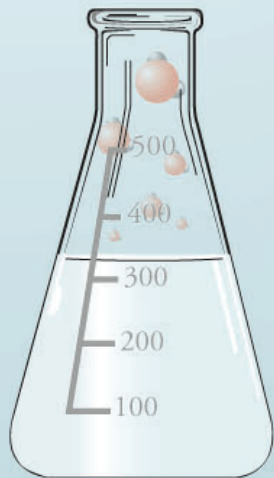


A series of water molecules, each consisting of one red oxygen atom and two black hydrogen atoms, are shown falling from the top left towards a flask. The molecules are arranged in a vertical line, with some appearing to be in motion as they fall.

The Scientific Method

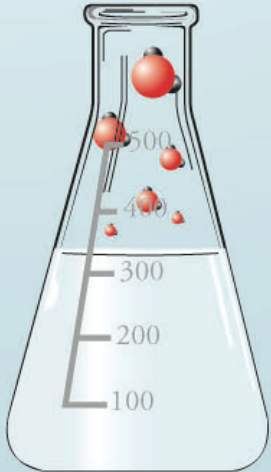
An Introduction to Chemistry

By Mark Bishop



Scientific Method

- No one *correct* way to do science.
- Different scientific disciplines have developed different procedures.
- Different scientists approach their pursuit of knowledge in different ways.
- Certain characteristics in common



