Collaborations in Architecture and Engineering Transcript

Authors in conversation: Clare Olsen (CO) and Sinead Mac Namara (SMN)
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Description: Transcript of a podcast of the discussion of the book, Collaborations in Architecture and Engineering between its authors Clare Olsen of Cal Poly Architecture and Sinead Mac Namara of Syracuse University Architecture and Engineering.

[Music]

Karen Lauritsen (Moderator): [Background Music] Welcome to Conversations with Cal Poly Authors. This episode was recorded on May 29, 2015 at the Robert E. Kennedy Library at Cal Poly, San Luis Obispo. This conversation features Clare Olsen and Sinead Mac Namara, discussing the book they co-authored, Collaborations in Architecture and Engineering, published by Routledge in 2014. Clare Olsen has a Bachelor’s in Environmental Studies from Brown University and a Master's of Architecture from UCLA. She taught at Tulane, Cornell, and Syracuse University before becoming an assistant professor of architecture at Cal Poly. Her areas of expertise include, beginning design, digital media and fabrication, interdisciplinary design, and shell structures. Sinead Mac Namara has a B.A., B.A.I. in Civil, Structural and Environmental Engineering from Trinity College at University of Dublin and a M.S.E. PhD in Civil and Environmental Engineering from Princeton University. She teaches structural engineering courses for Syracuse University School of Architecture and mechanics courses for the College of Engineering. Olsen and Mac Namara co-taught a course in architecture and engineering at Syracuse. After giving a presentation about their experience, Routledge approached them about writing a book. Olsen and Mac Namara agreed and researched 10 case studies from some of the most prominent firms in the world.

[Applause]

