

Tipping Point Commentaries

The Flipping Point

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How small can a tipping point be? The world of nanotechnology is approaching that answer by nanometers. Consider the following teaser from Scientific American:

from:

Microbial Computing

By Nikhil Swaminathan

Published: August 2008 Scientific American

Scientists have made a DNA computer that puts bacteria to work solving a sorting problem (namely, one that involves flipping pancakes golden side up).

First, no pancakes were harmed in the making of this computer – and in fact the computer described was never built, but rather it was modeled. This begs more description as this field has enough hyperbole associated with it.

There have been DNA computers already built, so that is not outside of the realm of reality. Further, bacteria and viruses have been harnessed to do the work researchers impose upon them. This is generally for mobility's sake. Even more, nanotech researchers have also built virtual bacteria and viruses, and molecular *walkers*.

In this snippet from Scientific American, this reference to *walkers* becomes evident. The walkers are processed to step by cycling enzymes to them. One enzyme causes a molecule to detach itself from a substrate. Another enzyme then deforms the molecule (causing it to physically translate about a bond). Then yet another enzyme causes the deformed molecule to attach itself to the substrate at a new distant point and return to its normal configuration. In this, only one leg of the *walker* is described where its best foot is put forward – so to speak. The enzyme process continues with the other leg to complete the full two strides of a walk. With the process repeated, walking continues.

This says nothing of how to deliver the enzymes, nor the specifics of the substrate that acts as the sidewalk. Those are practical necessities of the laboratory, but with a little imagination, those small steps for a molecule will eventual make on large step for nanokind. Try not to think of this in Hollywood terms of a vast ant army of nanobots swarming through your blood veins (or under your skin) – this is the hyperbole that often attends the reactionary response.

The DNA computers that have been built don't solve spreadsheets, correct spelling in a document, nor send email. When computers come to mind, the wrong image can cloud perception where this tipping point will trigger the next wave of invention. Rather, DNA computers will be solving conventional logic problems, but at non-conventional scales, and for very limited issues. Think of very rudimentary operations like drug transports moving toward light, following a trail, or recognizing a combination of molecules, DNA, or cells buried in a cluster or mass. Genetic and radioisotope markers do much of this already, as they arrive by the blood stream; but they can not travel far from it (generally limited to one cell layer away from a capillary). Mobility beyond this limited range is demanded for the next leap in internal medicine.