Francis Crick's letter to his 12 year-old son, Michael, about 2 ½ weeks after his discovery with Watson.

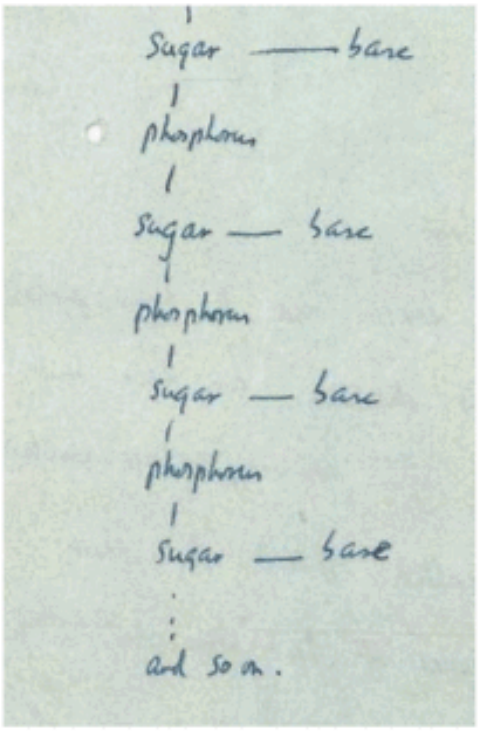
19 Portugal Place
Cambridge
19 March '53

My Dear Michael,

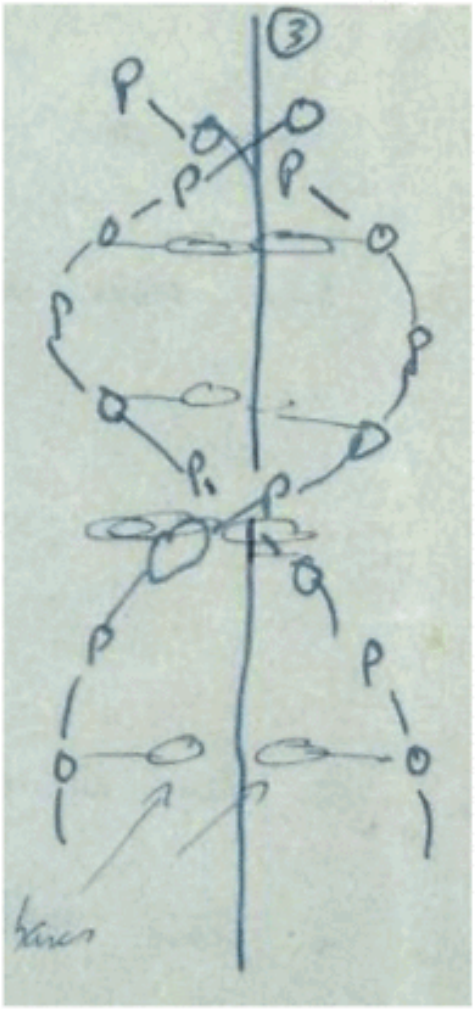
Jim Watson and I have probably made a most important discovery. We have built a model for the structure of des-oxy-ribose-nucleic-acid (read it carefully) called D.N.A. for short. You may remember that the genes of the chromosomes -- which carry the hereditary factors -- are made up of protein and D.N.A.

Our structure is very beautiful. D.N.A. can be thought of roughly as a very long chain with flat bits sticking out. The flat bits are called the "bases". The formula is rather like this.

[diagram]



Now we have two of these chains winding round each other -- each one is a helix -- and the chain, made up of sugar and phosphorus, is on the outside, and the bases are all on the inside. I can't draw it very well, but it looks like this




[drawing of double helix showing base pairings on inside]

The model looks much nicer than this.

