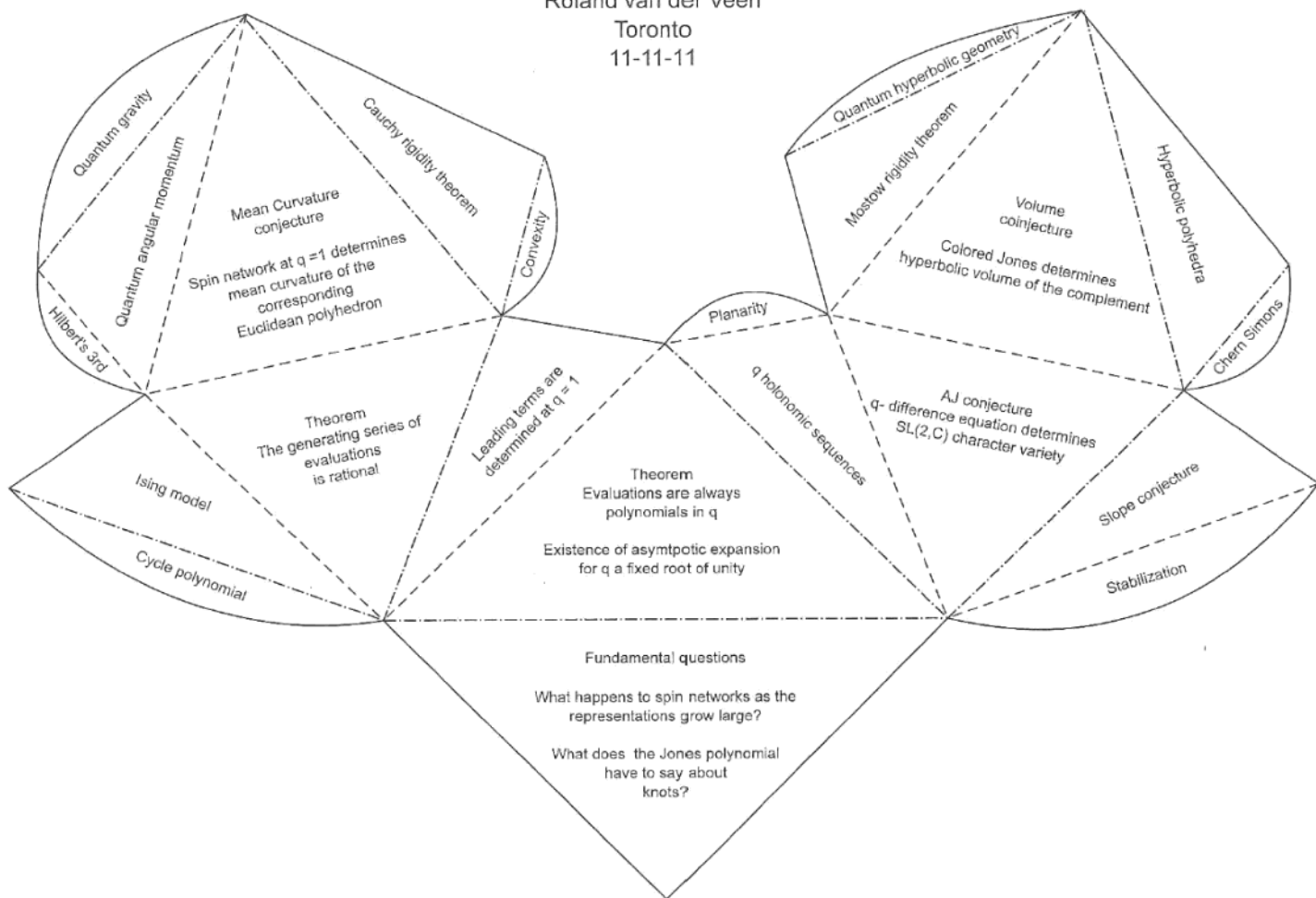


Spin networks

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Def. A spin network is a cubic ribbon graph Γ together with a map $\gamma: E(\Gamma) \rightarrow \mathbb{N}$.
Can be evaluated in the usual way:

$$\gamma_1 = A \left(\text{cup} \right) + A^{-1} \left(\text{cap} \right) \quad \bigcirc = -[2]$$

$$[k] = \frac{A^{2k} - A^{-2k}}{A^2 - A^{-2}}$$

$$\boxed{n+1} = \left| \begin{array}{c} \boxed{n} \\ | \end{array} \right. + \frac{[n+1]}{[n+2]} \left(\begin{array}{c} \boxed{n} \\ | \\ \boxed{n} \end{array} \right) \quad \boxed{1} = \left| \begin{array}{c} | \\ | \end{array} \right.$$

+ the usual planar vertex rules:

