# Spell Your Name in DNA

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The alphabet of DNA might seem really small at first: just 4 letters, representing the nucleotide bases. But there's actually much more to it than that. Those A, T, C, and Gs code for the molecules that make all living things.

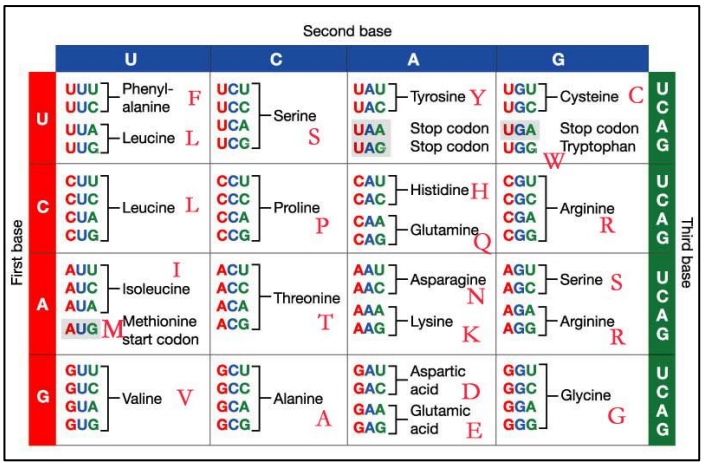
**How do we go from a string of nucleotide bases to proteins and a person?**
DNA undergoes two important processes: Transcription and Translation.
**Transcription** 'reads' the DNA and creates a complementary strand called RNA. For example, if our DNA sequence is

TGATCGTACGA

Then the RNA strand will read: ACUAGCAUGCU

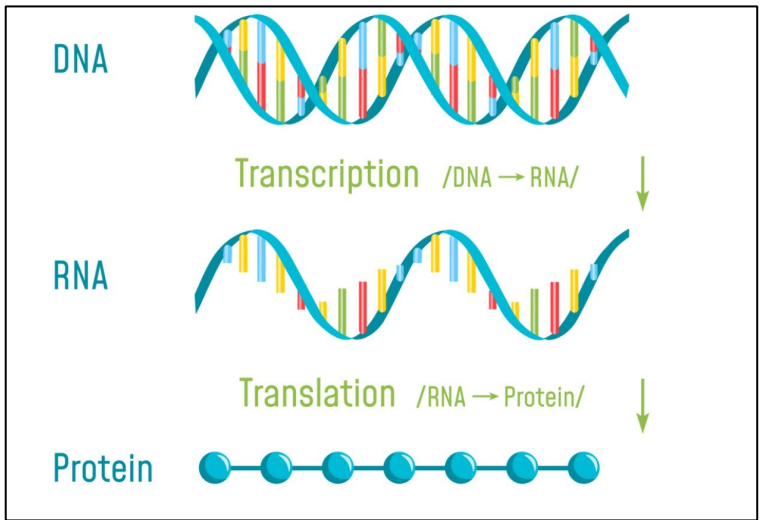
So you may have noticed something odd in that RNA sequence. Why is there a letter "U" instead of "T"? When DNA is transcribed into RNA, Uracil (U) base pairs with adenine (A) in place of thymine (T). There are a lot of steps to this process of transcription, but we're not going to worry too much about those right now.

What's important is the next stage: **Translation**.
During translation, organelles called ribosomes attach to the RNA sequence and read the order of the bases. Every three base pairs will code for an Amino Acid. This set of three is called a Codon. Check out this chart to see what codons code for each of the 20 amino acids. All amino acids can be represented by a single letter (shown in red here).




When two or more amino acids are joined together, a protein forms! The finished proteins will go off and do their jobs within an organism: forming hair or bones, building organs, or becoming hormone messengers!

That's a lot to learn. Here's a simple diagram showing what we just described:

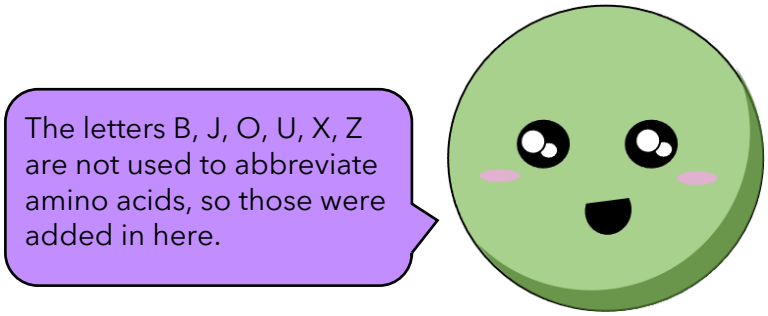



**So let's spell your name in DNA!**

Before we start, there is one problem: there are only 20 amino acids and each one of them is represented by a single letter. But there are 26 letters in our alphabet. So our chart isn't exact. We've had to add in codons for the 6 missing letters—because no one wants parts of their name missing!

| Letter | Codon |
|---|---|
| A | GCC |
| B | CGA |
| C | UGU |
| D | GAU |
| E | GAA |
| F | UUU |
| G | GGA |
| H | CAU |
| I | AUC |
| J | GGC |
| K | AAA |
| L | CUA |
| M | AUG |

| Letter | Codon |
|---|---|
| N | AAU |
| O | UCC |
| P | CCA |
| Q | CAG |
| R | AGA |
| S | UCG |
| T | ACU |
| U | UUG |
| V | GUG |
| W | UGG |
| X | GCU |
| Y | UAC |
| Z | CAC |




Materials Needed:

- 4 different color beads (or anything similar- multi-colored breakfast cereal would work too!)
- Pipe cleaner or string
- A piece of paper and pencil to make notes
- 4 crayons or colored pencils in the same color as your beads

Process:

1. Write out your name (or whatever word you want to spell) with some space in between each letter. We're going to use Gregory's name as our example:

   G R E G O R Y

2. Use the codon chart to find the three bases represented by each letter and write them above. This is our RNA strand.

   GGA AGA GAA GGA UCC AGA UAC
   G R E G O R Y

3. Now we need to translate the RNA back to DNA. Remember that G pairs with C and A pairs with T (which will take the place of any U). In the case of Gregory, the DNA sequence would be:
   CCT TCT CTT CCT AGG TCT ATG

4. Use a crayon or colored pencil to assign each base a specific color (whichever four beads you chose to use). In this case our color code is:

   A = Red C = Blue G = Yellow T = Green

So Gregory's name looks like this:

CCT TCT CTT CCT AGG TCT ATG
G R E G O R Y

5. Place beads onto your string in that same order and either tie into a bracelet or knot each end to do something else with it, like a keychain

6. You've now spelled a word in DNA!

**Extensions:**

- Try out some other words and notice which bases are most common.

- Make your bracelet double stranded by creating the complimentary strand to the one you have (hint: this will look just like your RNA strand, but without the U)