act after seeing *An Inconvenient Truth*, the documentary that tracks the evidence related to global warming. He said he was frustrated with the disconnect between the urgency of the science and the complacency of the public.

Bruce: When you look at the line, you're looking at the effect of a global climate on the streets of your town. Now it's not a current effect. It's a future effect. But you can see where it would in the future right at your feet today. So it's just my part of trying to bridge that divide between science and public awareness and public interest.

Chris Bell: Caron says seven meters is roughly the same amount of surge that occurred during Hurricane Katrina and the Indian Ocean tsunamis of 2004.

[Video playing in background]

Stephanie: I have seen this interview, and I was curious about the prototype that you apparently created. What's that like?

Bruce: Yeah, we did a paper prototype, and we put it on all of the streets at all of the locations and took photographs as part of our proposal to the county Arts Committee. See but this is Canary Project, this part of the video—

Chris Bell: Also on display at the exhibit are photographs of landscapes around the world that are already exhibiting dramatic transformation due to global warming. There are postcards by local artist Tom Houston that portray Santa Barbara with a higher sea level.

Bruce: You know, we're all invested in the waterfront down here in Santa Barbara. We want to see the ocean down at the beach. We don't want to see it up at the top of Milpas Street.

Chris Bell: The project hopes to paint city streets with a blue line indicating where the seven-meter elevation line is. After Santa Barbara, Caron would like to take Light Blue Line on the road to other coastal cities, cities like ours that have a high regard for their low-lying areas.

Bruce: Every time you drive across the line or bike across it or hopefully walk over it, it makes you think, are you doing the right thing? Am I doing the right thing today to help keep the ocean down at the waterfront?

Rachel Acenas: Caron says the Light Blue Line is partnering with the Community Environmental Council to address solutions to this crisis. For more information about the Light Blue—

[Video fades, as Bruce dials down the volume]

Bruce: Yeah, so it was really interesting, the partnership with the Canary Project and the first phase of our project. In the exhibit at City Hall, we had a lot of dramatic photos of impact, and not a lot of, “Okay, so what do you do?” Not many solutions. And the “Okay, so what do you do?” part really wasn’t our main focus. We were passing people off to the Community Environmental Council for solutions. The Community Environmental Council decided that their solution was to be oil free by 2030. That was their idea for the county. But they were really focusing on the end of cheap oil. They were not focusing on climate change, and they didn’t want to talk about climate change.

Stephanie: So they weren’t make explicit connections between climate change and what it might mean to be oil free in the near future?

Bruce: No, they thought it wasn’t a win for them to tie what they were doing to climate change at that time. They were more astute in some ways than we were. They said, “What we want to talk about is the economy and the economics of alternatives becoming cheaper as oil gets more expensive. That’s our pitch.” They just weren’t going to hop on the climate change wagon at that point.

Stephanie: It’s interesting how Bill McKibben has attached unconventional, “tough” oil to climate change and said, essentially, that you have to have an enemy in any effective narrative, and this is what it is for climate change. With the climate change question in Santa Barbara, what I’ve read suggests that *The Santa Barbara News-Press*, the city’s primary newspaper, and the real estate lobby were working together to put an end to your project, or at least to make it impossible to realize it fully.

Bruce: We went through the hoops. There are public meetings. No one goes to these meetings. But these committees like the public art committee, we went to them and they gave us some suggestions to make it stronger. We came back a couple months later. We had a better proposal. And they said, “Okay, we can pass this on to the city council.”

We had been talking with the mayor, Marty Blum, and Helene Schneider and other city council members independently. Because of the Brown Act you can’t get them all together. They can’t be in the same

room talking about something. But we were holding weekly meetings with the volunteers we had. We had a dozen or more volunteers up at the University Club trying to determine how we were going to do this. If the city says yes, what do we need to do? And how do we tie the action to the media? That's why we came up with these little curb markers that have a website [address] on them where you can get more information [about] that spot of the line. The line would be drawn across the street, and on the curb tops on both ends of the line we would glue the small medallions.

