VIDEO 1: DNA translation

What you are about to see is DNA's most extraordinary secret — how a simple code is turned into flesh and blood. It begins with a bundle of factors assembling at the start of a gene. A gene is simply a length of DNA instructions stretching away to the left. The assembled factors trigger the first phase of the process, reading off the information that will be needed to make the protein.
Everything is ready to roll: three, two, one, GO! The blue molecule racing along the DNA is reading the gene. It's unzipping the double helix, and copying one of the two strands. The yellow chain snaking out of the top is a copy of the genetic message and it's made of a close chemical cousin of DNA called RNA. The building blocks to make the RNA enter through an intake hole. They are matched to the DNA - letter by letter - to copy the As, Cs, Ts and Gs of the gene. The only difference is that in the RNA copy, the letter T is replaced with a closely related building block known as "U". You are watching this process - called transcription - in real time. It's happening right now in almost every cell in your body.

VIDEO 2: mRNA translation

When the RNA copy is complete, it snakes out into the outer part of the cell. Then in a dazzling display of choreography, all the components of a molecular machine lock together around the RNA to form a miniature factory called a ribosome. It translates the genetic information in the RNA into a string of amino acids that will become a protein. Special transfer molecules, the green triangles, bring each amino acid to the ribosome. The amino acids are the small red tips attached to the transfer molecules. There are different transfer molecules for each of the twenty amino acids. Each transfer molecule carries a three letter code that is matched with the RNA in the machine. Now we come to the heart of the process. Inside the ribosome, the RNA is pulled through like a tape. The code for each amino acid is read off, three letters at a time, and matched to three corresponding letters on the transfer molecules. When the right transfer molecule plugs in, the amino acid it carries is added to the growing protein chain. Again, you are watching this in real time. And after a few seconds the assembled protein starts to emerge from the ribosome. Ribosomes can make any kind of protein. It just depends what genetic message you feed in on the RNA. In this case, the end product is hemoglobin. The cells in our bone marrow churn out a hundred trillion molecules of it per second! And as a result, our muscles, brain and all the vital organs in our body receive the oxygen they need.