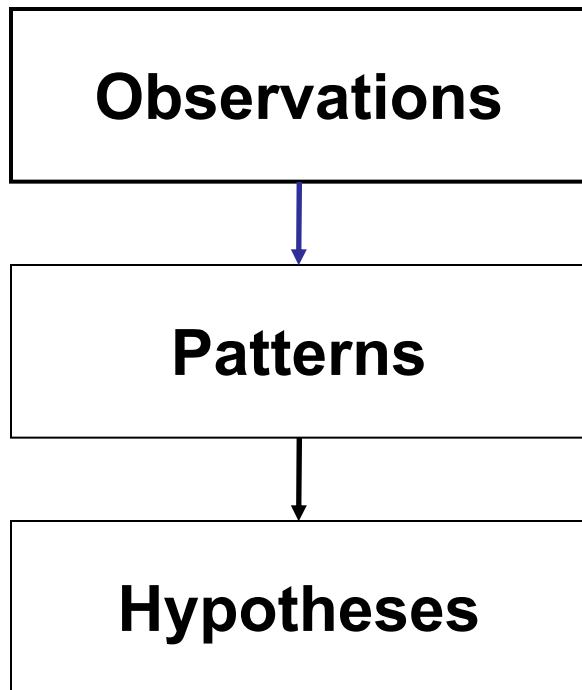
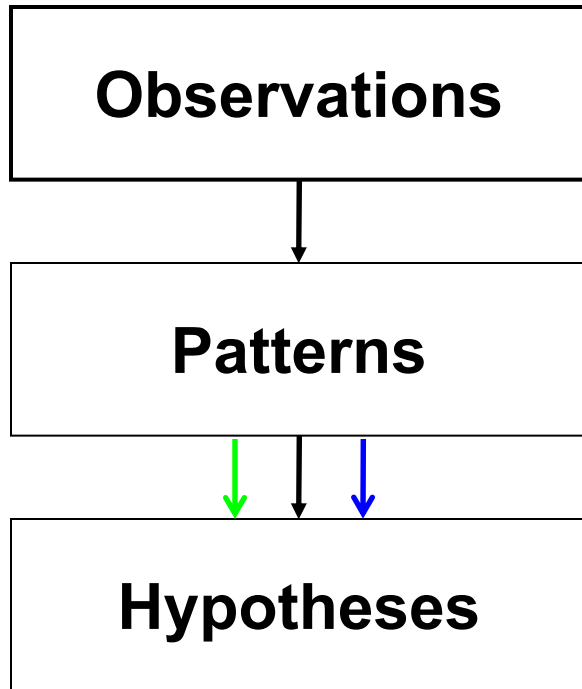


