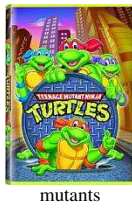
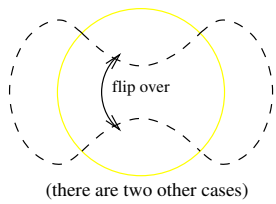


High altitude low oxygen proof of **Invariance under knot mutations.**

Assume "flip over" mutation and connectivity as shown.

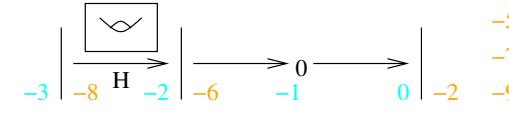


**The work of Green.**

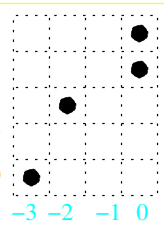
standard data:



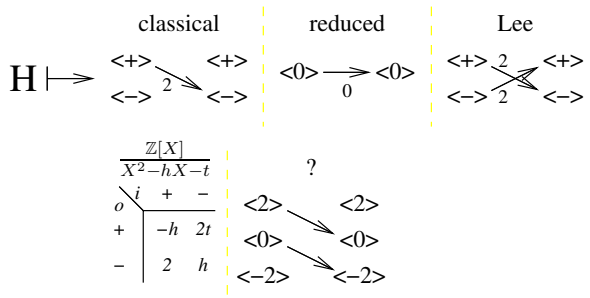
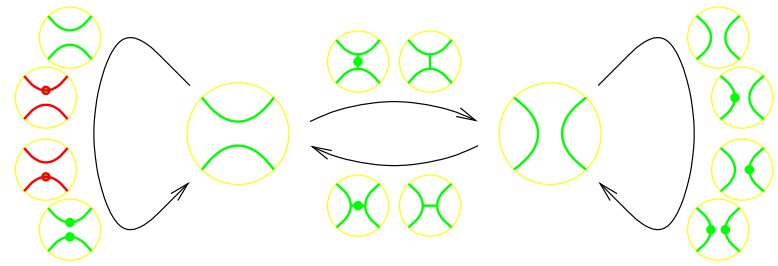
The universal invariant of the left-handed trefoil is



(and the invariant of the 48 crossing T(8,7) is computable in minutes...)

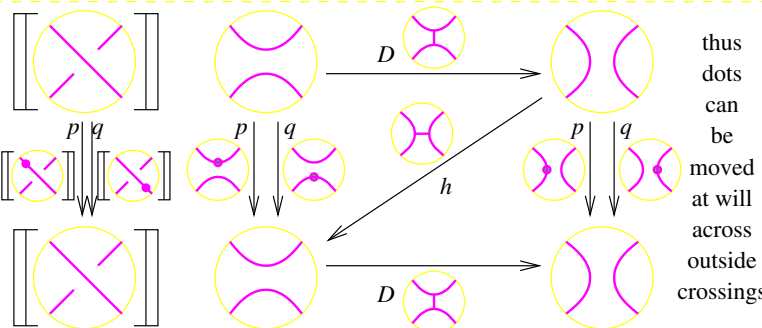


**The Inside Story.** After delooping, all that remains is in



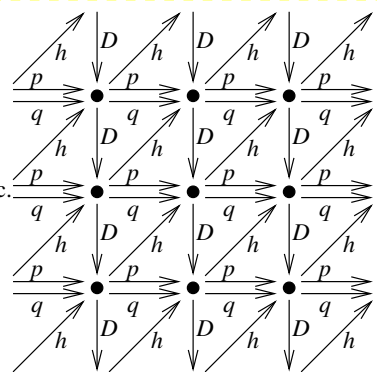
(Lee's spectral sequence and Rasmussen's invariant also recoverable)

**The Outside Story**



**Inside meets Outside.**

**Theorem.** If two horizontal differentials p and q are homotopic relative to the vertical differential D, and the homotopy h commutes with p and q, then the two double complexes involved are isomorphic.

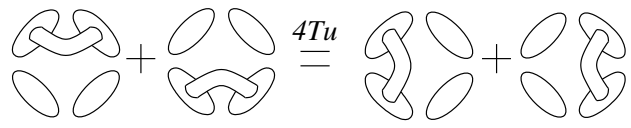


**Old techniques:**

Many computers, long time, no counterexample.

**4Tu**

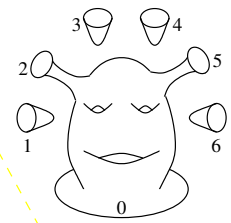
Replaces G and NC.



**The work of Naot.**

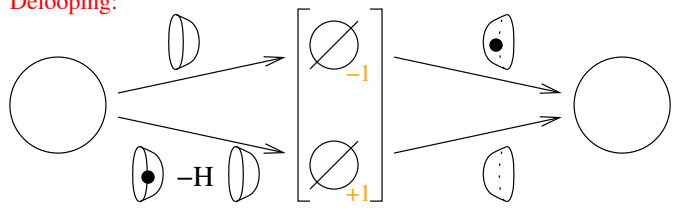
<surfaces>/4Tu is freely generated by Shrek surfaces

A Shrek surface with 7 boundaries (one distinguished), 3 handles and 2 tubes



Let ● denote a tube to the distinguished component (the curtain), and let H denote a handle on the curtain. Then

**Delooping:**



... so the invariant is valued in complexes over a category with just one object and morphisms in  $Z[H]$ ; all is graded and  $\deg H = -2$ .