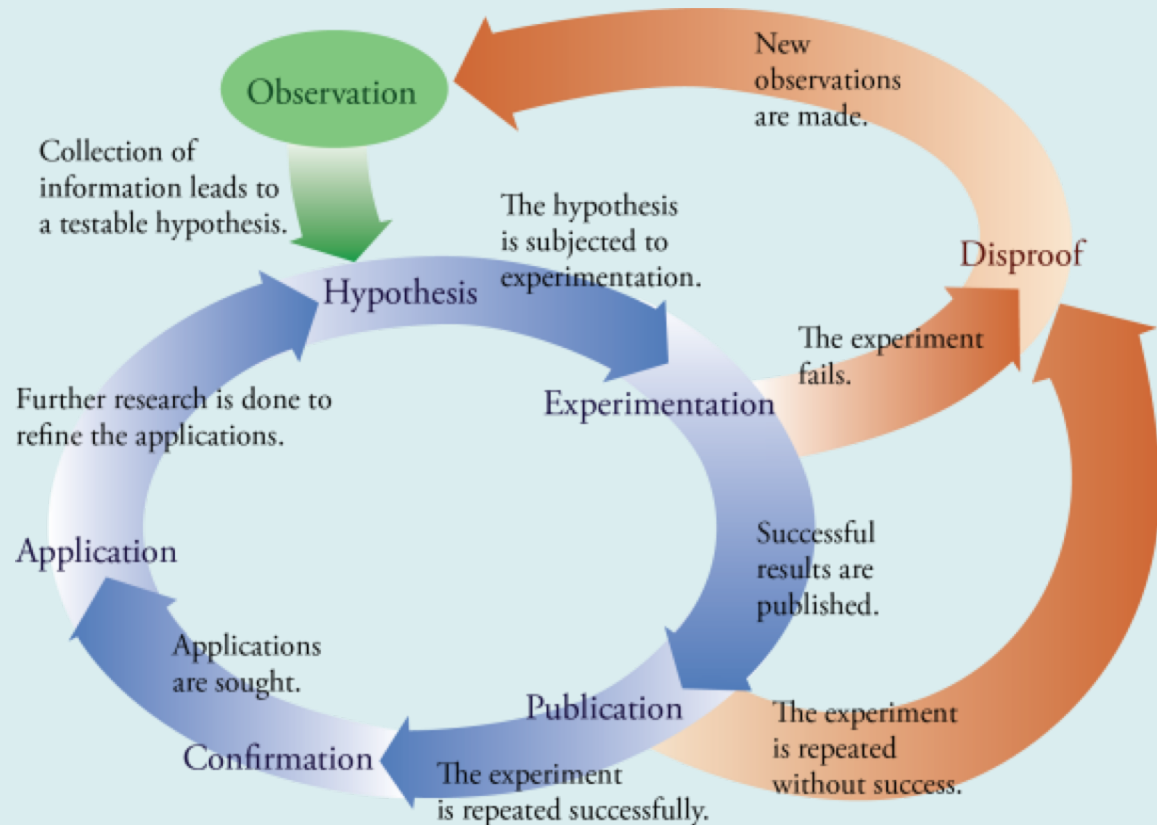
Parkinson's Disease

- Degenerative disorder of the central nervous system
- Shaking, rigidity, slowness of movement and difficulty walking
- Thinking and behavioral problems may arise later.
- Most cases occur after the age of 50