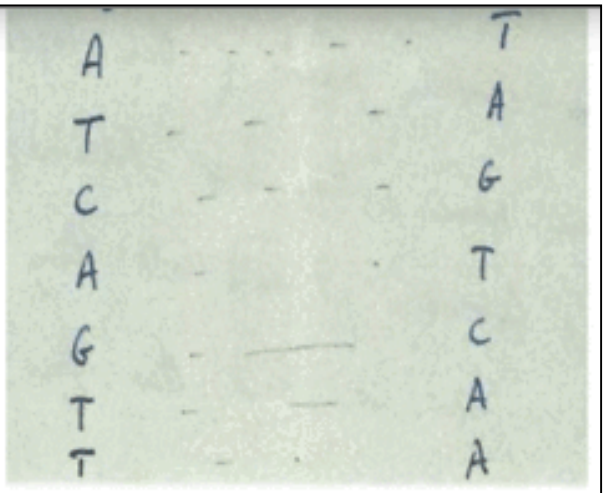
Now the exciting thing is that while these are 4 different bases, we find we can only put certain pairs of them together. Thee bases have names. They are Adenine, Guanine, Thymine & Cytosine. I will call them A, G, T and C. Now we find that the pairs we can make -- which have one base from one chain joined to one base from another -- are
only A with T

and G with C.

Now on one chain, as far as we can see, one can have the bases in any order, but if their order is fixed, then the order on the other chain is also fixed. For example, suppose the first chain goes

> then the second must go

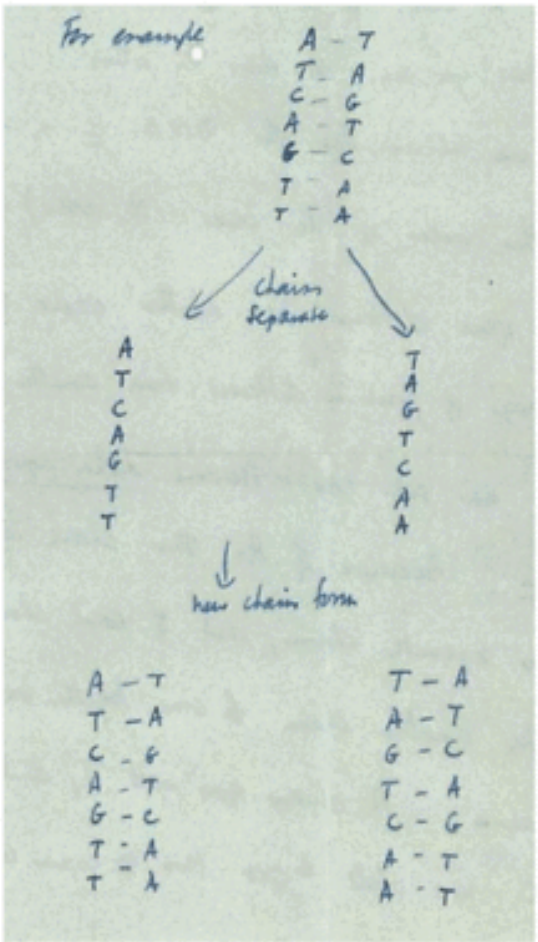
A - - - - - - - - - - - - - - - - - T
T - - - - - - - - - - - - - - - - - A
C - - - - - - - - - - - - - - - - - G
A - - - - - - - - - - - - - - - - - T
G - - - - - - - - - - - - - - - - - C
T - - - - - - - - - - - - - - - - - A
T - - - - - - - - - - - - - - - - - A




It is like a code. If you are given one set of letters you can write down the others.

Now we believe that the D.N.A. is a code. That is, the order of the bases (the letters) makes one gene different from another gene (just as one page of print is different from another). You can now see how Nature makes copies of the genes. Because if the two chains unwind into two separate chains, and if each chain then makes another chain come together on it, then because A always goes with T, and G with C, we shall get two copies where we had one before.

For example




[diagram showing chains separate into two newly formed chains]

In other words we think we have found the basic copying mechanism by which life comes from life. The beauty of our model is that the shape of it is such that only these pairs can go together, though they could pair up in other ways if they were floating about freely. You can understand that we are very excited. We have to have a letter off to Nature in a day or so. Read this carefully so that you understand it. When you come home we will show you the model.

Lots of love,

Daddy