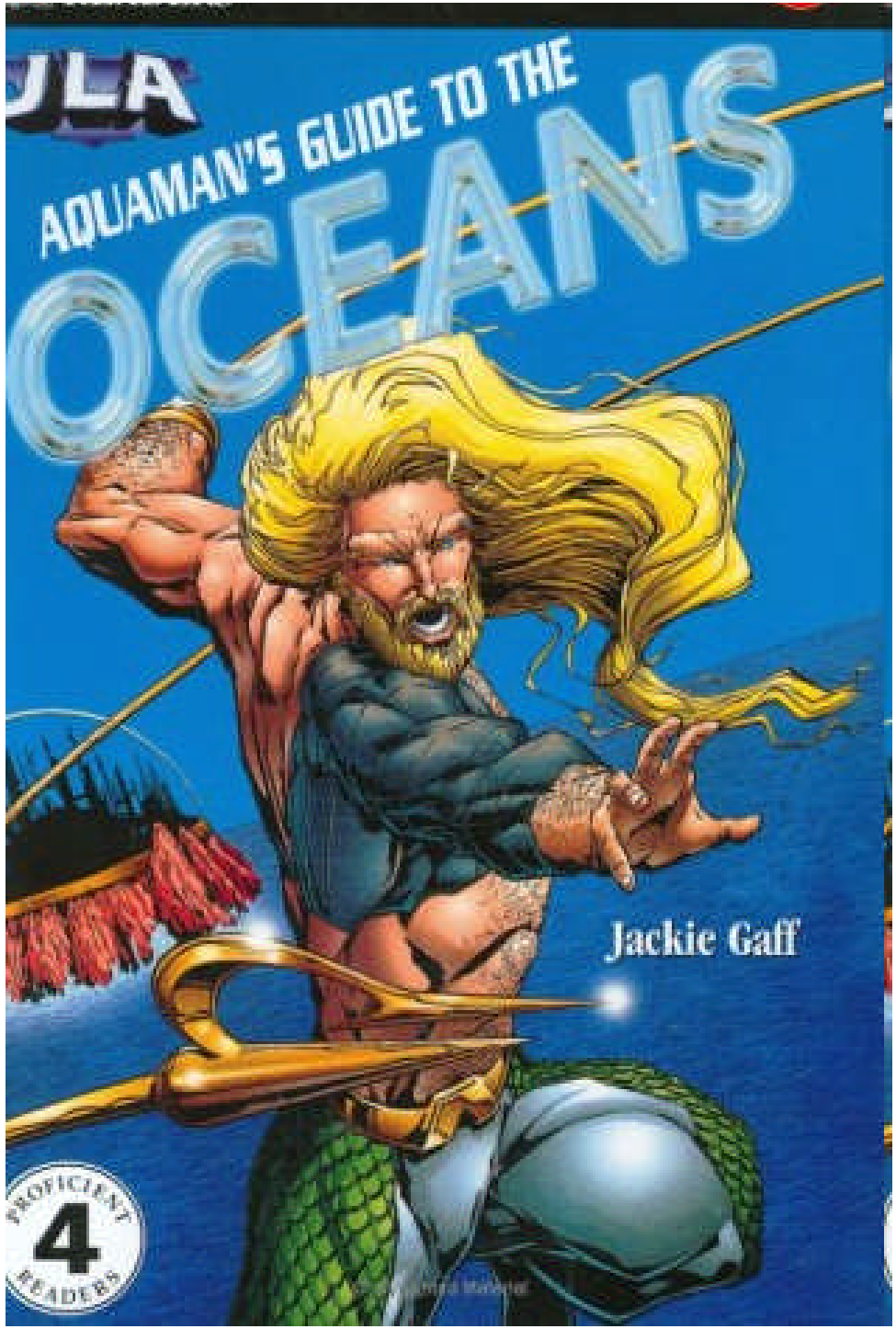
How Scientists Work

