

## Designing a Better Ink Pen

Quill and fountain pens fed ink to the writing tip through a combination of capillary action and gravity. Since the ink used in these pens was exposed to the atmosphere prior to its deposit on a document, it needed to be slow-drying. Slow-drying ink meant that one needed to be careful after writing in order to avoid smudging the wet ink across the paper. Moreover, the flow of this slow-drying ink was often not uniform, leading to unsightly droplets of ink on the document. The challenge of developing a better pen, then, could be formulated in terms of two desired functions: (1) protection of the pen's ink supply from the air until its deposit on the paper, thereby allowing faster-drying ink to be used, and (2) an even distribution of ink to the document.

When viewed in terms of these two functions, the ballpoint pen can be seen as a creative and direct solution to the problem. The rotating ball in the tip of the pen prevents the ink supply from contacting the atmosphere so that fast-drying ink can be used, and it provides a continuous and uniform distribution of ink across the paper as needed.