CO: That's so nice, thank you so much Karen and to the library for hosting us, we're really thrilled. So proud of this book and it's really wonderful to share it with you all. As Karen mentioned, Sinead and I taught together at Syracuse University and that was actually the start of this book project. Sinead was the author along with the Dean of Engineering on an N.S.F. Grant that looked at re-examining an engineering education and we thought since Sinead had a 75% position in architecture, we thought what a wonderful thing it would be to look at the kind of linear, traditional structure of engineering education and to bring engineering students and architecture students together in a classroom, so that engineering students could be introduced to open-ended problem solving, you know where the problem, the answer to the problem wasn't in the back of the book. And the architecture students could be exposed to, perhaps some more technical language and understanding of the importance of geometry and the development of shell structures. So shells were the topic of, was the topic for Sinead's PhD research and since I studied with Greg Lynn and UCLA who is, you know famous for curvilinear...
form, we thought it was actually a really fruitful and productive collaboration between the two of us personally. So I think since we were both really interested in the topic and that energy carried over to our students. So we had, because of the N.S.F. funding, we had faculty from the education department that would come in and do focus groups, talk to the students about their experience in the class, what they were gaining from, from the collaborative experience and that also helped us a lot to assess the, what was productive about having a collaborative course. And we’ve written quite a bit about, about that, that collaboration and it was in presenting one of those papers that an editor was in the audience and asked us to put together a book proposal for Routledge. And just a kind of timeline, I think, I think that paper presentation was in March of 2012 and we wrote a chapter that was peer reviewed and received a contract to write the book in August and then we wrote, we interviewed around 60 professionals around the world, because you know, how you have to write 50,000 words about 55,000 words about collaboration, okay. We better talk to some people. And actually that, that process of interviewing nearly 60 practitioners was so enriching and I think really gave us so much content and also has really helped us both in our teaching. So one of the, our, the book is really aimed toward students and it’s really nice to hear from, we’ve heard from a few professors around the country who have incorporated the book into their teaching including a professor at Dartmouth. One of our friends at UVA told me she saw our book on a syllabus sitting in the printer. We were, we were very conscientious about using disciplinary vocabulary for example. So Sinead would, when I would write something and we would edit each other’s writing, Sinead would say, listen you need to flush this out because this is, this is language you architects understand but this is not going to be clear to everyone reading this book. So and also because we were gearing it toward students, we wanted to have a section of the book on pedagogy and I think it was really productive in that I was, I would happen to be recently hired at Cal Poly because Cal Poly has a very long history of a collaborative course with a collaborative studio that brought together architecture students and engineering students often in the 4th year and it’s also happening as a graduate level degree, Masters of Science and Architecture. And the, they, the faculty here including Tom Fowler, Jim Doerfler who’s now in Philadelphia and architectural engineer, Kevin Dong who’s now the associate dean in the College of Architecture Engineer—Environmental Design. They, they, we included the case study about, about their collaborative work in the book. And so we asked Tom Fowler, who wasn’t able to be here with us today, to write up, to read the book which he said he was happy to do and to write up some questions for us. And so because there’s two of us we thought that would be an okay format still to be able to have a conversation and so we’re going to maybe a little bit awkwardly read Tom’s questions to us. And I’m going to read the whole thing and so including, “Your book is well researched and well written. So it was definitely a challenge to find questions to ask that has not already been anticipated in the text.” Thank you Tom. “The theme that emerged in your publication is that good collaborations are based on long standing relationships and the range of case studies that have been documented show this range. From SOM’s long standing collaborative infrastructure to Holl’s 30 year collaborative relationship with Nordenson,” and for those of you who don’t know Steven Holl’s an architect and Guy Nodenson is an engineer. So he has 4 questions that pertain to this topic. And in the first, “can you talk about any insights that you might have acquired from your research in and out of the ordinary skillsets that SOM looks for in new hires to be a part of this collaborative team?”
SMN: Okay I can talk about that. So one of the things that happened as we sort of set out to leverage every contact in our, our, that we both had to do this is I warned Clare before we started that there was going to be overlap in the engineering world, because the kinds of people who are what I would call an architect’s engineer, there it’s a relatively short list actually because of people who work with high end architects who do really, really good work. And you start to hear the same names come back again and again. You hear Arup, you hear SOM, you hear Cal Poly’s San Luis Obispo in fact because then if you scratch the surface at all, if the person’s not that, you discover oh their first job was with a bunch of Arup trained engineers or they started out working in a particular environment where all of that was happening during [inaudible] particularly good example at the moment. Or you found that the person you were talking to, who you thought was an engineer actually had an undergraduate degree in architecture or an graduate degree architecture or you found that they have come out of a small subset of programs, places like IIT play and, and in particular Cal Poly, San Luis Obispo because it’s one of the few colleges in the nation where structural engineering is taught within a school of architecture rubric which is incredibly unusual, incredibly clever and absolutely the way to do it in my opinion but incredibly rare unfortunately. So what was interesting in terms of skillsets was not actually so much the training of people to have these skillsets, so much as the fact that actually a lot of these people came from very similar backgrounds and they got that mentorship either as part of their training or their first job. Certainly at SOM they talk to us a lot about how they foster collaboration in the office, how junior people are brought to meetings that they don’t necessarily need to be in right now, but they need to be in them for their longer term careers. We talked a lot about the languages of collaboration. In particular I was interested to ask almost everyone we talked to rather or not every engineer we talked to, whether they themselves drew, whether or not they felt drawing was a communicative tool, that was important in their practice and whether or not they felt engineering students should be taught to draw. And every single engineer we spoke to said yes, yes, and hell yeah, so those three questions. And that was gratifying to me because that’s what I thought they would say. But also I think really interesting as an observation because I was taught to draw, not like draw well or anything but I was taught to make a diagram. I took you know T squares and French curves and the whole bit in my first year of college and it nearly killed me because technical drawing is a high school subject in Ireland. And a vast majority of secondary education in Ireland single sex and so all the boys had taken technical drawing for 5 years and none of the girls had and we had to spend 20 hours a week in the drawing office just to get these things drawn the first year. But it had set to me as a skill and I don't know no engineering program I've been exposed to that does this consistently. And so that was something that we took out as a skillset is the idea of using Rhino, modeling, hand drawing, all of those things did emerge when a foster told us that they had actually as they had incorporated their group of engineers in-house, they'd actually moved to an in-house group of engineers who helped with their design work, that they were the first ones soon as they got their hands on laser cutters and 3D printers to really start exploiting those resources. And that that wasn’t something that the architects had anticipated the engineers would do but that that had been a big part of integrating their work into the firm. So definitely the kinds of languages that people use to collaborate seemed to be amazing there and also the kinds of preparation and the fact that it’s a relatively small
world with lots of overlapping sort of nodes of particular, having worked for particular professor, have come from a particular program, having started out in a particular firm like Happold or Arup somewhere like that. So, so not so much that their training was necessarily explicit but that it had a lot of similar interconnected moments.

