Tying Beauty to Truth:
Visual Mnemonics Add Meaning to Perceived Patterns

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The information visualization community has made great strides in understanding and engaging human sensory and perceptual mechanisms over the last decade, essentially back-fitting them by designing displays that take advantage of human vision. I will present an abstraction of the human visual system that follows a "Knowledge Acquisition Pipeline" from photons to contextualized ideas at just the granularity needed by designers and engineers. My students and I have found it valuable in the analysis of visualizations and the design of visualization-like user interfaces: interfaces with non-standard widgets or spatial organization.

This pipeline does more than help us sort out and connect data to the appropriate perceptual mechanisms; it helps us explore the final stages in knowledge acquisition: the stages where patterns exposed by good visualization tools get integrated into the individual ideas and shared metaphors of a knowledge domain. By letting questions from domain experts define the goals of a view, and letting their shared metaphors inform the structure of the view space and shapes of the glyphs, we can streamline the task of interpretation and memory embellishment that anchors ideas.

Though many of the techniques I will share are well known, I hope this pipeline abstraction will help designers sort out which data to present to what perceptual/cognitive process, and evaluate designs to see whether they are missing expressive opportunities by ignoring one or more human "input channels." These techniques are more effective in some domains than others, but the approach can also help to identify where visual metaphors should not be used, helping prevent unintentionally misleading displays.

The approach also seems extremely well suited to alternate displays such as large-format prints and the pixel-dense meter-wide displays we will see in the near future. Perhaps most important: tying the tool more firmly to the representations experts have in their minds makes each tool more of a toy, work more like intellectual play, and might even add the depth of human meaning to our pretty patterns.

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