In recent years, low-cost solar cell technologies have taken major strides, emerging out of the research laboratory into the marketplace. Still, a great deal of work remains to understand the electronic properties of these rather imperfect, non-single-crystalline materials, and improve the efficiencies of devices. We have been working to extract quantitative information about the pn junction and grain boundaries from scanning electron microscopy and scanning probe microscopy images. From these studies arise interesting questions about our fundamental understanding of the interaction of a probe with the semiconductor surface, while our results also contribute to the practical application of these techniques in understanding, and improving, the electronic properties of solar cells.