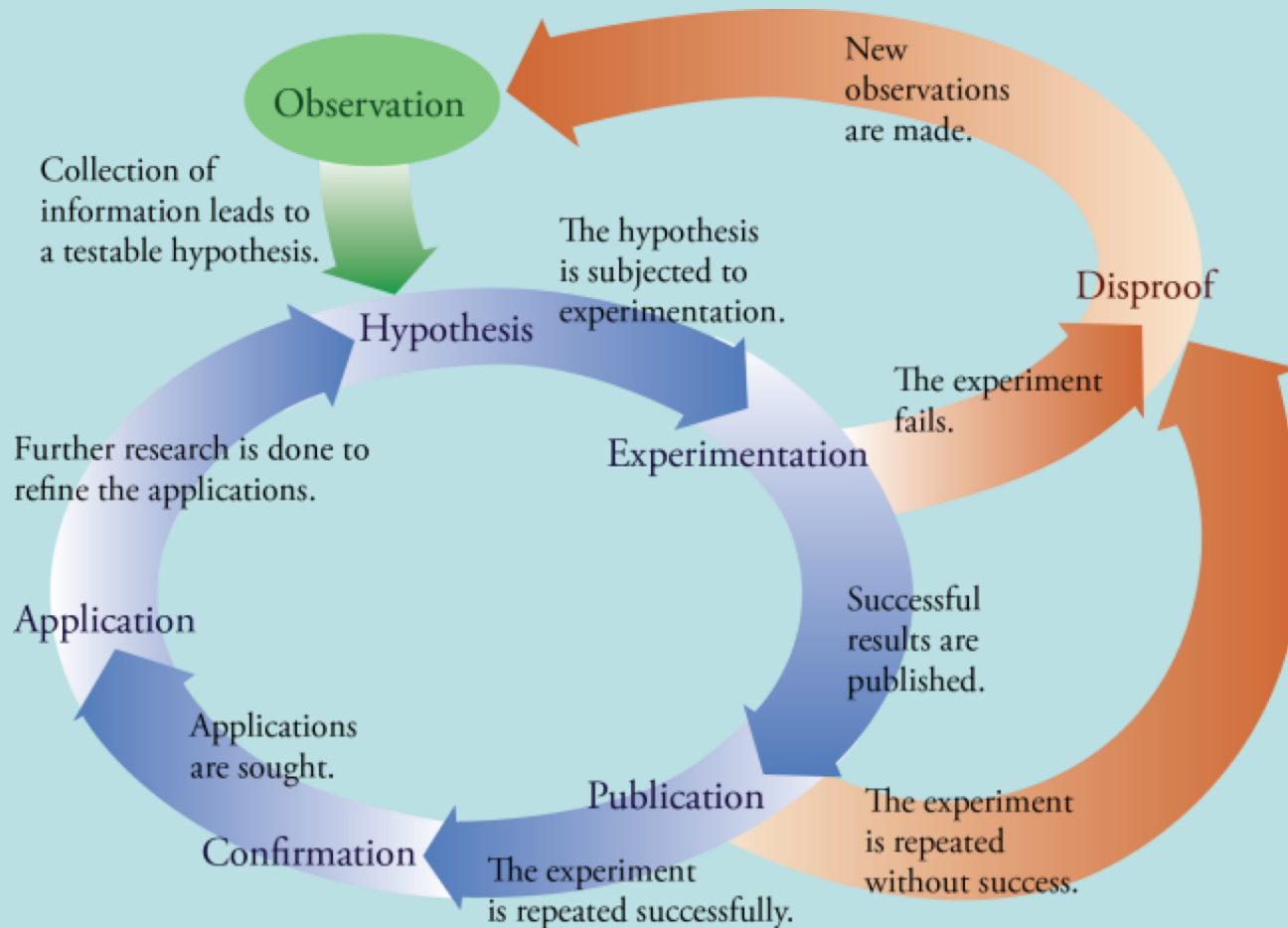
Scientific Method Steps

- Observation and the collection of data
 - 1960's: scientists observed that South American manganese miners were developing symptoms similar to the muscle tremors and rigidity seen in Parkinson's disease



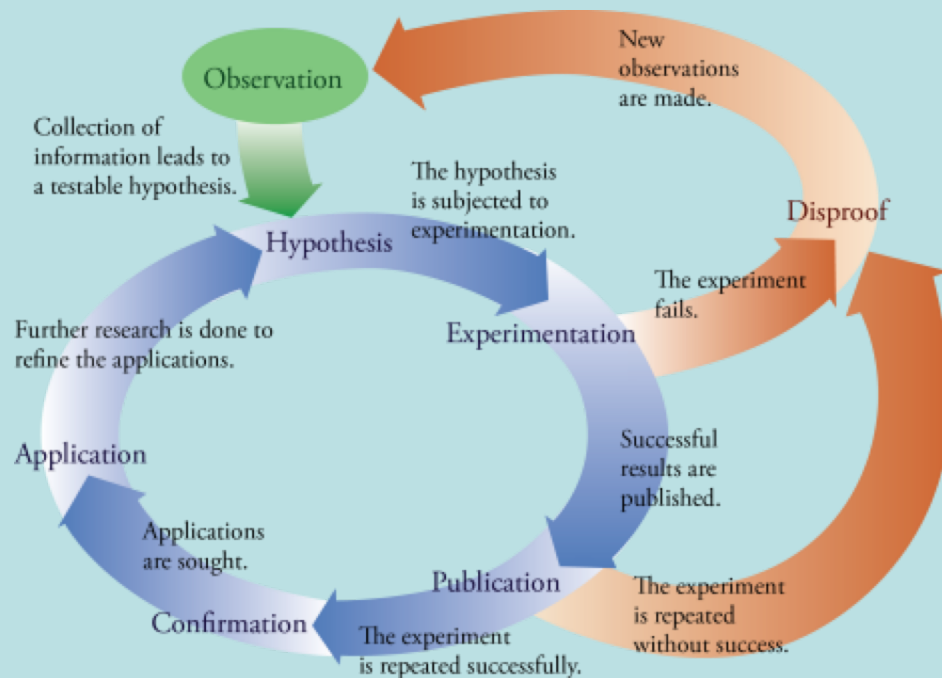
Scientific Method Steps

- Initial hypothesis based on the observations
 - The symptoms of the manganese miners and of Parkinson's sufferers had a common cause.