# Traditional (Common Sense) Method



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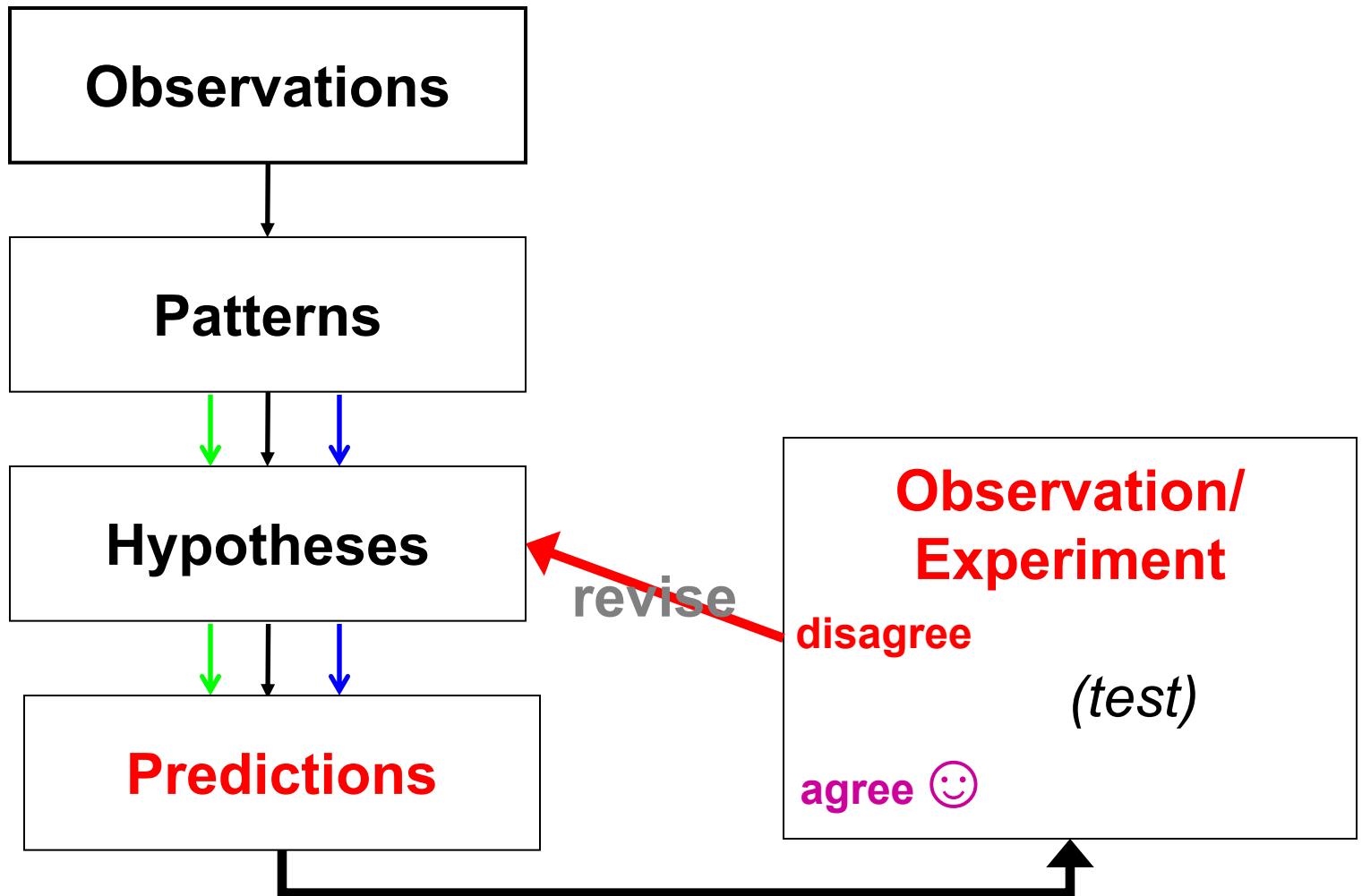