Chapter 1.2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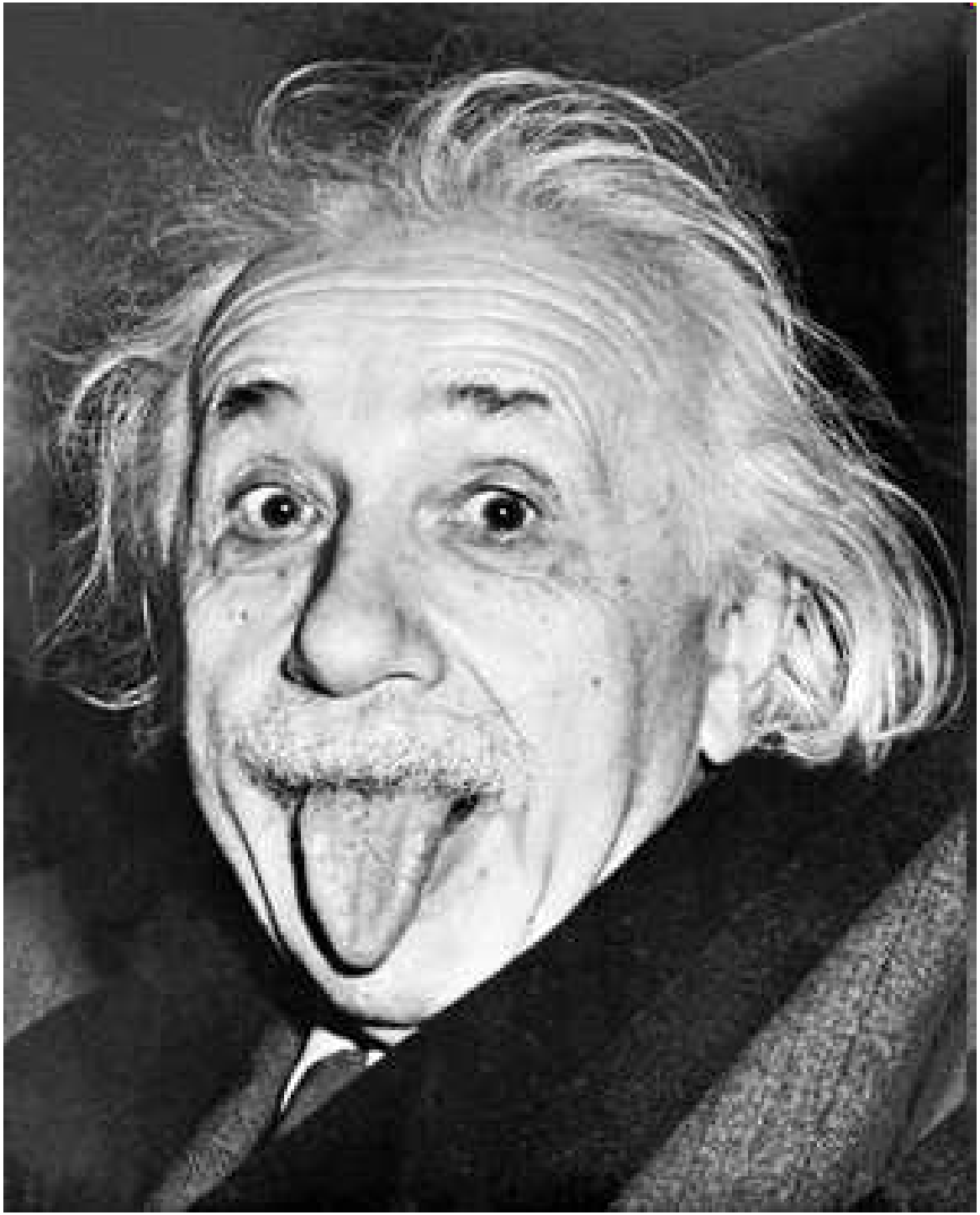
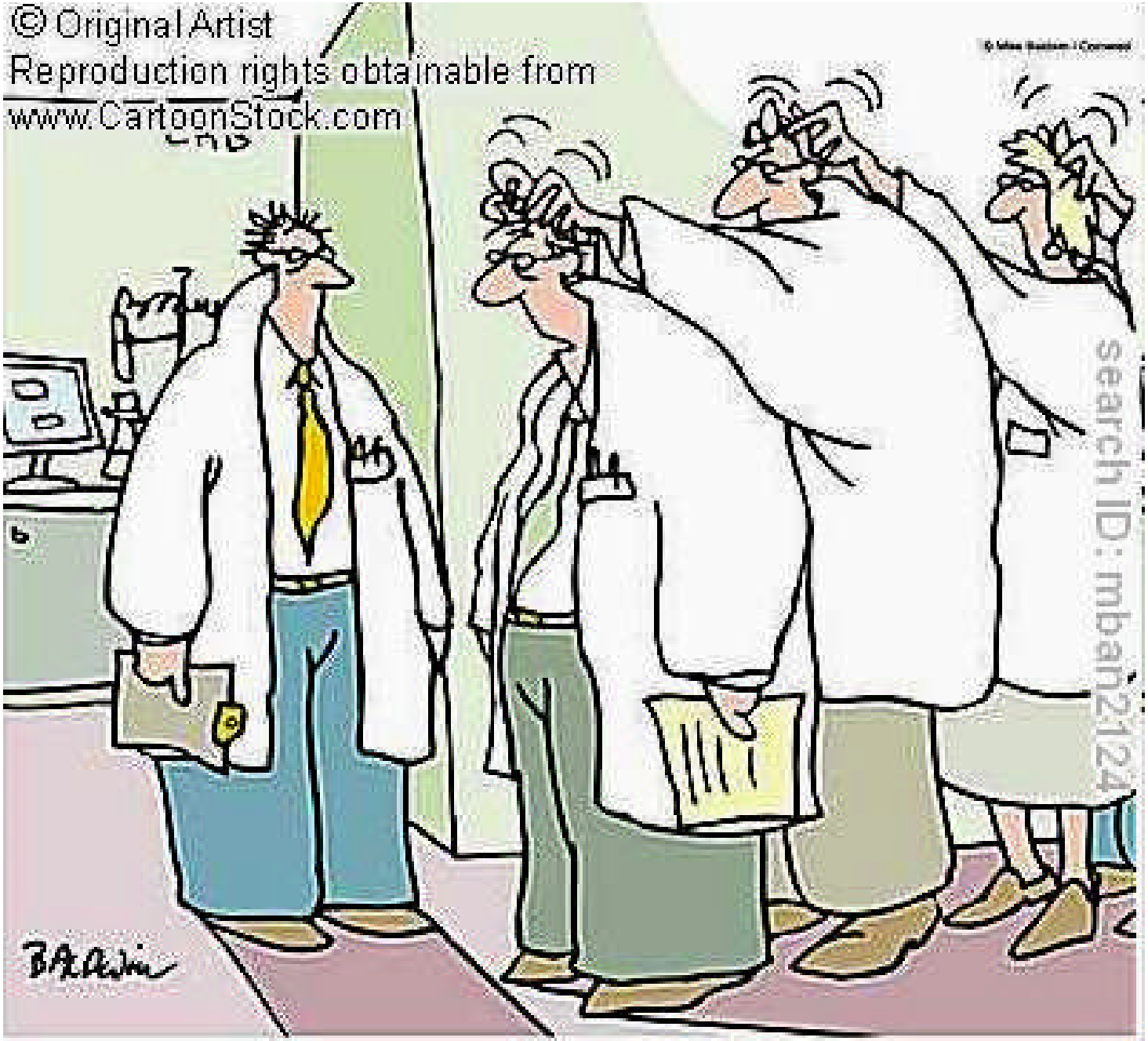