CO: And we also heard from drawing, it was really interesting to hear you ask about drawing because it, sketching is something that the architecture students do on a daily basis. And so I would hope would feel comfortable going into a meeting at the office and sketch a few ideas out. And it was really interesting to hear that the engineers value this skill as well and do it frequently. And we also talked to them about the software that they used, you know both of us having obviously a lot of interest in relaying to our students productive skillsets to enter into the workforce and so it was really, I appreciated getting affirmation from, the folks that we interviewed about the types of software that they use and how important it is for both the engineers and the architects to have for example, Rhino and Grasshopper skills so that they can do design development and sketching and to be at the design table early on with a lot of ideas. We also found that all of the people we interviewed talked about how important communication is and for example, Gensler, one of the principals and Gensler described that—this is the most profitable firm in the world by the way—that the number one of the things that they look for in new hires is the ability to communicate and okay go ahead.

SMN: So why these particular case studies and what might we learn from these example stories that younger architects and engineers might use as a start for long-term collaborative relationships or how might they be simplified for application in the collaborative design studios?

CO: You know, we were just, Sinead and I were just discussing this morning, how lucky we were to have had the contacts that we have to be able to write these 10 case studies for the book that are really from the most prominent firms, some of the most prominent firms in the world. And although there was maybe one case study where we thought, I don't know if we should include this because some of the information we were getting was maybe not so collaborative. I mean there was a lot of animosity unfortunately, but we just decided because we'd invested so much time in that particular case study, and because it was actually really interesting in terms of the way in which the engineers for that particular case study had kind of done a huge amount of design work for that project, and so that's partly where the stress in the relationship came about. But we included, we interviewed, you know, about 10 different projects and we included all 10 in the book. And we wanted to demonstrate that really innovative work doesn't happen through some glorified idea of a master architect or you know even a master engineer, that the process of pushing the boundaries in contemporary practice involves a lot of people but too, it's not just about, I mean and I think one would, everyone would agree that that, of course, happens in every project that exists. However, these offices that we talk to are recognized throughout the world, award winning, because I think they do innovative work that is made possible through the collaborative process. And we were talking for example, the question asks about younger architects and how this might be a plight in the design studio setting and we were talking yesterday for example, about the mentorship process of that. And
Sinead just mentioned happens, happens at S.O.M. where the younger engineers are brought into the conversation very early. And you know and even throughout engineering and architecture, there's a long history and tradition of mentorship and we actually tried to sort of model, perhaps unknowingly that mentorship process when we co-taught the course together that we were very explicit about the, when women have for example, some disciplinary vocabulary that might not be familiar to the other half of the students in the room. We were—tried to communicate and be open about the differences and to acknowledge those, sometimes even bringing up stereotypes in order to, in order to be more supportive of the communication that needs to happen in a collaborative process.