# Elmhurst College

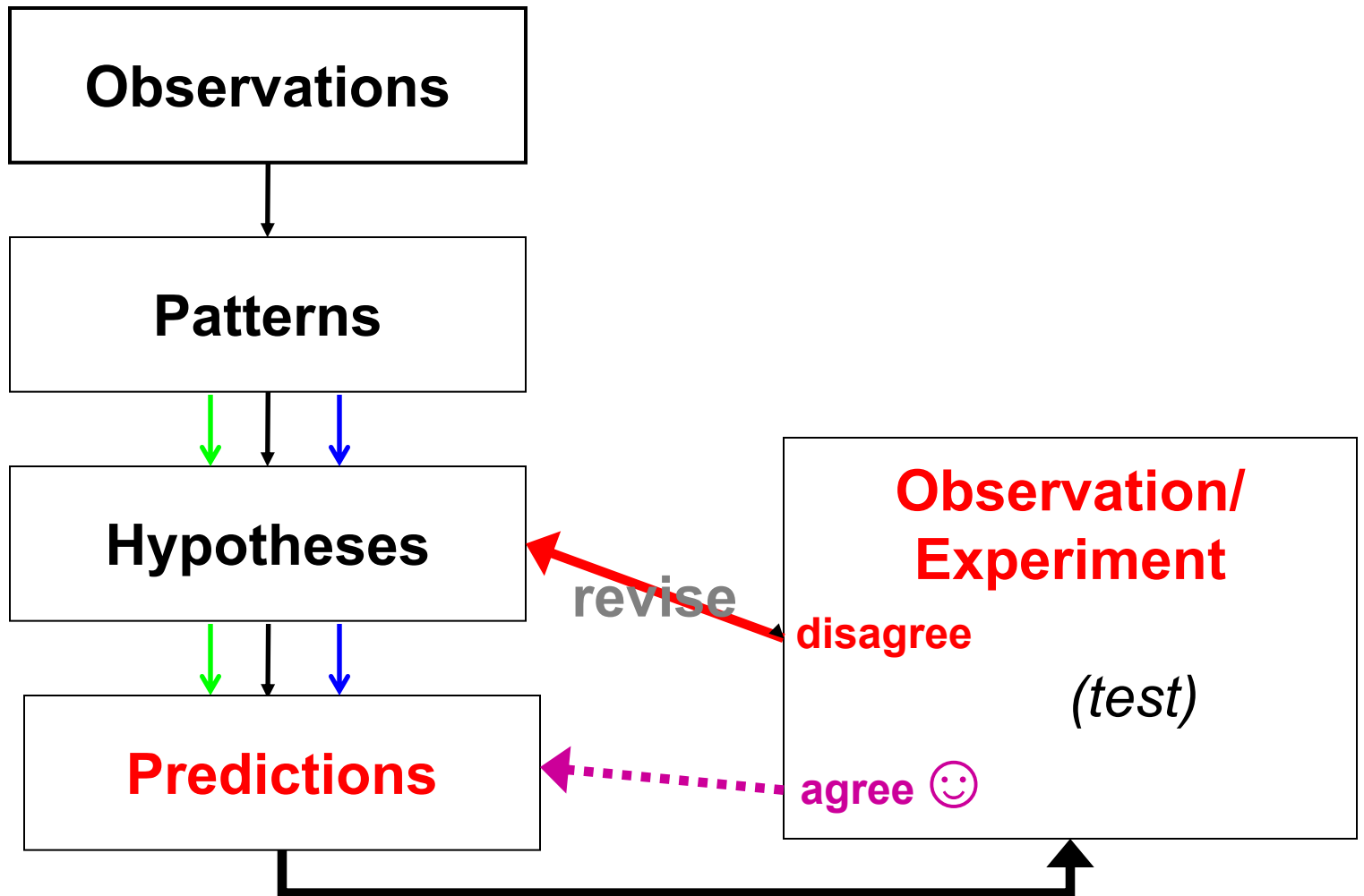
## Development of Cosmology

Observations	Ideas
<p>Stars move together Circular motion during night Fixed North star - axis</p>	<p>Stars attached to giant “crystalline” sphere Earth at the center Uniform rotation of sphere → <b>ALL move together in circles about earth</b></p>
<p>A few wanderers (5 “planets” + sun &amp; moon)</p>	<p>7 more spheres Different uniform rate for each new sphere → <b>UNIFORM rate for each planet</b></p>
<p>Planets loop back and then catch up  (“retrograde motion”)</p>	<p>Several nested spheres with tilted axes for each planet → <b>each planet at CONSTANT distance from earth</b></p>
<p>Planets are brighter during retrograde motion</p>	<p>Large circle centered on earth (deferent) Smaller circle with center on large one (epicycle) Epicycle moves uniformly around deferent. Planet moves uniformly around epicycle. Lock motions of planets together → <b>Intrinsic (“natural”) explanation of brightness variation</b> → <b>Calculations of positions</b></p>
<p>Position calculations <b>don’t</b> match measurements well</p>	<p>Put epicycles on epicycles (80) Displace center of deferent Uniform motion about yet another point (equant) → <b>Detailed position calculations ....</b> [Arbitrary size, lots of parameters to be “tuned,” different versions emerge]</p>

