

$$[Y_{\text{new}}, \underline{\theta}, \underline{y}] = [Y_{\text{new}}, \underline{\theta} | \underline{y}] [\underline{y}]$$

$$\propto [Y_{\text{new}}, \underline{\theta} | \underline{y}]$$

$$[Y_{\text{new}}, \underline{y}, \underline{\theta}] = [Y_{\text{new}} | \underline{y}, \underline{\theta}] \underbrace{[\underline{y} | \underline{\theta}]}_{\text{posterior}} [\underline{\theta}]$$

$$\propto [Y_{\text{new}} | \underline{y}, \underline{\theta}] [\underline{\theta} | \underline{y}]$$

$$[Y_{\text{new}}, \underline{\theta} | \underline{y}] \propto [Y_{\text{new}} | \underline{y}, \underline{\theta}] [\underline{\theta} | \underline{y}]$$

$$[Y_{\text{new}} | \underline{y}] = \int_{\underline{\theta}} [Y_{\text{new}} | \underline{y}, \underline{\theta}] [\underline{\theta} | \underline{y}]$$