IMAS International Museum of Art & Science

Women's History Month: Create Marshmallow DNA

Celebrate Women's History Month by creating a marshmallow DNA strand and learning about women's contributions to science.

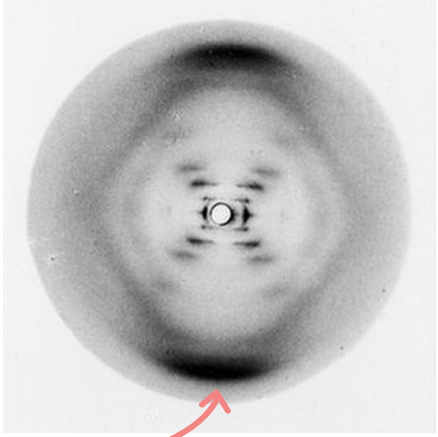
Time Needed: 30+ minutes
Age Level: 14 and up

Materials Needed: 12 toothpicks, colored marshmallows (9 green, 9 pink, 9 yellow, 9 orange), 2 sticks of licorice

Why do we celebrate Women's History Month?

For much of history, women were discriminated against and unacknowledged for their contributions to the arts, culture, science, and society. It is important to acknowledge and celebrate those contributions so that young girls know that they also have the opportunity to change the world. In 1986, the National Women's History Project succeeded in convincing Congress to dedicate the month of March toward recognizing women's history.

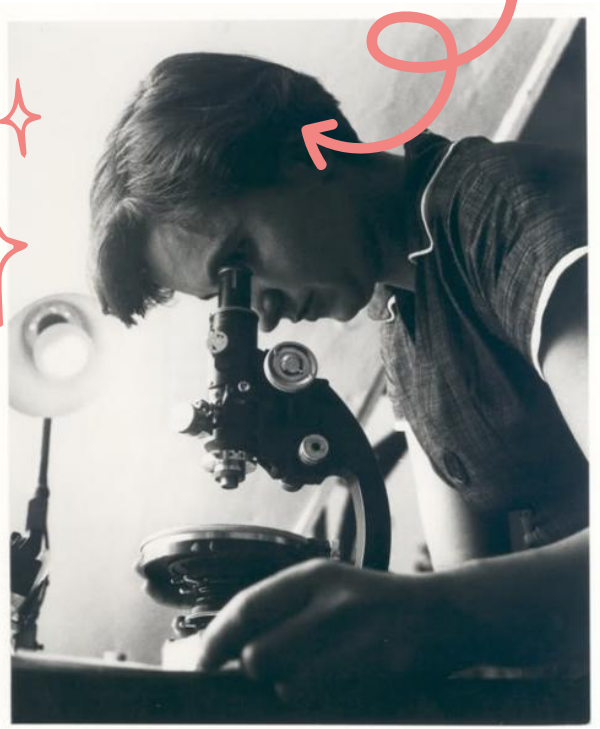
Much like in the field of art, many women who made world-changing contributions to science went unnoticed throughout much of history. When you look up in most textbooks, "who discovered the shape of DNA?" you might find the answer "Watson and Crick." This is not the full story.



Photograph 51

Rosalind Franklin (1920-1958) was an English chemist who made the crucial discovery of the shape of DNA. However, Francis Crick, a former colleague who often downplayed Franklin's accomplishments in their lab, got a hold of her unpublished data and Photograph 51, which showed DNA as a set of two strands, coiling around each other in a double helix structure. Using Franklin's photograph and data, Crick published the DNA model with a new colleague Jim Watson. Franklin passed at the age of 37 from ovarian cancer, without any credit to her findings.

Rosalind Franklin



Image(s) Credits: Creative Commons.

Maxmen, A. 2018. Why it's hard to prove gender discrimination in science. Nature. doi: https://doi.org/10.1038/d41586-018-05109-w

Tragically, Franklin was not the first or last woman scientist to be discriminated against and discredited in the field. According to an article published in 2018 by Nature, one of the world's leading journals in science, 45% of doctoral degrees in science, mathematics, and engineering are held by women, but only 30% of senior faculty members at most institutions are women. The fight against gender discrimination is ongoing, which is why it is increasingly important to acknowledge, honor and celebrate women's contributions to society.

Activity Procedure

DNA, or deoxyribonucleic acid, is a chemical structure that determines how all living things will look like and function. A genome is an organism's complete set of genetic instructions. Genes are tiny segments of those instructions to make a protein, which determines specific things such as eye color. A single molecule of DNA looks like a twisted ladder, known as a double helix. The double helix is made up of four amino acids called adenine, thymine, cytosine, and guanine. In a DNA strand adenine and thymine, and cytosine and guanine always pair together.

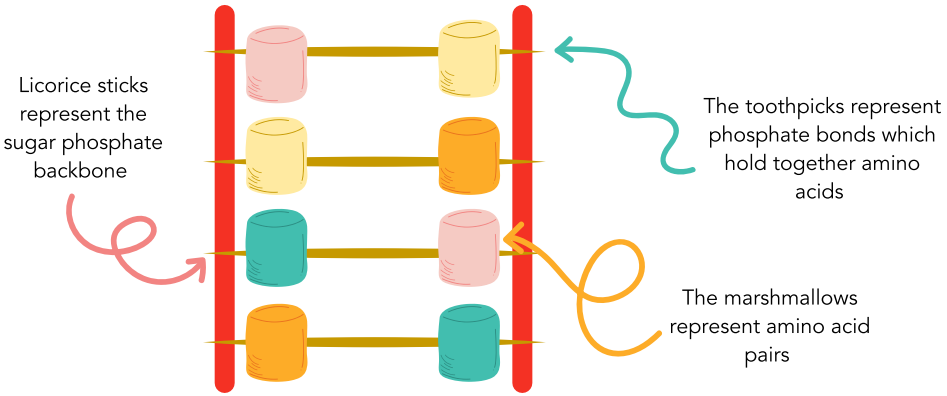
1. Gather your materials. The marshmallows represent the different amino acids in DNA: (A) adenine is green, (T) thymine is pink, (C) cytosine is yellow, and (G) guanine is orange.

2. Pick one of the two sequences.
Sequence 1: TCATGAAACTTA
Sequence 2: TTGACATAGTAG

3. Determine your DNA sequence. A piece of DNA is made up of two sequences that complement each other. (A) always pairs with (T) and (C) always pairs with (G). If your first strand is TAGC, then your second strand will be ATCG. What is the complementary sequence for GATC?_____

4. 1.Each color of marshmallow should correspond with your DNA strands. For example, if your first three amino acids are TCAG, then your marshmallow order should be pink, yellow, green, and orange. Take a stick of licorice and place it on a flat surface. Then place your first marshmallow next to the licorice. Take a toothpick and stick it through the marshmallow and the licorice. Repeat with a second stick of licorice to correspond with the first strand.

5. Now, connect both strands by pushing the marshmallows through the opposite toothpicks. Once the strand is assembled, it should look a lot like a ladder and be flexible. Twist it slightly so that you can see the DNA double helix strand!



6. Share your DNA with us by taking a photo and tagging us at @imasmuseum Instagram and Twitter or @imasmcallen on Facebook. Continue learning about influential women scientists at the Story Collider Podcast, a podcast that tells the story of scientists, engineers and doctors from all over the world.