Stephanie: And this was one of the things that the real estate folks were really afraid of, this medallion? That came up in *News-Press* articles, that this was somehow seen as a way of devaluing property.

Bruce: Yeah, and that we were some rogue organization that was presenting only one side. That we didn't present the whole other side of skepticism. So it was that whole "The news has two sides, and you're only doing one side" argument.

In response, we did a couple things. We said to the city, "If you guys want to take over this domain name and the website, that's fine. You can run it through your education outreach. We don't need to run the site. You guys can run the site."

Stephanie: From the articles I read, it sounded like people were either generating a false hysteria or experiencing real hysteria about their property values. Will I lose my home insurance, my mortgage? The dark joke being that you're already on a fault zone and you're in a flood zone and tsunami zone. This is southern California—what's the worry?

Bruce: Right. How is the radon in your basement doing? You can find a map of Santa Barbara County online that shows your risk of having a radon problem in your house. It's a question of what you choose not to know and what you choose to know. But back to our story. Finally we get through all the preliminaries, and we get to the City Council. Helene and Marty wanted to help us financially, because it was going to cost some money. We were willing to go out and raise the money, but they said, "Well, we have \$1 million for public art." They said, "We'll take \$14,000 of that, and we'll spend it on the city workers who are going to help you, so that you don't have to spend that." Which is reason-

able, because we were coming through the public art program as a public volunteer.

There was one person [on the City Council] who voted against it, because he said, "I don't think we should be spending money on this." And then they asked, "When are you going to do this?" At that point, maybe we made a tactical error. We said, "We'd like to wait and have students back in school, so that we could arrange for students to help paint the line as an educational thing."

Stephanie: Were you thinking K-12 students?

Bruce: Yea, K-12 students. Because we wanted to do a lot of education outreach in the schools with this. Unfortunately, that delay gave people on the other side a chance to say, "Well, we don't like this."

Stephanie: We don't like education?

Bruce: We don't like this whole idea. So the *News-Press* called, and they didn't have a reporter, of course, at the City Council meeting. So they're asking us, "Well, what's this all about?" And I said, "We'll send you our information."

And I'm talking to the reporter from the *News-Press*, and I'm saying the same thing I said to you. I said climate change is a really long process. It's difficult to figure out exactly when what's going to happen is going to happen. So seven meters could take several hundred years. But we really only have ten years of using this much carbon to change the direction of this big process. So the next day the seven-meter map, showing which parts of Santa Barbara could be under water, goes up in the *News-Press*. And the paper reports that I said in ten years this is what's going to happen.

Stephanie: So they misquote you.

Bruce: They misquoted me. I called them up and I said, "No. That's not right." But I had no idea that they'd do something that stupid. They scared a lot of people. I started getting people calling my home who were scared and angry. People who were scared would call me up, and they would say, "You scared my old grandmother. And you shouldn't do this. People like you shouldn't be alive." Things like that.

Stephanie: Oh, my god.

Bruce: It was the same sort of thing that everyone gets now, everyone who talks about climate change.

Stephanie: It's still shocking. Because what we're talking about here is essentially an educational project, and the science is there.

Bruce: All of that backlash caught us by surprise. Suddenly Bill O'Reilly is talking about how crazy Santa Barbara, California, is.

Stephanie: The Light Blue Line got on Bill O'Reilly?

Bruce: Yeah. And Clear Channel was calling, but I didn't want to talk to them at that point. So we didn't really respond to them. We maybe should have engaged them. Then I got a call from the mayor, Marty Blum, and she said, "Well, we have to go through the historical district. The historical district is going to have to approve this in the spots where the line goes through the district." Which is all just a way to deflect whatever we are trying to do.

Because the historical district has nothing to say about what's in the street or what's on the curb. The curb is part of the street. The city or anyone can put anything on the curb. In fact, they have all these plastic "Flows to ocean, do not dump" signs all over the curbs in the historical district. Those signs were pretty ugly and they were not holding up well. A lot of them were just these opaque ovals. Our medallions were well designed.