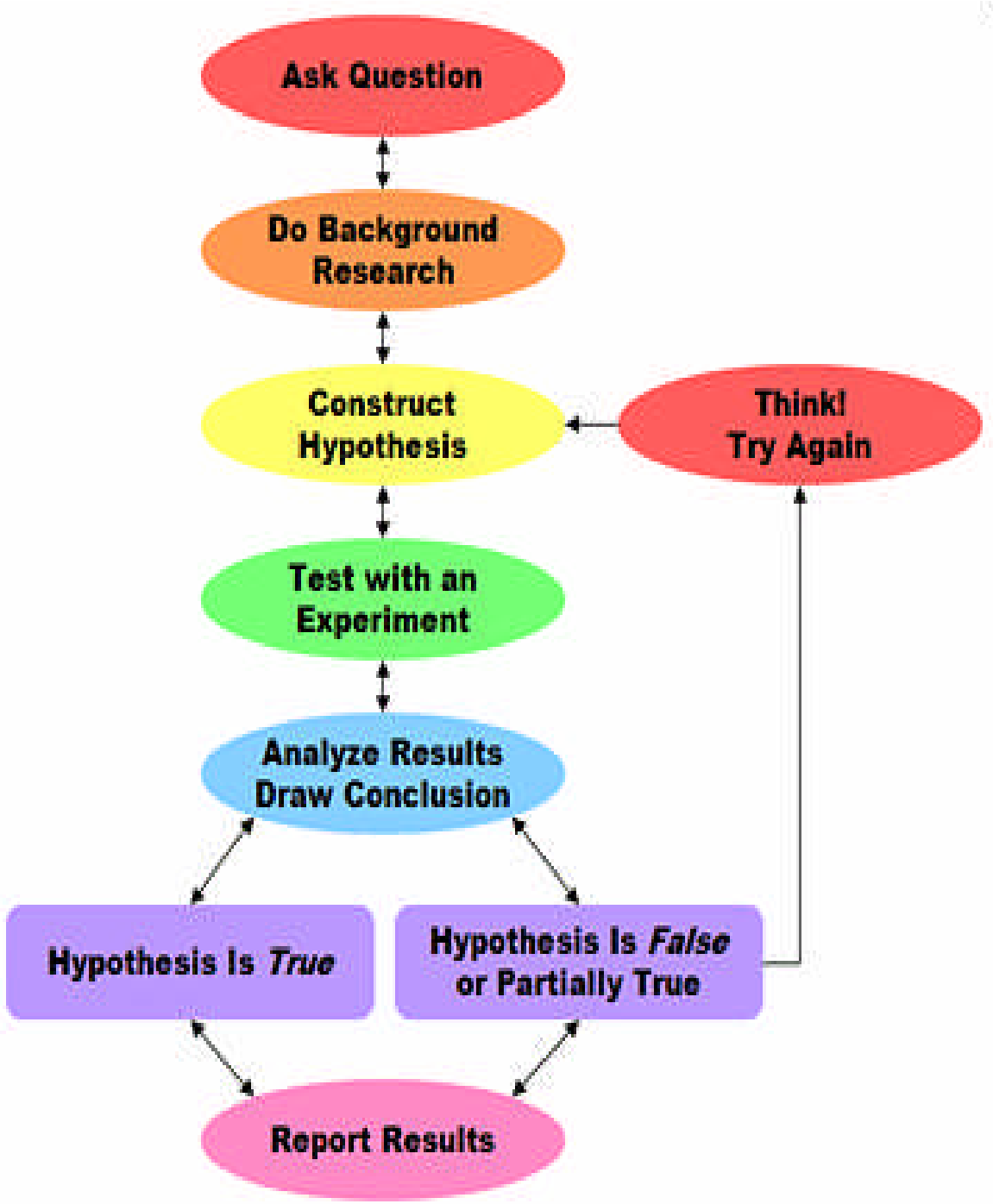