SMN: I think we tried to model that and so if Clare said something that either I didn't understand or I was very sure the students didn't understand, I was more than happy to say in front of my students, “Professor Olsen, I don't know what you mean could you explain that or I'm not sure I know that architect could you tell me some more about that person?” To get the students into the idea that it was okay not to know something. But we weren't trying to teach them facts, we were trying to teach them a process of how to think, how to talk, how to learn, how to get the most out of each other. One of the things we have to do quite a bit was with the group work, we exercised that every time up until now they've been given group work to do in a class. That was work that conceivably any one member of the group could have done by themselves, but we you know perhaps it was too big of a job or the professor just didn't want to grade all of those assignments and so we divvied them up into groups. But in this case, we often had them just as pairs, one architect and one engineer and we gave someone an assignment that neither of them could have done by themselves and they have to have a little bit more trust in and a little bit more faith in each other and learn how to get the best out of their partner. But also defend their own professional background by displaying their own professional goals and advantages that they might have. And we would sort of, kind of tease each other back and forth like I'm into not falling down business, I don't care what it looks like, I actually do but to kind of model for the students that they needed to kind of learn how to make that negotiation themselves. And I think one of the things that, you know, so willing to kind of be the person who knows a thing in front of the students I think is really useful. I think that gave them a lot of scope. I would actually often do with the architecture students because then they could feel really empowered to tell me something that I might actually already know, but I pretended not to so that they could sort of see how they could insert their own professional expertise. So I think we were kind of willing to model that in front of them and be the person that didn't know the thing or kind of show them how we might even have a disagreement about something or we might look at a building and appreciate different parts of it and that was okay, especially for the engineers for whom there's one right answer, they were very uncomfortable for the first few weeks of the class. But we told them they were going to, we were like, it's okay this should feel like chaos it's all right so don't worry it'll be okay. We're still going to have a good day basically, you just have to take that part out of the equation. So I think that was really useful and that really was echoed in what a lot of the professionals told us in terms of kind of mutual respect for each other's expertise. And a lot of people we've talked to have been working a long time really portrayed that like, I don't know how to do this but I've got my people who do and I know how to talk to them and I listened to them when they tell me
something about work. Or I know you know an engineer saying well I wouldn't, I couldn't understand why they needed to do it this way, it was making my life really hard but they explained it to me and I respected that and then I was on board and figured out a way to get around the column or the whatever I didn’t want to deal with. But, so a lot of that is kind of mutual respect. I think you have to model that for the students and give them agency to be the expert in their own interactions.

CO: Be okay with not knowing everything, that was a big lesson.

SMN: Yes

CO: Tom says, “I would consider all case study architects to be in the middle age range of their careers and therefore, schooled at a time when innovative collaborations between architects and engineers were less common. Would you say that given that building today has become more complex, these collaborative pairings were started out as necessity for these architects to get assistance figuring out their projects or do you think there was truly an interest in pushing the envelope in a balanced collaborative manner to develop a project that was beyond what either discipline could develop alone?”

SMN: So I mean obviously I have not been an engineer for 100 years but I would question a little the binary nature that he sets up there, that there was a time when people didn't collaborate, now there's a time where they do. Because I think that if you take the very long view of people in the world who have built things, I go all the way back, we were the same person. If you go to a gothic cathedral, the person who was in charge of not falling down, keeping the rain out, providing some comfort, but the person inside of the building and deciding what the aesthetics would be and the formal and the political and the economic factors of the project, that was all the same person. However, it was okay, it was cold inside the building, it was okay for the building in 700 to be built and it was okay to sell it half way through. So we've moved on, right, we have much more complex expectations for our building and as such overtime and I think it's been a real continuum, it's been a continued time ever more subdivided sets of expertise is. And if you go and as early as the 1800's we had Viollet-le-Duc who was a prominent French historian and architect, historian of architecture and architect himself talking about, he's lamenting the split between engineers and architects then. [inaudible] was talking in the 50's and he's lamenting, uh these engineering students need to take an art class and these architects could take some math, it wouldn't kill them, you know and there's you know that's back to all who existed. But I think we’re at a particular time now where that it splintered so much that, you know in many of our projects we're 16 or 17 firms by the time you've got to that consulted and the facade consultant and the sustainability consultant and the landscape architect and the architect engineer and the mechanical engineer, you know. And so we just kind of like now there’s a particular and interesting moment to start to talk about well how do you draw that back together or if don't draw it back together how do you teach those people to talk to each other well and productively? So that was kind of where I think we fell with the book, that it was kind of an interesting time now to have that conversation and I think that conversation is happening at multiple levels across disciplines and
across universities in particular where there's been a lot of concern but have an increasingly siloed nature of research. It needs to be circumvent and even in the last 20 years people have been talking about this and interdisciplinary programs have emerged and I think universities in particular have grappled with how do we teach people to work across their discipline and while not using the sort of specific, deep study that we want people to be able to engage in. And so and so, that's where we try to identify this sort of facet of good collaboration that aren't necessarily about you, we got a hold of it yesterday about well I really think that architects should take more math, do I really think engineers should do more of this? And I think that ultimately I don't know if I care that much about what classes let's say my architect students should take so much as they be taught how to think through the problem in a way that allows them to access, exercise skills that they themselves don't need to have, but that's really very much what we were talking about. Because particular because the architect is the one who has to coordinate all 20 of these experts. Okay great. So another one of the questions that Tom had for us was that it seems the more common reason that these collaborative models work, is that a number of these engineers have an appreciation for the creative process for example, Guy Nordenson has an interest in sculpture, Mark Sarkisian who we interviewed at S.O.M., had actually started out as an art student and so Tom asks us if, from our perspective, if there's much support on the architecture side for people having an appreciation for engineering. And I mean, I would say as an engineer who has been teaching architecture, who's met all of the architects who have come through to lecture at Syracuse and through the process of this. So really there's only a small handful of architects that I've ever encountered who don't have, practicing architects—actually it happens more with academic architects—practicing architects who don't have a great deal of respect of engineering and engineering knowledge. And it's often a respect that has come over time and they'll often sort of—and they've all got this story, they've all got this story of the engineer who ruined their project and they've got my guy, my guy's great, my guy knows what he's doing and all like that so. But the, so there's a kind of, I do think that over time and particularly in the practice and people can do good work and do good work over time, both sides really come to very much respect. From another's point of view whether they start out with it I think is, you know is an issue and I do think some of my students get kind of—and oh Professor Mac Namara with your instances on gravity and I could have tried to point out, you know what else consists on gravity, gravity and you'll learn soon enough. And I do, I get emails, I get emails three or four years out going I should have paid more attention in your class. But the, I do think that it, the kind of lack of kind of interest in technical things can be a [inaudible] but it's really [inaudible].

