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
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• 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
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- Initial hypothesis based on the observations
  - The symptoms of the manganese miners and of Parkinson’s sufferers had a common cause.
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• 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.
• Hypothesis refined
  – Researchers hypothesized that the brains of Parkinson’s sufferers had low levels of dopamine.
  – Brain studies showed this to be the case.
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- Results published
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• Other scientists repeat research and confirm or refute conclusions
  – Other scientists confirmed the results of the dopamine research
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• 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.
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• 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 levocarbidopa, which inhibits that process.
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• And the cycle continues