"We were just as surprised by the test results as you. We're still scratching our heads over it."

The Scientific Method(s)



Experimental Design

Controlled Experiments: An experiment where one variable (factor) is changed at a time.

Variables: Factors that can change such as temperature, time, quantity.

Controlled Variables: Factors that are kept the same.

Manipulated (Independent) Variable: The single factor that is changed.

Responding (Dependent) Variable: The factor that you measure.

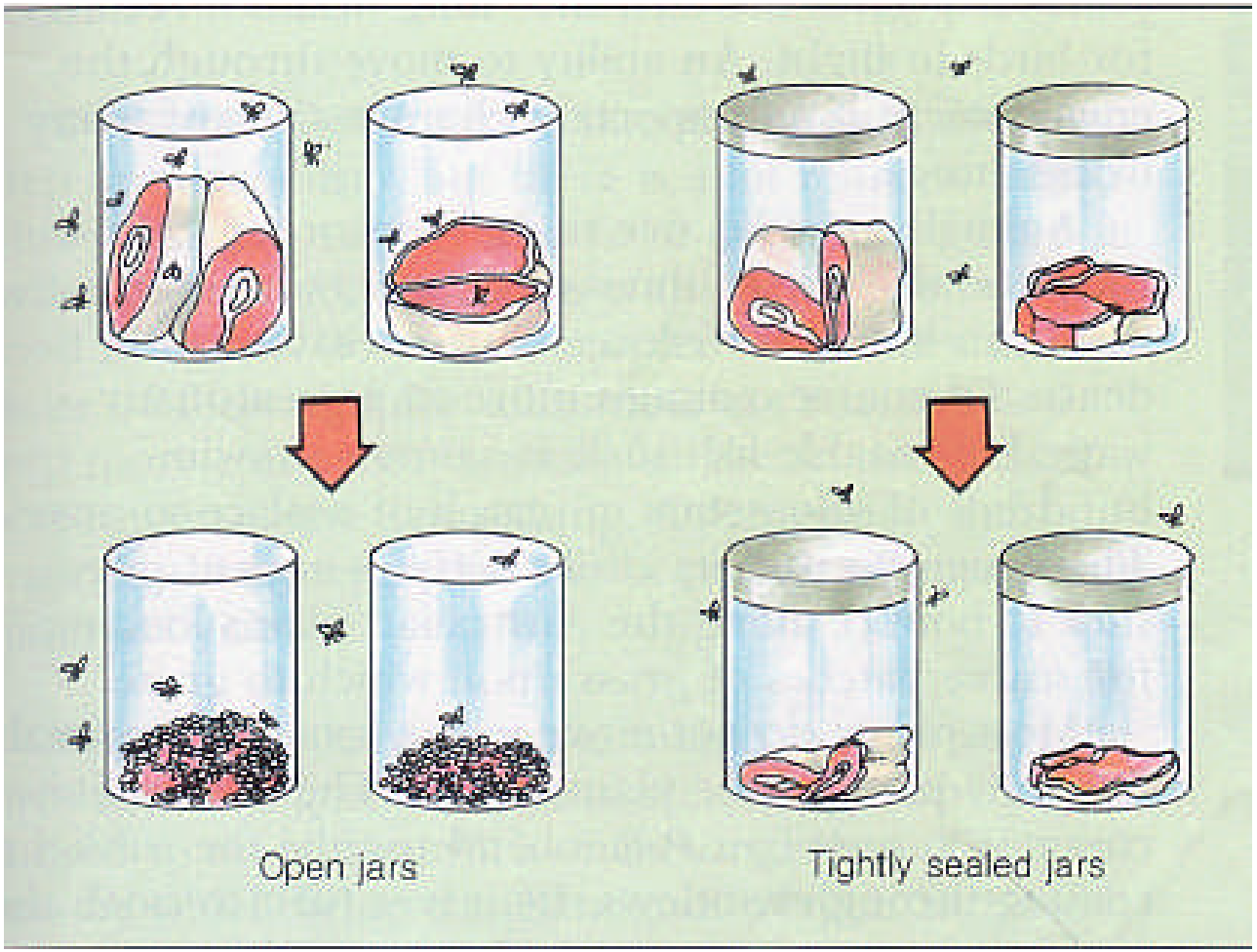
Back in the day…..

Observation: Maggots come from meat, mice come from grain, and beetles come from dung.

Question: Where does life come from?