CO: Well, you know it's hard, to know about how many architects we interviewed, I think for example to Tom's question who had an undergraduate degree in engineering for example, I think we did encounter a fair amount of architects working within engineering firms which is interesting and also a growing number of architecture firms that have an interest and wants in incorporating engineering colleagues into their practice. So I think that, although I don't have any kind of anecdotal stories about architects, you know really being technical guys, I think generally I agree that there was a lot of, everyone that we talked to had engineers that they worked with, that they really value and that to me shows a respect for the discipline of engineering and of kind of appreciation for the discipline. So moving on to the next set of
SMN: So I teach both engineering students and architecture students and on occasion I teach both in the same classroom. But when I have the engineering students by themselves, I mean, this is really, I think of more of an uphill battle in engineering education than it is in architectural education. I do think architecture is much more open to multiple modes and so therefore, students just encounter a lot of different modes just by default and some of them will be more collaborative by definition. But in engineering, the sort of lecture answer problems in the back of the book model is almost universal and the textbooks were all written in 1956.

You have a kind a very constrained problem like here is a beam, this is how long it is, this is how it's connected on one end, this is how it's connected on the other end, here's all of the loads that are on it, now tell me some, you know give me some information about the bending or how big the beam needs to be or what should we make it from or something like that. But it's so constrained that the students will all get, they should all get the same answer. And also any engineer who works the field will tell you that all the work is done by the time you know how long the beam is and where it's connected and how it's connected and where the loads come from. And frankly we already know the answer to that question which I say to my students all the time, no one is going to hire you to solve this problem. We know the answer to this problem. And so it really is an uphill battle. I ask every single year, I teach second year students, I have between 120 and 40 depending on the year, second year civil engineering students come into my statics class. I ask the same question on the first day every single year and that question is who is your favorite engineer? And I've been doing this for 10 year, probably about 1,000 students at this point. I have never once received an answer that was not the name of a faculty member, a college engineer. And I say okay, fine, fine, engineering is not a discipline of personality, we don't necessarily associate individuals with their work in the same way that arch, architecture might do, that's fine. You have all been alive in the world for 20 years. You all filled out applications to college, took the facts of engineering, you've been here for nearly 3 semesters, you can take classes, you've been passing them, you're planning on being an engineer for the rest of your life, most of you. So name me some stuff engineers build that are cool. Great, no one has an answer, eventually you might get rollercoasters or something out of one of them. And then you start to say well yeah the Eiffel Tower is pretty nice, Empire State Building is not bad, roads are good, clean water's nice, sanitation turns out to be pretty handy.
And they're like oh is that all, oh okay I guess that will work now that you've mentioned it. And they're just not, they're not in the mindset of people who will make things or you know that think that the world is constructed largely out of things of their profession had a very serious role in. And so we're really trying to get them to just any kind of opening up, any kind of action where like give them an answer to which there might be more than one solution. They might work in different ways.