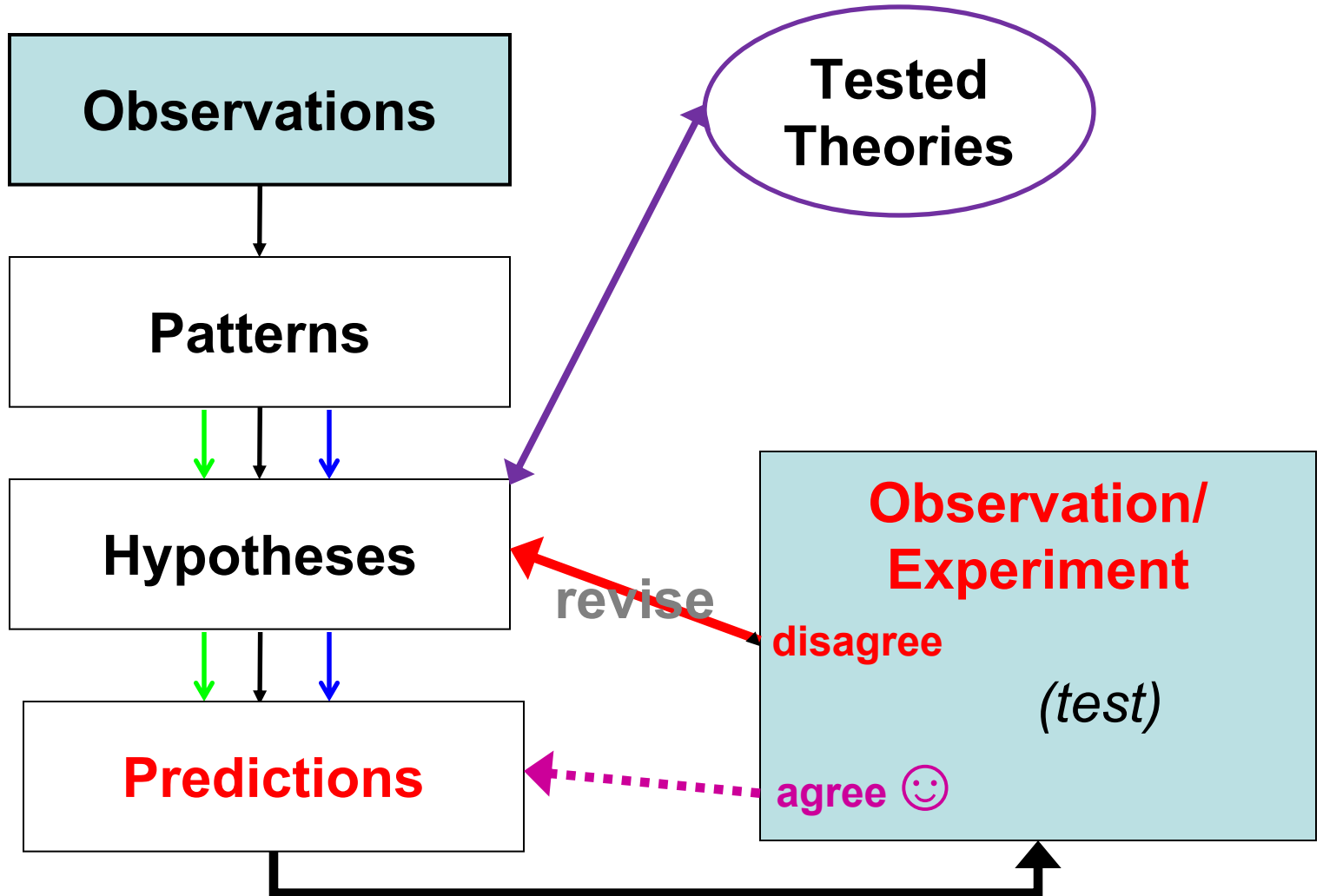
# Scientific Process



# Scientific Process



# The Scientific Process



The aim of science is not to open the door to everlasting wisdom, but to set a limit on everlasting error.

– Bertolt Brecht  
in *The Life of Galileo*

We are trying to prove ourselves wrong as quickly as possible, because only in that way can we find progress.

– Richard Feynman

Extraordinary claims require extraordinary evidence.

– Carl Sagan