So I said, "Really? Okay." Then we get to the historical district, and I'm giving a presentation. And the district commissioners say, "Fine. Except we don't like aluminum or steel. We think your medallion should be brass. You should do this in brass, so it looks historical." So I said, "Yeah, we could do it in brass for these streets. This should be like the nineteenth century or something, or like the eighteenth century."

Stephanie: How ironic for a future speculative project to have such antique emblems.

Bruce: If you do it in brass, they all say, then that's fine. So I thought, "Well, okay. That's a little weird, but we can do that." We sort of had

it figured out. But the real estate community really showed up at that meeting, and they spoke out. They said, “You’re dividing the city into two groups: the people above the line and the people below the line. And who knows how many billions of dollars in property damage this will cause?” As if public art had ever been a real issue for property values, as if it had ever in the history of the planet.

Stephanie: Right, and we’re talking again about unknown and vast temporal scales, not the “ten years and this will happen” that the *News-Press* reported.

Bruce: I never could get them to correct that. I called them. I talked to them. They never corrected it. And then coming up in the fall there was going to be an election. So all of the people who were now running were running against the Light Blue Line. They talked about the silliness of the City Council for not getting rid of the homeless people, and instead spending your money to paint this line, which will destroy the economy.

I think Das Williams and Grant House and Helene Schneider and Marty Blum [all local politicians], they’re sort of thinking, “Well, this is kind of weird.” I don’t think they expected it, either. They didn’t expect the daily newspaper to be run by someone who just doesn’t like science or doesn’t believe in science.

Stephanie: It’s also interesting that the real estate lobby in Santa Barbara often has been in a coalitional relationship with environmentalists, at least around issues of preservation. But with the climate change issue and with climate science, they seem reactionary and terrified.

Bruce: Yeah, but we were still on track. We were still going to paint the line. Come the second week in September, we would paint it. At that time it was August of 2007 and I was in Washington DC in a hotel, on a NASA earth science panel to review proposals for funding. I got a call from Marty Blum, the mayor, and she said basically that there was a lawsuit in the works, that this guy Jerry Beaver had already had his lawyer talk to her and said that he was willing to put up as much money as was needed to stop the line. He spent \$30,000 in two weeks, and he was ready to make sure the line never happened.

Stephanie: In a broader sense, what does this say to you about the power of making scientific data visible to the public?

Bruce: I know. It says a lot. There's irony here, too. Every day on either the front page or the opinion page of the *News-Press*, the seven-meter map was there. We didn't have enough money to put it once in the *News-Press*, and they put it up almost thirty times. So everybody knew where the line was. And the *Independent* [Santa Barbara's progressive paper] finally got around to doing an article explaining what it was all about. But that took a month.

Stephanie: So in a way the line *was* drawn.

Bruce: Exactly. I was talking to Dave Davis and I said, "We didn't do it, we didn't paint the line." And he said, "No, you did. You got more publicity for climate change than you could have imagined. And you really don't have to paint the line anymore because everybody knows about it. It's embedded in the political rhetoric."

Stephanie: Even if to discredit your map, the *News-Press* kept printing the map. Now I know you have legacies, other artists and activists worldwide who are doing projects similar to the Light Blue Line. Can we talk briefly about some of those projects?

Bruce: The main ones that I know about—and many people just went to our website and kind of did their own—are in Olympia, Washington, and in Honolulu. In some ways Eve Mosher's High Water Line in New York was a sister project. In Durban, South Africa, for the big climate conference, they drew a line. We didn't really get off the ground in Washington DC, but we had some people that were planning to do something like the line in DC.

Stephanie: Do these people refer back to you? Is there a social media network of people working on this, or is it more DIY in different places that you hear about here and there?

Bruce: It's more DIY. We were exhausted and discouraged at the end of that whole thing that we didn't get it done. We really figured that we'd sort of done as much as we wanted to do at that point in Santa Barba-

ra. Oh, I should have mentioned Ventura. We actually painted the line there, but it wasn't on the road. It was seven meters up on a building at the waterfront.

Stephanie: Is it still there?