CO: By contrast and herein lies the difficulty in collaboration after graduating from these sorts of academic trajectories is that in architecture traditionally, in architecture education there is a kind of primacy of the individual, what's meaning to support the creativity of the individual and through, you know singular design projects oftentimes, although sometimes the students work in groups, but primarily working alone and there is a celebration of that, of the creativity of the individual. And I think that there is a little bit of a—these are sort of opposites in a way obviously. The open-ended problem primacy of the individual, the answer in the back of the book, the you know, you mentioned that when we took photographs of each of our classrooms for the book and all of her students are in rows and facing the same direction and have a pencil on a piece of paper and my students are looking different directions. One's on a model, one's on a computer, one's pinning something up, you know it's much looser even, in terms of the framework in which these students are taught and so I think this really gets out a lot of the difficulty in coming at problems from very, very different perspectives.

SMN: So that when we started out to teach the students in the same classroom, we did get some kind of like concern from engineering like, do you know engineering students do not know how to do that, they're not going to come from that, they're not going to, they can't learn those architecture students have been learning that software 3 years. Our students aren't going to be able to do that and they laughed.

CO: I was especially freaked out when Sinead said let's teach Rhino to the engineering students. I said this is going to take too long. We do not have time for this and actually the engineering students, it's Rhino, the software for modeling, 3D modeling is very, very logical and the engineering students learned it in about 2 days and in some cases we were, the students were designing shell structures together and in a number of the cases, engineering students were actually doing a lot of the modeling because we were asking for a form based on parabolas, hyperbolic paraboloids, this was all based in geometry and something that the engineers felt really comfortable with.

SMN: I think that the flip side of that was that there's sometimes, and I think that this is probably not a program where this happens because of the amount of structural engineering that you take, but there's a sort of sense on the part if you prep some my more theoretical colleagues that like, you know engineering is just going to inhibit the creativity and how dare you put constraints and you're getting in my way. And we did not find that our architecture students really seemed to embrace the technical constraints we gave them as part of the design problems in the class and in fact a number of them felt that it was some of the best work that they had ever done. And I always think back to a conversation I had with an art students when I
was a graduate student about this and she said of course there's constraints, there are always constraints. If you're a painter there's constraints, as to how many layers of paint could you put on the thing before it falls down and how big the pallet size is and what the paint is made out of and what kind of canvas is orientated, there's always some level of constraint, no matter how artistic or creative you're being. In that—in a way constraints can really allow creativity to flourish if it's done right. And so, and so we feel that dichotomy is absolutely there, but it is false because there are the engineering educators who will tell you, you don't have time for that, there's too much to learn, they just have to learn all those subroutines and all those little algorithms and processes and they can just learn to put it together later. And then on, I think the architecture educators are like yeah they'll learn the facts, they'll learn all that stuff later and stop them from building buildings from falling down. It's fine they'll learn that later. It's so much more important to just learn the design process and the thinking and that's hard enough in it of itself. And there's some truth to both of those facts but what we discovered was that we think it's far more important that the engineers at least have some idea about how to engage in the process because they can all learn the facts later. And I also think that it's important that the architects at least if not learn all the different technical things, at least be exposed to enough environments where they have to learn one or two specific technical things and learn how to integrate them, so that their process can accommodate all the new things, accept both proofs of capacity to learn more things. Because we're not—4th or 5th year is not the last day they learn anything, they're going to have to be capable of learning new things constantly. And so we feel both models can be broken apart a little, fairly successfully to do that so. One last question. This is for you.

CO: Okay.