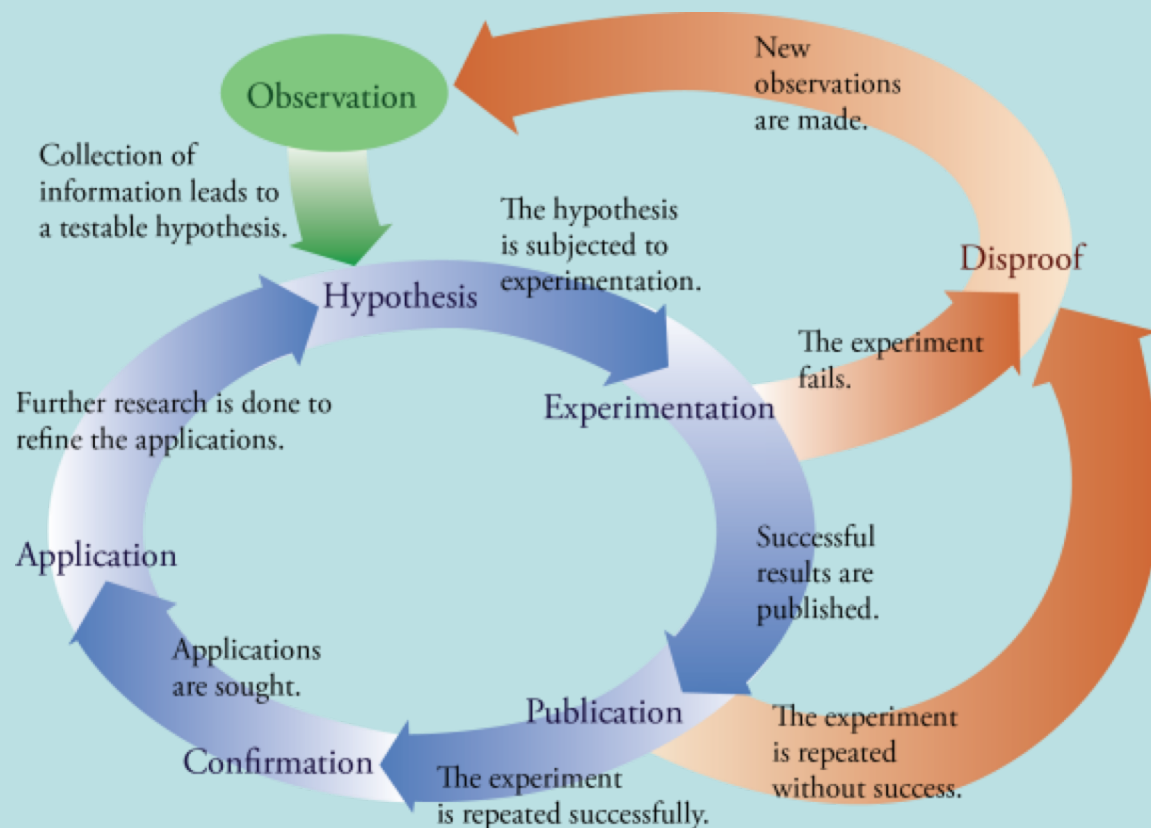
Scientific Method Steps

- Systematic research or experimentation
 - Found that manganese interferes with a brain chemical called dopamine, which is important in the brain's control of muscle function.
 - Absorbing abnormally high levels of manganese would be expected to lead to troubles with movement.



