**What is it good for?**

1. Cutting necks:

   \[ 2 \leadsto \] \hspace{1cm} \[ + \] \hspace{1cm} \[ = \] \hspace{1cm} \[ + \]

2. Recovers the good old Khovanov theory,

   \[ \mathcal{F}(\otimes) = \epsilon : \{ 1 \mapsto v_+ \} \]

   \[ \mathcal{F}(\otimes) = \eta : \{ v_+ \mapsto 0 \}
   \]

   \[ v_- \mapsto 1 \]

   \[ \mathcal{F}(\otimes) = \Delta : \{ v_+ \mapsto v_+ \otimes v_- + v_- \otimes v_+ \} \]

   \[ v_- \mapsto v_- \otimes v_+ + v_+ \otimes v_- \]

   \[ \mathcal{F}(\otimes) = m : \{ v_+ \otimes v_- \mapsto v_- \}
   \]

   \[ v_+ \otimes v_+ \mapsto v_+ \]

   \[ v_- \otimes v_+ \mapsto v_- \]

   \[ v_- \otimes v_- \mapsto 0 \]

3. Trivially extends to tangles.

4. Well suited to prove invariance for cobordisms.

5. Recovers Lee's theory,

   \[ \Delta : \{ v_+ \mapsto v_+ \otimes v_- + v_- \otimes v_+ \} \]

   \[ v_- \mapsto v_- \otimes v_+ + v_+ \otimes v_- \]

   \[ \mathcal{F}(\otimes) = m : \{ v_+ \otimes v_- \mapsto v_- \}
   \]

   \[ v_+ \otimes v_+ \mapsto v_+ \]

   \[ v_- \otimes v_+ \mapsto v_- \]

   \[ v_- \otimes v_- \mapsto 0 \]

6. Leads to a new theory (over \( \mathbb{Z}/2 \) and with \( \deg h = -2 \)),

   \[ \Delta : \{ v_+ \mapsto v_+ \otimes v_- + v_- \otimes v_+ + hv_+ \otimes v_+ \} \]

   \[ v_- \mapsto v_- \otimes v_+ + v_+ \otimes v_- + hv_- \]

   \[ \mathcal{F}(\otimes) = m : \{ v_+ \otimes v_- \mapsto v_- \}
   \]

   \[ v_+ \otimes v_+ \mapsto v_+ \]

   \[ v_- \otimes v_+ \mapsto v_- \]

   \[ v_- \otimes v_- \mapsto 0 \]

7. Trivially extends to knots on surfaces.

8. Non-trivially recovers Khovanov's \( c \),

   \[ \epsilon : \{ 1 \mapsto v_+ \} \]

   \[ \eta : \{ v_+ \mapsto 0 \}
   \]

   \[ v_- \mapsto -c \]

   \[ \Delta : \{ v_+ \mapsto v_+ \otimes v_- + v_- \otimes v_+ + cv_- \otimes v_- \} \]

   \[ v_- \mapsto v_- \otimes v_+ + cv_+ \otimes v_- \]

   \[ \mathcal{F}(\otimes) = m : \{ v_+ \otimes v_- \mapsto v_- \}
   \]

   \[ v_+ \otimes v_+ \mapsto v_+ \]

   \[ v_- \otimes v_+ \mapsto v_- \]

   \[ v_- \otimes v_- \mapsto 0 \]

(Added June 29, 2004: what appeared to work didn’t quite. The recovery of Khovanov’s \( c \) remains open).

"God created the knots, all else in topology is the work of man."

Leopold Kronecker (modified)

URL: http://www.math.toronto.edu/~drorbn/papers/Cobordism (and see the ‘‘GWU’’ handout)