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A universal science of cities would be a great asset to cities. One of the defining features of science is the ability to make (accurate) predictions. Thus a science of cities would be able, for example, to predict the consequences of policy and planning decisions, such as the effects of building a new freeway on business. This would be an invaluable tool to municipal governments to make decisions that are “best” for the city and even for the citizens to test whether their government is actually doing what is best. But the science of cities being developed by Geoffrey West, etc. doesn’t quite capture this idea.

West has discovered a trend in cities that as the size of the city doubles, any number of statistics about that city increase by 15% per capita (1, 2). This is called super-linear scaling in that the dependent variable is higher than it would be if it were just a linear relationship. For example if a city of 100,000 has 1,000 crimes per year, then a city of 200,000 would be predicted to have 2,300 crimes, not 2,000. But instead of considering all cities together, they are partitioned, usually by country. He says “I can take these laws and make precise predictions about the number of violent crimes and the surface area of roads in a city in Japan with 200,000 people. I don’t know anything about the city or even where it is or its history, but I can tell you all about it.” (3) But he *does* know something about the city and where the city is. It’s in Japan, which brings with it all sorts of other baggage. A graph of crime versus population that combined both cities from Japan and those from the United States wouldn’t follow a 15% growth curve at all. And this reveals a big hole in the universality of West’s model – size isn’t nearly enough to predict much of anything about a city. There are so many variables besides size that will factor into how much crime a city has, such as culture or policy. At a city’s heart is its populace, and without being able to model the people and their interaction with the city’s infrastructure, it’s not possible to model the city accurately.

Another problem with West’s theory is that, even if accurate, it doesn’t provide terribly useful predictions. His model works with various summary statistics averaged across entire cities of hundreds of thousands to millions of people. What sort of planning or policy decisions could be made by a city knowing that the marginal amount of asphalt they need will fall as the city grows? It would be a mistake for a city to try and apply that knowledge at a local level – planning the future asphalt budget around the model while ignoring the planned needs and uses for the asphalt. At best, this sort of model could inform federal policy. For instance allocating marginally more resources to cities as they grow because they are expected to be marginally more productive, or, on the contrary, allocating fewer resources because they are predicted to require less infrastructure. To borrow West’s oft-used example, it’s the same as an elephant knowing that she uses proportionately less energy than a mouse – not much use to the elephant as she is the way she is, but potentially useful to the mad scientist who is trying to crossbreed humans and whales in an attempt to reduce our energy requirements.

It seems to me that the science of cities and its applicability to planners may be akin to quantum mechanics and its applicability to chemists. Using the laws of quantum mechanics we can theoretically derive the periodic table. Quantum mechanics *could* tell you that sulfur is yellow and that iron melts at 2,800°F. The problem is that it’s *very, very* hard. A state-of-the-art super computer will be hard pressed to describe any atoms more complicated than hydrogen, let alone molecules. So for all practical purposes, we still rely on careful observations of individual substances. So too there exists a fundamental science of cities. But it may be that for a universal model of cities to be precise it would be too complex to be solvable, requiring as many variables as there are people in the city, buildings in the city, etc.. And thus each city and its unique circumstances would always need to be taken into account. There are almost certainly heuristic models that could describe cities reasonably well and be broadly applicable. But we will still need to take into account all the aspects that make a city unique.

That’s not to say that there is nothing to gain from the work being done by West. A colleague of West’s, Luis Bettencourt, has started to work on models that can explain why the super-linear correlation West found might exist (4, 5). His theory is based on the gains from the increased number of social interactions as people interact in a denser environment. This sort of work is important because knowing *why* a city displays certain properties may allow us to reinforce the causes of good properties (income, innovation) and reduce the causes of the bad (crime, pollution). It also may be that all the good and bad are inexorably linked and that increasing one without the other is impossible. But that is the sort of question that a true science of cities could answer for us.

A science of cities would have much to offer us. The grand unified theory of everything (urban) would of course be incredibly useful in policy and planning. But West’s clean super-linear correlations are not it. Such a theory would necessarily be messy because we can’t forget to take into account all those messy human sorts of things that are very difficult to quantify, such as human culture and behavior. Humans are at the heart of cities (until our computer overlords see fit to take over) so we can’t leave them out of the equation.

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