The apparatus shown in the diagram consists of a series of chambers that rearrange the nucleotides in a short DNA fragment. Your goal is to find the shortest path that not only leads you to the finish, but also produces the desired DNA fragment from the one given at the start. Conceptually, the DNA fragment acts like a "token" that affects where you can move in the puzzle. At the same time, where you move in the puzzle affects this token.

The tubes connecting the chambers allow fragments to pass only if they contain specific DNA sequences. For example, a tube labeled <CT> would allow fragments CTG or GCT to pass, but not TCG. (This is how the token affects where you can move.)

GIVEN: GTA   WANT: ATG
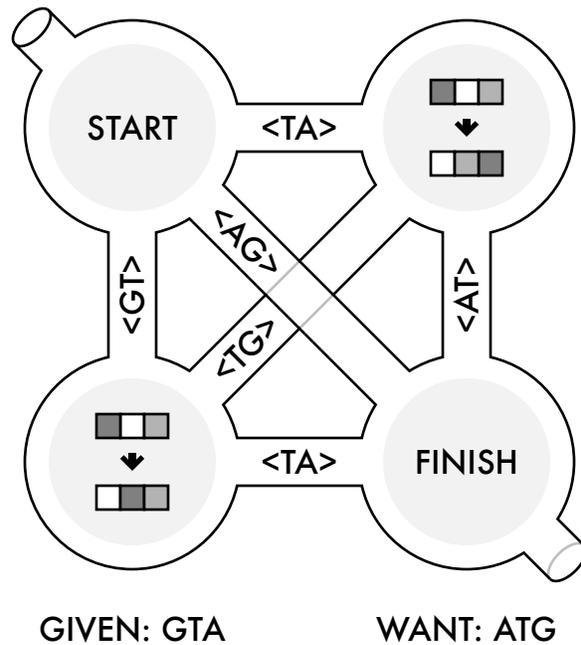
The spherical chambers contain enzymes that specifically move the first nucleotide to a different position in the fragment. For example, the chamber labeled at right indicates that the enzyme in this chamber moves the first nucleotide into the second position; it would take the fragment CTG and produce TCG. (This is how where you move affects the token.) Remember, the shaded squares represent positions within the fragment, not particular nucleotide bases.
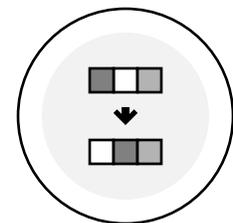
The chambers are designed so that the enzyme always works in the direction indicated by the arrow, no matter how you enter or exit the chamber. (In other words, the enzymes never work in reverse.) The chambers also ensure that enzymes eject the DNA fragment once the rearrangement has occurred. The only way a fragment can undergo another rearrangement by a given enzyme is by leaving and re-entering the chamber. One way to repeatedly apply an enzyme would be to move back and forth between either the start or finish chamber, as these chambers contain no enzymes and thus do not rearrange the fragment.

DNA Transposition
Instructions