Knowledge In, Knowledge Out:
How Much Knowledge Is Needed To Develop Insightful Visualizations?

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"Knowledge signifies things known. Where there are no things known, there is no knowledge. Where there are no things to be known, there can be no knowledge. We have observed that every science, that is, every branch of knowledge, is compounded of certain facts, of which our sensations furnish the evidence. Where no such evidence is supplied, we are without data; we are without first premises; and when, without these, we attempt to build up a science, we do as those who raise edifices without foundations. And what do such builders construct? Castles in the air."
– Frances Wright, 1829

Throughout its history, visualization techniques have been developed both in isolation of the application area and data, as well as specifically for a given problem and domain. Many of these techniques are still popular and effective today. This begs the question as to whether we need domain, process, and data knowledge to generate effective visualizations for scientists, physicians, engineers, analysts, and decision makers.

In this talk, I'll discuss the issues, techniques, and importance of moving from data to information and finally to knowledge. I'll discuss the importance of using knowledge about the data and its characteristics to generate accurate visualizations, as well as the importance of adding statistical, perceptual, domain, process, user, and task knowledge into the visualization process to enable the most effective visualizations. I'll illustrate the importance of these aspects with examples from applications ranging from cloud modeling to syndromic surveillance.