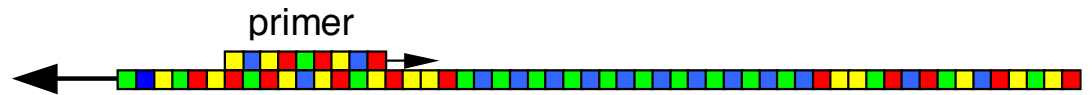
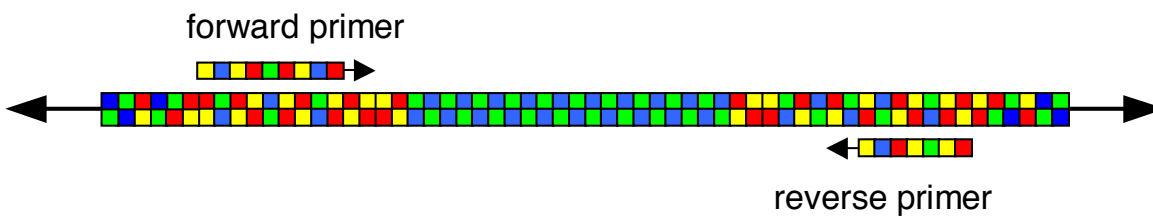


The polymerase chain reaction (PCR) was one of the most significant inventions of the last century and has found its way into almost every area of biology and medicine. Like so many great ideas it is elegantly simple and a whole generation of geneticists has struggled to come to terms with not having been the first to think of it.

The process exploits the fact that, presented with a single stranded template in laboratory conditions, DNA polymerase can elongate a complementary strand, but cannot initiate the creation of a new strand from scratch. This means that for strand replication to begin we must provide it with a short piece of single-stranded DNA, that will anneal to the template strand and act as a 'primer'



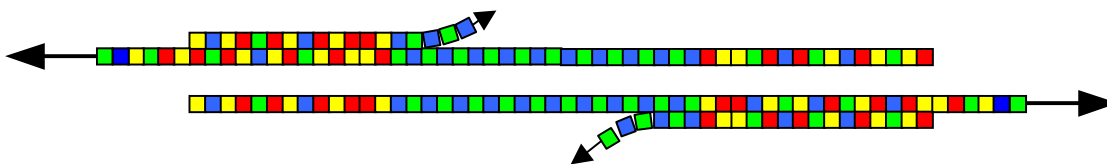
The sequence of the primer is designed to be complementary to a sequence on the template that flanks our microsatellite. The unlikelihood that this sequence will occur anywhere else in the genome means that we can be sure that replication will only begin at one locus, no matter how much other, extraneous DNA is present. In the PCR we include two such primers, both flanking our microsatellite, but complementary to opposite strands:



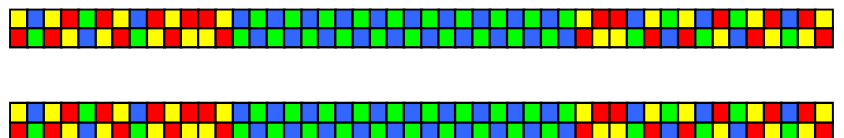
We begin by 'melting' our DNA sample by heating it to ~94°C, the two strands separate but remain intact themselves.



The reaction mix is allowed to cool, so that the primers anneal to their complementary sequences and initiate replication.



After a short time, we now have two double stranded copies of our microsatellite and flanking regions. By heating the mix up again, each of the four strands will separate once more and, on cooling, each will capture a further primer.



In consecutive cycles, four becomes eight, eight becomes sixteen etc. until after 25-35 cycles we have many millions of copies of our microsatellite. Other extraneous sequences in our original DNA sample are not amplified and now are effectively invisible.