Reactions which occur at material interfaces often profoundly affect the properties of a fabricated device. This is nowhere more important than in the semiconductor industry whereby even a few atomic layers of interdiffusion or chemical reaction can drastically change the behavior. In situ studies using high-resolution electron microscopy, whereby atomic re-arrangements are seen directly, can be invaluable to document and to understand these processes. In this presentation, the development of this technique will be reviewed, drawing upon examples from semiconductor technology. The introduction of the focused ion beam machine extends the power of in situ microscopy and some recent studies will also be illustrated.

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