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Dr. Narang examines the base sequence of a sample of synthetic DNA.

The instruction to produce the vital hormone is so compelling that the bacterium *Escherichia coli* has poured almost everything into the task, even its household chemical energies. "All that protein is good for diabetics, but fatal to *E. coli*," comments Narang as he reaches over to close his window against a gathering wind.





The chemist's shorthand for writing the genetic code. The base letters that appear ladder-like in the winding helix of DNA (left) are normally written as parallel columns (centre). On the helix, cytosine (C) is always across from guanine (G) and adenine (A) from thymine (T). Chemists forshorten the description further by simply drawing out the line of letters (right), and, since the strand that holds the code (left) automatically determines the complementary strand (remember, C must have G across from it, and A must have T), the complement is seldom written out as well (bottom). When a chemist writes out this bottom, single line then, what he or she is actually describing is the double helix at left.

For Saran Narang the singleminded bacteria are the embodiment of over ten years of research in one of science's most exciting new fields. In two short decades, scientists have created a powerful combination of techniques - widely known as "genetic engineering" that enable them to build genes from off-the-shelf chemicals and induce bacteria and yeasts to dutifully translate them into medically-important proteins like insulin. More so than most, Narang appreciates the history of this burgeoning field. After all, he helped write part of it. The chemistry that went into build-

ing the insulin gene, and which underlies the made-to-order DNA capabilities of the new "gene machines," was developed in part at his Ottawa laboratory.

Outside, a storm moves across the Ottawa river from the Gatineau hills, driving rain against the high, cathedral-like windows of Narang's office. On blackboards (actually, greenboards) that crowd against his desk on walls so close that his outstretched arms can almost touch them, are long strings of letters connected by chalk dashes. Though there is no apparent pattern to the letters, it becomes evident on scan-