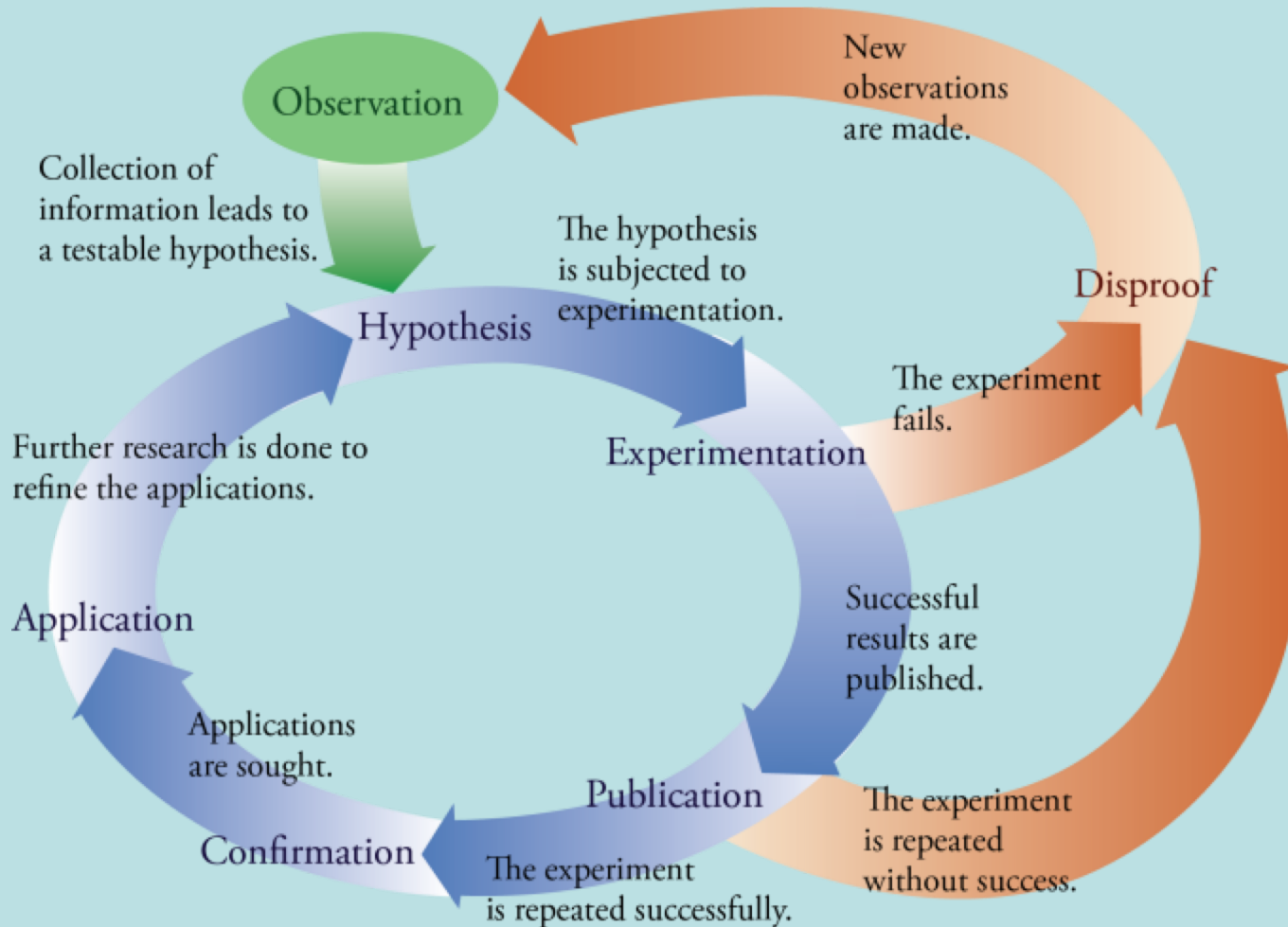
Scientific Method Steps

- Hypothesis refined
 - Researchers hypothesized that the brains of Parkinson's sufferers had low levels of dopamine.
 - Brain studies showed this to be the case.



