FABRICATING RESILIENCE

A Conversation with John Fernandez

JOHN FERNANDEZ, AN ASSOCIATE PROFESSOR OF ARCHITECTURE AT MIT, GAVE A TALK OCTOBER 27, 2010, AS THE FINAL SPEAKER IN THE RDA LECTURE SERIES "A MATERIAL WORLD." NEERAJ BHATIA SPOKE WITH HIM THAT DAY.

FERNANDEZ'S RESEARCH PLACES THE CONSEQUENCES OF THE FULL LIFECYCLE OF BUILDING—CONSTRUCTION, OPERATION, AND DEMOLITION—IN A GLOBAL CONTEXT. "URBAN METABOLISM" ACCOUNTS FOR AND ANALYZES THE FLOW OF ALL THE INPUTS, ALL THE TRANSFORMATION OF MATERIALS, AND ALL THE OUTPUTS OF AN URBAN SPACE.

NEERAJ BHATIA: How can one employ data from the study of urban metabolism as a design tool?

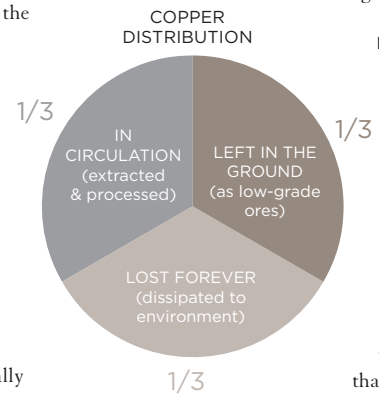
JOHN FERNANDEZ: The first stage is essentially education, making designers, policymakers, and stakeholders aware of the resource consequences of their decisions from construction to operation and ultimately demolition. For most buildings today in the United States, 80 to 90 percent of lifecycle energy consumption is in the operation phase. A tiny percentage, 8 to 10 percent at most, is attributable to embodied energy in the materials. Along with this is establishing benchmarks: how resource intensive is one city in comparison to another?

The second stage then is to place initiatives into that macroscopic context. There are plenty of green initiatives—buildings, mass transit, recycling, urban farming—what is the potential for resource savings for any one of these strategies? The third goal is design oriented. Within each one of those strategies, there are more or less efficient ways to do things. Urban metabolism is meant to give us a better scientific base for making decisions.

NB: I have heard you speak about the need to invest and adapt existing building stock as major resource-saving strategy. While the waste formula means one thing in North America, where there is a massive amount of what Koolhaas would call "junkspace," this formula is vastly different in developing nations where every ounce of space and materials is often used in a multitude of ways. But this is also changing as these countries develop wealth. What are the major strategies to sustainably develop new growth and do these ideas require us to adapt our notion of comfort?

JF: Within the next several decades, 90 percent of the increase in urban population is going to be in the developing world. With increase in affluence, how do we stem the tide of a commensurate increase in resource intensity following the Western model? Our urban metabolism studies are meant to provide a framework for understanding what the potential savings are, assuming an increase in affluence and urban population. It is going to be the responsibility of individual governments to put into place very aggressive energy efficiency, taxation on consumption, and other policies that can attempt to stem the tide of greater resource consumption as a result of greater affluence.

The LEED system has been a huge market driver. The continued evolution of the LEED standard, especially toward actual building performance, is extremely important. In the United States, we have a governance gap. We don't have the highest authorities imposing disincentives or incentives that would drive the built environment towards resource efficiency. I think that is certainly one of the things that needs to happen.



WISH YOU'D SAVED GRANDPA'S PENNIES?

NB: What role do you see parametric design software and new tools for fabrication playing in this material ecology?

JF: Parametric modeling makes it possible to script and modify forms and geometries [in response to] attached databases of information about those forms. [These factors could be, but are not limited to, structural forces, heat absorption, wind pressure, light intensity, etc.] Hopefully we can get to a rich set of tools in which simulation of actual performance is also attached. Energy performance and material performance, attached to the actual physical form and the process of designing that form, is a huge holy grail.

On the fabrication side, there is a lot of hype. I'm a little bit of a skeptic about the extent to which digital and robotic fabrication will have a place in the actual construction of buildings. It already has a fairly significant footprint in the manufacturing of components for buildings. A couple of my colleagues talk about the elimination of construction trades. I'm not so sure.

NB: Could the evolution of whole cities be improved through constant monitoring and adaptation – an ecological feedback loop?

JF: If a city has a good recycling regime I don't have to track every glass container. Real-time and data-rich sensing of a city are appropriate for managing transportation. In between is the built environment. Across a collection of buildings, say a campus or in a neighborhood, you can manage that flow so that a collection of buildings acts as a small, smart grid.

NB: In the last 200 years, the architect's role has systematically changed from looking at the city and its infrastructures to focus on the building alone. Other disciplines, such as urban design and planning, emerged to fill this role. A "softer" or distributed network where things are being cultivated or harvested at the scale of the building implies that architects can reinvest in the city through the design of the unit. Is this a fundamental paradigm shift in the role of the architect?

JF: Yes, it is. A building that is very energy efficient, produces power on site, harvests water to a reasonable degree, even provides for some agriculture or at least maybe some green that reduces the urban heat island effect—all of those things are enormously exciting in terms of design. None of those things are mutually exclusive with aesthetic interests.

Only 15 or 20 years ago when I first got into the business of architecture, there was a little bit of navel-gazing about the profession. Are we just an indulgence? Do we just wallpaper buildings and make them pretty? I think we are very much past that.

It's a challenging time. Designers are by default optimistic. They have to envision. To envision, you have to have optimism about what it is you could bring about. That is the real power of an architect versus an engineer or scientist. Those two disciplines may be so steeped in the challenges that they might have a hard time being optimistic. This is where the designer has a really important, fundamental role.

SOURCE GRAEDEL, T. ET AL. 2006. *PNAS*