Bruce: You know I should check that out. I'm not sure if it's still there. Then Alec Loorz [the graphic designer, activist, and founder of Kids v. Global Warming] was doing his sea-level posts at the Ventura waterfront, to educate the public about the effects of sea-level rise.

Stephanie: Yes, those I've seen all along the waterfront.

Bruce: And so Alec came up. We worked with him and Tom Houston. That was the actual stencil that we did.

Stephanie: It's beautiful. It certainly doesn't convey the fear that some of your detractors imagined—or wanted to stir up.

Bruce: They were telling people that we were going to draw on their buildings; we were going to draw on their lawns.

Stephanie: That this is an elaborate kind of graffiti.

Bruce: I think it's a kind of action. I think the whole logic of marking vulnerability as a way to imagine it is a productive artistic expression of resilience. We are becoming more resilient because we either don't want this to happen or, if this happens, we want to still be around and be happy where we are.

Stephanie: So many questions of access and engagement come up as a result of this kind of project—I know you talk about such questions in your work around the New Media Studio, how you're looking at new ways of thinking and working and socializing and trying to encourage action through digital imaging . . .

Bruce: Yes, and the Light Blue Line would fit into an augmented reality that shows different sea levels. You can do a Google Glass thing that would show it. But, as I noted, we faced some really strange—or what I think are unexpected—events. A more academic problem that I haven't

mentioned was that people didn't understand the terms contour and elevation contour. They didn't really understand the whole idea of a contour map and what that meant.

We are, as a society, clueless about maps generally. Although we're using maps a lot more, on our phones and in our cars. We're getting better. But at that time people didn't understand what we were talking about. *What is this line?* They thought we just made this thing up, as if it were some arbitrary line, as if it didn't exist unless we painted it.

Stephanie: As if you supposed it. Mapping seems to be an incredibly hot and exciting topic across the board in new media studies and also in literary studies right now. In your opinion, what do maps do for us as humans. Ecologically speaking in terms of our survival, what's a map for?

Bruce: I think the use of maps is now pretty fluid. Street view is an interesting example. People are messing with street view maps, and once you get the information behind there, you really are developing a whole way of looking at neighborhoods, either before you go there or after you go there, or adding your memories to something. The whole idea of mapping is becoming really fascinating.

There's a person—she's at Esri now—but she started her own company in Portland doing geofences. So this is her company, GeoLoqi, Amber Case. Amber's someone who would be good to talk to about the cultural value of maps. She runs the Portland Research Park for Esri, and she's also a cyberanthropologist. She's been running cyber camps for several years up and down the coast and getting into issues of cybernetic human interfaces. Mapping is part of that, sort of extensions of the body into space and the vision into places. So maps are visual tools that connect with places, and they can do that in ways that reveal or conceal . . . Maps are of course very power laden: who gets to draw them, what they include and what they hide, and how they change perspectives on places.

In some ways, the *News-Press* was right. We did something very powerful. We added a line to the city map. And we talked about more than just climate change. We talked about storm surge from Katrina. We talked about tsunamis. People should be aware. And then they had letters to the editor of the *News-Press* asking, "How many lines do we

have to know about?” It’s a good question. How many lines should we know about? How many lines are invisible? Should any remain so?

Stephanie: That’s a great question. Asking people to assume the power of imagining and analyzing spatial data that wasn’t accessible to them until this project came into being. I think some people were probably excited about that kind of empowerment, and others scared.

Bruce: Of course we had people attacking us for other reasons that were valid. For example, the solid earth geographers would say, “Well, of course when it’s going to erode, it’s going to erode in different ways in different places. And you can’t say that that’s going to be the shoreline, because it could suck in way over there, or it could hit a cliff over here. And we don’t know what’s underneath the ground.”

Well yes, thank you, thank you. We don’t know that. This is just the elevation, just the digital elevation. It has nothing to do with the actual pattern of erosion.

Stephanie: And it’s a prompt for thinking about space and also about the long trajectory of time that we’re looking at with climate. As a final question, I’m wondering what you forecast as your own future in the field of environmental new media. What projects are you working on?

