

“Gene” the Molecular Mascot of “DNA & Beyond” Sings the “ABCs of DNA” (& RNA and Protein Songs Are Included)

Background: The “ABCs of DNA” was registered by DNA & Beyond with BMI in 2015. It’s to be sung to the famous “Alphabet Song” that helps young children learn their ABCs. Here, “D” stands for “Deoxyribose” (the sugar molecule of DNA) and “P” stands for Phosphate. Letters A, T, C, and G are initials for the four DNA code letters (adenine, thymine, cytosine, guanine). Methyl tags (methane minus a hydrogen atom) form a “second epigenetic language” on top of the DNA. When methyl tags are attached to two “C” (cytosine) letters, they put the gene to sleep, allowing it to rest.

So, sing with us!

“A” with “T” and “C” with “G”...

Held in place by “D” and “P”! (Optional coupled descant: “Held in place by P-D-P-D-P”)

When I rest, you will see,

Methyl tags plugged into “Cs”...

Now I know my ATCGs,

Won’t you come and twist with me.

“RNA’s Song”... Gene’s Twin (transcribed copy) known as RNA--sings...

“A” with “U” and “C” with “G”...*

*Held in place by “R”** and “P”!*

When I fold,[‡] sometimes I see...

Groups of letters snipped from me.[‡]

Now I know my AUCGs,

Won’t you come and fold with me.

**“U” replaces the “T” in RNA **“R” is for the “Ribose” sugar.*

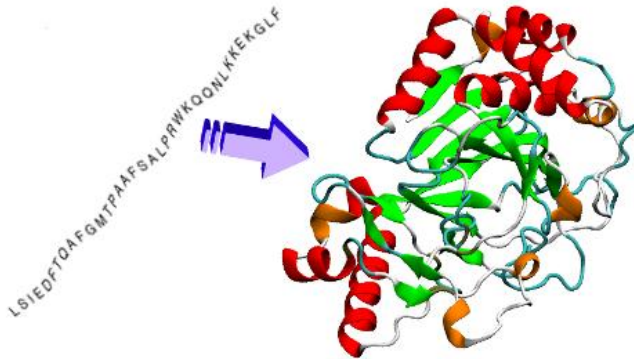
‡ Many RNAs are known to fold: tRNA, rRNA, microRNAs and more.

*‡ In eukaryotes, the higher animals above bacteria/algae, **sections of mRNA molecules are often snipped out once the mRNA copy has been made.** These snipped-sections are called “introns.” The other sections, “exons,” are spliced together, prepping the mRNA for its journey to the ribosome.*

Now...the Protein Song!

Gene’s Twin, the thread-like messenger RNA (mRNA), is used as a template for assembling a **protein** as it passes through a tunnel in one of the floating factories in our cells—called a **ribosome**. This marvel of ingenious micro-technology, crafted for the task of protein assembly, allows the RNA to be

“read”...one word (three RNA letters) at a time. These “words” are called **codons**. In this pattern, the three letter word is “translated” into a single amino acid, with the help of a molecule called a tRNA. Thus the RNA message serves as a blueprint to build an entire chain of amino acids, a **protein**, which rapidly “scrunches”—that is, it folds precisely and tightly--into an **exact, pre-programmed 3-D shape** as it leaves the ribosome! (Some larger proteins do some of their 3-D folding in a barrel-shaped container, a “chaperone,” near the ribosome.) Here below is graphic representation of that transition.



Fortunately, the 20 letter amino acid alphabet of proteins is commonly referred to by certain selected capital letters from the English alphabet. (See below to find out what amino acid type of molecule that each letter stands for.)

Think of this set of 20 amino acids, each with its own properties, as similar to the totally-unique 20 members of a “cast” of a movie or TV series, such as the “Brady Bunch” (this would be called the “Protein Bunch”). Better yet, consider the

movie “Cheaper By the Dozen 2” with a cast of 20 children: 12 Baker kids (Steve Martin is the dad) and 8 Murtaugh kids (Eugene Levy plays the dad). Just as this cast has 20 unique individuals (all members of a big extended family) so the “amino acid cast,” has 20 unique building blocks acting together. These amino acids join together in a functional order to make folded protein chains.

There is just one hitch for our hope that the alphabet song might be adapted through the 20th letter, “T.” It turns out we can’t simply sing the first 20 letters then add some lyrics. It just so happens that there is no usage of letters “B” and “J” and “O” for amino acids. Yet, on the other hand, there are three letters after T that are used for amino acids: “W” and “V” and “Y”! So, we simply move these three W/V/Y letters (3 symbols of amino acids) into the “B/J/O slots” in the alphabet song. Presto... it works! Now, let’s sing...

A, W, C, D, E, F, G...

H, I, Y, K; L-M-N-V-P

**Q, R, S and T’s the last, in a
Twenty member amino acid cast.**

**Now I know my protein bunch;
Won’t you come with me and scrunch.**

Here is the symbol system, using the order of our song:

A = Alanine; W = Tryptophan; C = Cysteine; D = Aspartic acid; E = Glutamic Acid; F = Phenylalanine;
G = Glycine; H = Histidine; I = Isoleucine; Y = Tyrosine; K = Lysine; L = Leucine; M = Methionine;
N = Asparagine; V = Valine; P = Proline; Q = Glutamine; R = Arginine; S = Serine; T = Threonine

For more information, please visit dnaandbeyond.org or contact us at twoodwardaslan@gmail.com. The crafting of our entire Dynamic DNA enterprise is the work of a hard working staff led by Media Director Guillermo Gonzalez. Check out <https://dnaandbeyond.org/our-product/> to see our DNA model!