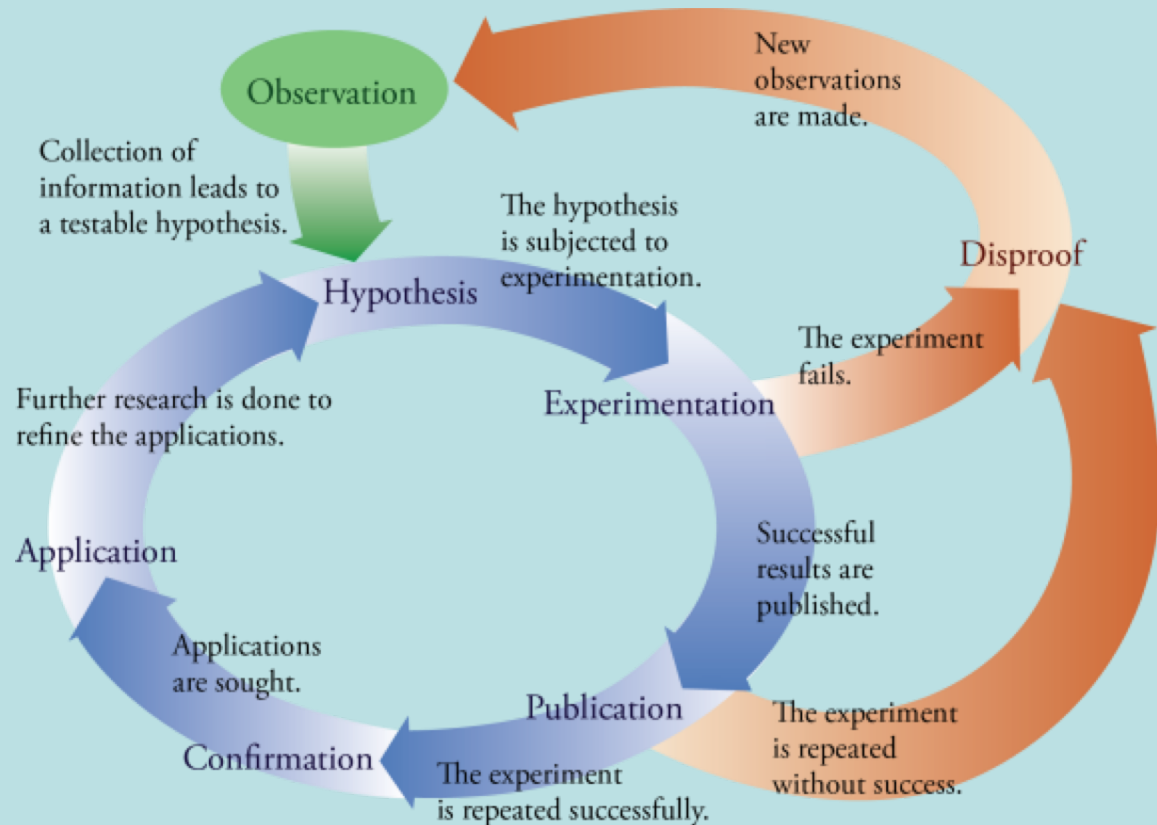
Scientific Method Steps

- Results published



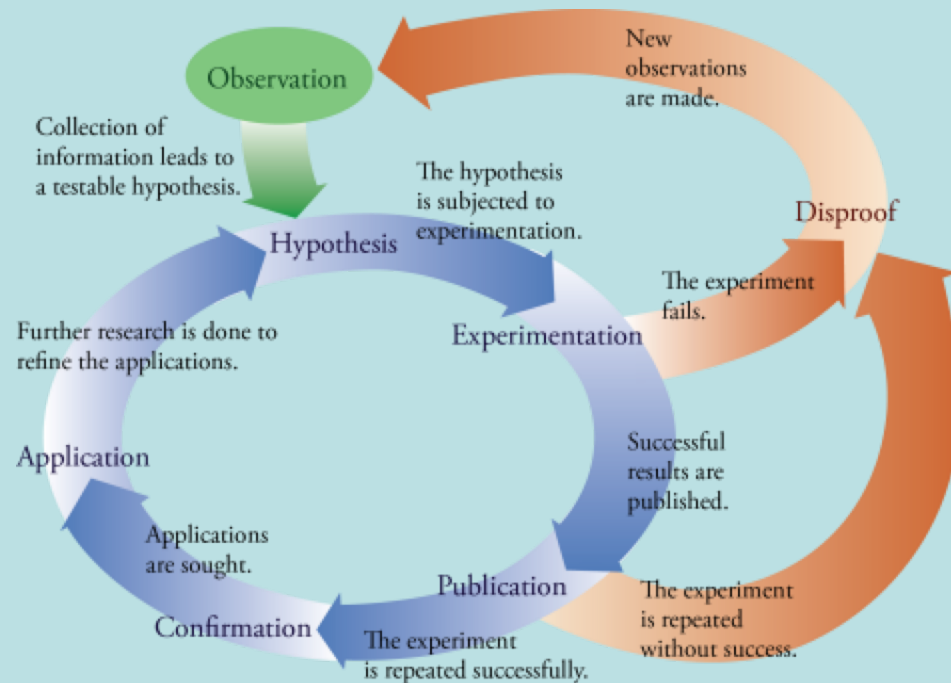
Scientific Method Steps

- Other scientists repeat research and confirm or refute conclusions
 - Other scientists confirmed the results of the dopamine research



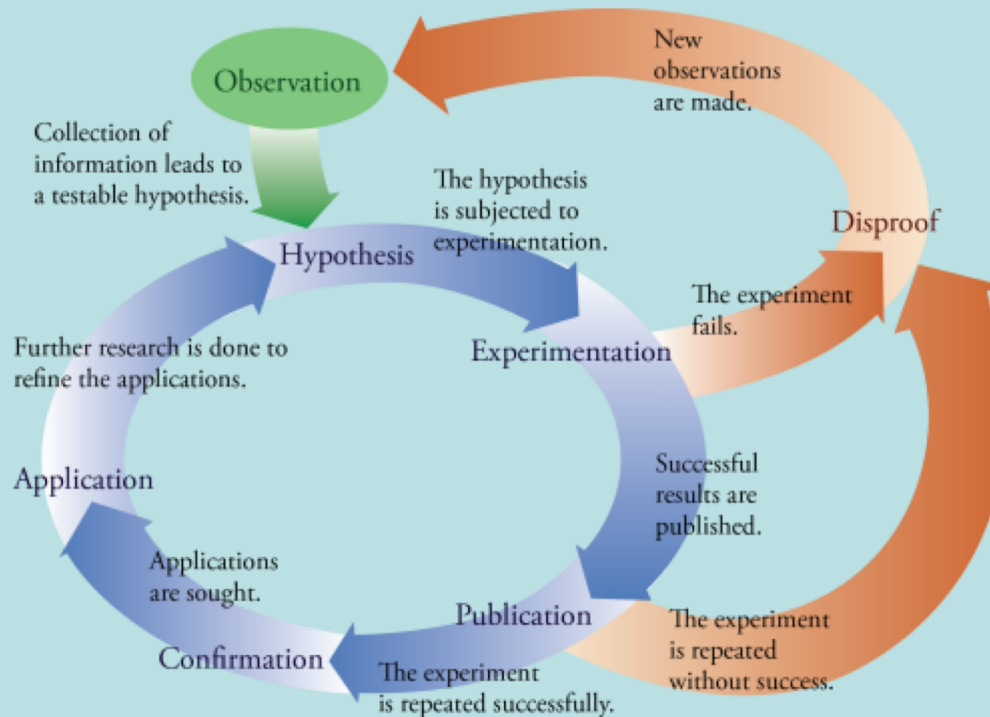
Scientific Method Steps

- Search for useful applications
 - Dopamine unable to pass from the blood stream into the brain tissue.
 - Researchers looked for a compound that could penetrate into the brain and then be converted into dopamine. Levodopa, or L-dopa, met these requirements.



Scientific Method Steps

- Development of applications often leads to another round of hypothesizing and testing to refine applications
 - Side effects, including nausea, gastrointestinal distress, reduced blood pressure, delusions, and mental disturbance.
 - The drug's effects on blood pressure seem to be caused by the conversion of L-dopa to dopamine outside the brain. L-dopa is now given with levocarbiodopa, which inhibits that process.



Scientific Method Steps

- And the cycle continues