Bruce: Well, if we get funded to do the NASA sea-level change portal, then probably the next four years will be busy working with all kinds of teams of NASA-funded scientists to really examine what’s going on. The main problem with the IPCC predictions on sea-level rise is that they just didn’t include anything from the ice sheets, because they didn’t know what to include. So they just said, “Well, we don’t know what to include. So we’re not going to include it.”

So all of the sea-level rise estimations are too low, because there’s a chunk of potential sea-level rise that is just not included. We can’t model it. But when you can model it, you’re going to get a more accurate and scary future mapped out for many places. We lost with a meter. A meter and we’re in big trouble. We don’t need seven meters.

Stephanie: Will this portal be something that’s available within schools? How is it going to be disseminated?

Bruce: The portal will be a nasa.gov website. So everything that's on there is publically available. We put in almost half a million dollars for graphics that deal with the data and deal with the science of using the data. There's going to be a lot of graphical content.

Stephanie: So that visual dimension is a really big part of making the point, of getting the science across.

Bruce: Yes, and which we hope will be a bonus for the proposal. But we don't know. We just said, "You really need to have better graphical explanations of how it all works." We're also building as part of this a member-only network of scientists that extends beyond the NASA-funded scientists to any scientists who are interested in sea-level change across the planet. Students can get in that, too. It's members only in the sense that you have to say, "I want to be a member." A lot of the pre-conversations are about data quality, issues of what do we know and what do we not know, before it becomes available to the public.

We're always thinking of other ideas to do something like a Light Blue Line, too. We're not going to draw the line on the street, but if someone else wants to do it, great. We've had Santa Barbara City College students saying, "Well, why don't you let us take it over and do it?" Fine, take it over and do it. That'd be great. And they say, "But we would move on and maybe there's an idea I've got to put a halo of blue LED lights on Cabrillo Boulevard [the coastal roadway that runs through Santa Barbara]." There are about fifty-six different light stands on Cabrillo, and at dusk they would go on, these light blue lights, and from the perspective of the drivers, they would create a light blue line, a blue dotted line at seven meters.

Stephanie: That would be haunting—

Bruce: But the other thing that we could really never get into—and I did a panel at UNESCO in Paris on this, where I found out that in other places where they were doing maps of vulnerability and building resilience, they actually start with the mean higher high tides. So there are two high tides a day. You take the higher of the high tides for every day, and then you average them out, and you come up with the mean higher high tide. Because when you think about it, even if the water's not there all the time, it's flooding every day. So you can't build there. You can't

have a road there. So that would actually add another meter and a half to where we drew the line, which would bring it up on State Street. So there'd be a more accurate sense of vulnerability.

But let me ask you about *Resilience*, or at least the term "resilience." There's this guy Nassim Nicholas Taleb who wrote a book on anti-fragility, *Antifragile: Things That Gain from Disorder*. About resilience, it makes a really interesting point.

Think of fragility, the light bulb in the box that you're sending to the post office, and it's like Schrödinger's light bulb. It's either broken or it's not when it gets there, because it's fragile. And you stamp it fragile, and you send it off.

What he's saying is that the opposite of that isn't resilience or robustness. The opposite of it is anti-fragile. The opposite of it is an object that when it's crushed or abused in certain ways becomes stronger or better, and that there are certain circumstances in nature and in social interaction that are like that. And they are very interesting to note. And part of what he was saying was that that's what the big Wall Street firms have attempted to be by externalizing their risk and internalizing all this other stuff. They managed to become anti-fragile, at everyone else's expense.

We've become more fragile. Some things become anti-fragile. Everything else becomes more fragile. But he says, "Well, evolution is anti-fragile at the scale of the planet." The planet really doesn't care which species lives or dies, but at that scale, evolution is working. Whatever happens, something else will come in and be dominant and go on.

I just think in terms of resiliency—I don't like the term "anti-fragile." I don't want that to be what resiliency means. I'm trying to come up with another term. I use the term "superversatile" in my next novel.