3 April 1994

Cherilyn Crowe
c/o Fred Tabbutt
Matter and Motion

Dear Cherilyn,

I found a note that you left me last quarter, asking about growing bacteria. If you haven't started a project yet, here are some suggestions.

First, it is apple-pie easy to grow bacteria and study their growth. We standardly do this with the various strains of *Escherichia coli* we keep in our lab (none of them pathogenic, I assure you). The easiest way is to just follow the increase in optical density with a spectrophotometer, at any visible wavelength. (I used to use OD_{350}; OD_{600} is commonly used, and in our T4 lab, for purely historical reasons, we use OD_{490}.) At the very least, you see a bacterial culture go through the classical sigmoid growth curve, and you can test various growth media and conditions of growth.

One suggestion that might interest you: The general rule is that the more cellular components you give bacteria, the less they have to make for themselves and, therefore, the faster they grow. With glucose as the sole carbon source, they might take an hour to double in mass; with a rich mixture of amino acids, vitamins, etc., they might double in 20 min. Years ago, Charles Helmstetter showed that each addition to the growth medium of a single type of amino acid (out of the 20 found in proteins) increases the growth rate by a small increment; you might want to test something like that. Does the addition of a much-used amino acid, such as glycine or alanine, increase the growth rate more than a rarely used one such as tryptophan, or does tryptophan increase the growth rate more because it has to be made by a complicated biosynthetic pathway, requiring the synthesis of several enzymes?

There are, of course, other possible experiments, but you might find this amusing. Sorry to have taken so long to answer you.

Best wishes,

Burt Guttman