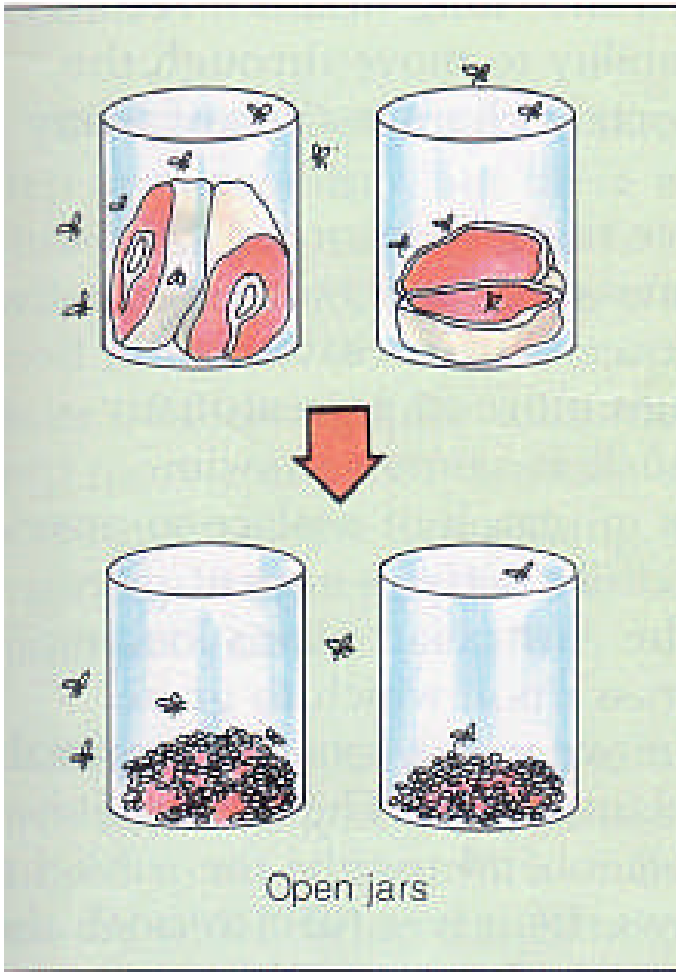
Hypothesis: Life can arise from non-living things. Spontanteous Generation

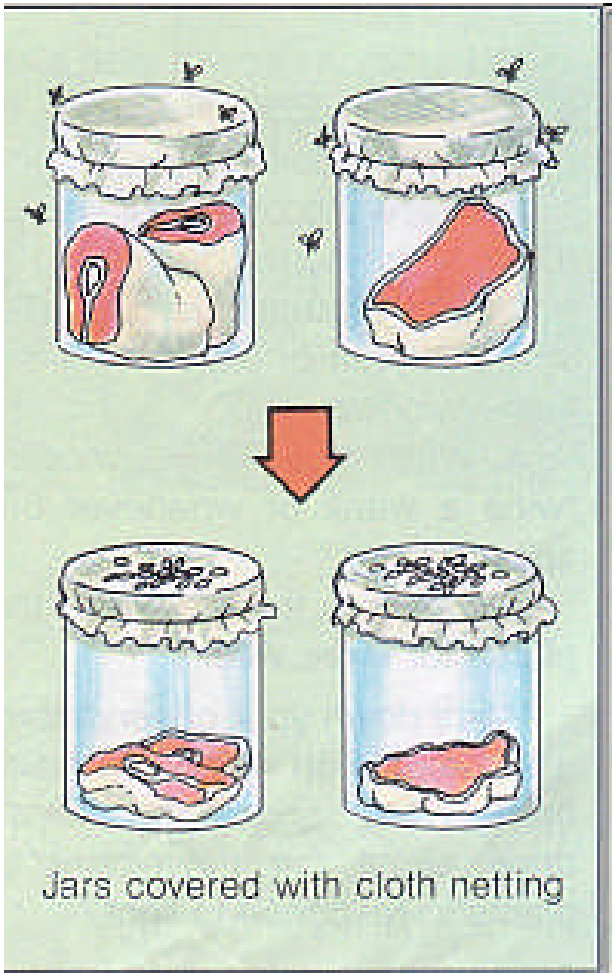
Francesco Redi, 1668



1. Flies with and without access.

2. Jar with fresh air and without fresh air.





Controlled Variables: Temperature, size of meat, exposure to fresh air.

Independent Variable: Flies excluded or not excluded.

Dependent Variable: Maggots or no maggots.

John Needham, 1700s

Believed that “animalcules” arose from spontaneous generation.

To test his hyposthesis, he boiled gravy in a sealed container. After several days the gravy was teeming with life.

Spallanzani

- Didn’t think that Needham cooked his gravy long enough.
- Boiled two flasks of gravy and immediately sealed one of them. The sealed gravy did not grow micro-organisms.
- **Problem:** two variables manipulated.

Pasteur, 1864

- **Found a way to repeat Spallanzani's experiment with only one manipulated variable.**