# **S**cience **C**hallenge - **F**ilm **C**anister **M**ystery

## Introduction

Building models to explain natural phenomena is part of being a scientist. Models can be made to explain things that can be seen. But, sometimes, models are made to explain what is unseen.

In the 1940s and early 1950s, Linus Pauling (chemist), Francis Crick (biologist), and James D. Watson (biologist) were all on a quest to determine the structure and shape of deoxyribonucleic acid - otherwise known as DNA, the genetic material that makes up each organism. DNA is found in the nucleus of cells and, due to its tiny size, DNA's shape is impossible to see with a microscope. At the time, scientists knew what DNA was made of, but they did not know how it was all arranged. In early 1953, Linus Pauling - who, years earlier, had published the alpha helix structure of proteins - published an incorrect triple helix model of DNA. Later in 1953, using X-ray data collected from other scientists studying DNA at the time, Watson and Crick published an article that desribed the discovery of the double helix structure of DNA. Watson and Crick were not the first to publish a model of DNA, but they were the first to connect all the scattered fragments of information gathered from other experiments that were required to produce a successful molecular model of DNA.

## Objective

In this activity, you will predict the contents of a sealed, black film canister by building and testing models of your own.

## Materials

- □ *Black* film canisters (30)
- □ Small, loose items such as: Macaroni, staples, paper clips, thumbtacks, pennies, cotton balls, popcorn kernals, corks, uncooked rice, marbles, nails, q-tips
- □ Tape

## Method

1. Before class, the teacher will fill and seal 15 black film canisters with a combination of small, loose items. These are the mystery canisters.
2. Take a mystery canister, an empty film canister, and 2 of each small, loose item back to your desks.
3. Working with your partner, determine what items are in the mystery canisters without opening the film canister. This can be done by, first, shaking, rolling, tilting, and jostling the sealed film canister and observing what sounds are produced. Record your observations in the table provided.
4. Then, using the empty film canister and the small, loose items, build and test your own sealed film canisters.
5. Compare the sounds made by your film canisters to the mystery canister. Do they sound the same? If not, continue steps 3-5 until both your film canister and the mystery canister do.

## Observations

| **When I...*(describe your interactions with mystery canister)*** | **I hear...*(describe what you hear)*** |
|---|---|
| | |

## Discussion

Using the CER (Claim, Evidence, Reasoning) template, summarize what contents you believe are in the mystery film canister.

Claim: _____

_____

Evidence: _____

_____

_____

_____

_____

Reasoning: _____

_____

_____

_____

_____

_____

## **T**eacher **N**otes

- □ I filled my film canisters with a penny, a paper clip, and a cotton ball.
- □ Fill the canisters with 3 or more objects, but do not fill it up completely. The objects need to be able to move in order for students to hear what's going on inside.
- □ [Extension] If you have time, create 15 different mystery canisters and number each one. You can then have a different challenge for each group.
- □ [Extension] Have students brainstorm what other ways can be used to determine the contents of the flim canister. Suggestions can include the high tech (X-ray) to the low tech (determine by mass of individual items) to the creative (blow it up and see what fragments can be retrieved from the mess). Then, connect student suggestions to real science applications (ie. x-rays are used to determine contents in luggage, mass differential can be used to determine the composition of an object by calculating density, and blowing up objects and analyzing fragments is what is used at CERN to study subatomic particles).