SMN: So, Clare had mentioned to Tom that there was some resistance when we were, resistance when we were insisting with the publishers that we list a full team of engineers and architects and in some cases, consultants and the construction company as the kind of authors of each of the projects in our book. And do you think, can you talk more about where that resistance was coming from and do you think that the book like opened up a need for more transparency about who was actually involved in design. We tend to look at something like the Morphosis buildings—actually, bringing in one of our case studies, that's Thom Mayne's building. We didn't talk to Thom Mayne, we talked to 10 other people who built that building so, so do you think that's what we're doing?

CO: Yeah, well I think this gets to a little bit of what I just mentioned about the primacy of the individual in that both in way in which architects are trained, and I think that also the way in which architects are both valued and devalued in the profession. So in other words there are a few architects that everyone knows their name and their name becomes part of their brand and they're very protective of that. And, you know also architects aren't paid very well in general. And I think to give up some ownership or give up some credit is hard to do when you want, you're so concerned about survival, you know making sure that the work that you put out there in the world, if it gets any kind of recognition that that recognition will come to you, because you work so hard on it and you know I think, I perhaps projected a little bit when I was
speaking to Tom about the hesitancy that we heard from architecture practitioners to perhaps not give equal credit because I think actually that was not the case. There was some question I think maybe from one or two people, you know under the image credits we always had both the architect and the engineers that we were, we were talking to. And there's like this is not common and I said yeah we know it's not common, but this is a book on collaboration so we thought it was appropriate. But I think, hands down, without a doubt, all the architects that we talked to would agree that the buildings you know were more, were successful and were more perhaps innovative than they would have been if they hadn't had the kind of productive and fruitful collaboration that they had had. So in the end it was never you know an issue in terms of sharing credit.

SMN: The fact that you mentioned money is interesting though because I will often say to my architecture students when they, especially when they come you know back to the studio and they want to change like nine things. Like okay and you know you have to pay for that right like my fee comes out of your fee and I always get paid. And you want me, and you'd like me to redesign it no problem, that will be extra money. [inaudible] was famous for having said in the 50s, he was a prominent British engineer, like you have enough money, engineers can have almost anything, whether or not it's a good idea is another conversation. And so I do think that's interesting in that a number of people who talk to Rich Gerloff which is a Leslie Robertson and Associates, is the architect at the engineering firm that built the first World Trade Tower, is the Bank of China Building in Hong Kong. Actually the World Trade Center is one of theirs and Rich, I taught for Rich when I was a grad student and he's been a great mentor, and he talked to us for the book and he said one at a time—the way he finds these relationships work over time is that he often will get called in to fix a problem and if he fixes a problem and especially if he saves them money, he gets the phone call much, much earlier the next time because if you can save even 10% of the material in the building, if you know what you're doing it's not that big of a deal that's, the material of the building is about often 30% of the total cost, that's 3%, that’s nearly most of the architects fee you just saved. So you know it's the same credible capacity too, I think that students don't understand at all. Between leverage, business, and economic concerns as part of your collaborations and that was another facet that we tried to bring up a little bit in the book contracts, structures, and other conversations, because I think it's a conversation that isn't taught at schools a ton and I understand why we're cautious about it, but I think it's not a bad conversation to have when it's about how you can assert, use your professional expertise in a way that can kind of, if you don't spend it here you can free it up for this. But people do need to understand it sometimes a zero sum game and if you get something wrong technically then you don't have enough money for that great facade or you don't have any money for some other aspects of the design.

CO: This flashed into my mind and I'm glad you reminded that not only I've been talking about the primacy of the individual and that's really been upheld by the industry, the architectural engineering and construction industry where these contract structures are setup so that the architect is responsible and has everyone else as a consultant working under them. And I say with air quotes, and so what as Sinead mentioned, we did try to describe some new contract structures where the, the owner is contracted with both the architect and the engineer, so that
the architect doesn't have to worry about their fee coming out, the engineering fee coming out of their fee. And also, contracts like integrated project development where everyone is at the table from the beginning. And so it really is completely, these, these professional contract structures are not, they're not blowing up I would say. I mean it's a little bit hard for, it's challenging given how long we've been working under the, the design built model, contract structure. It's taking a while for these contracts to change. But I think that there is tremendous potential in changing the contract structure to then affect the way in which a project is designed in the collaborative process.

[Applause]

[Music]

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