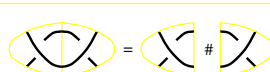
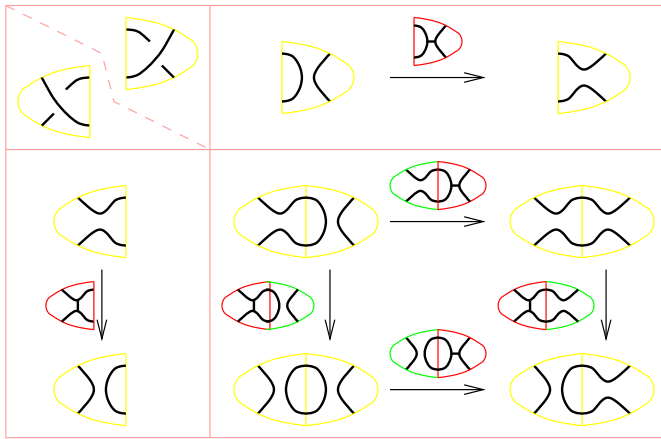


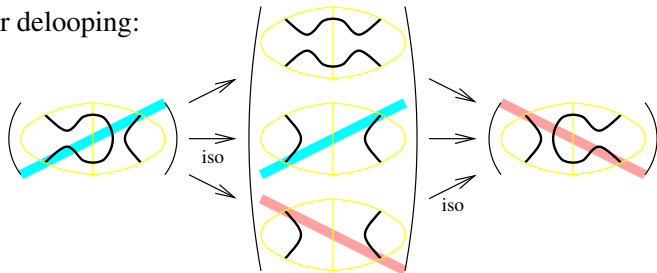
# Computations and Mutations



## Invariance under R2.

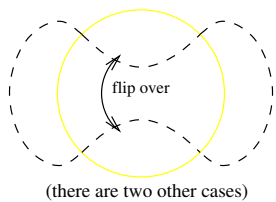


After delooping:

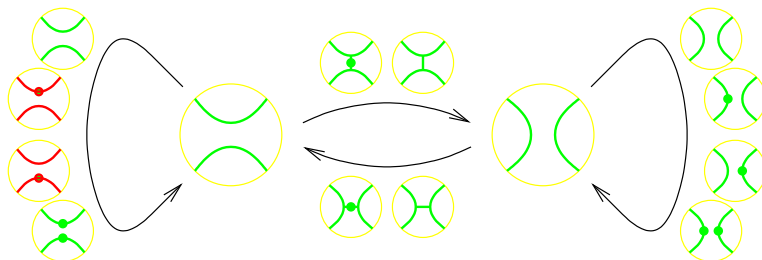


High altitude low oxygen proof of **Invariance under knot mutations.**

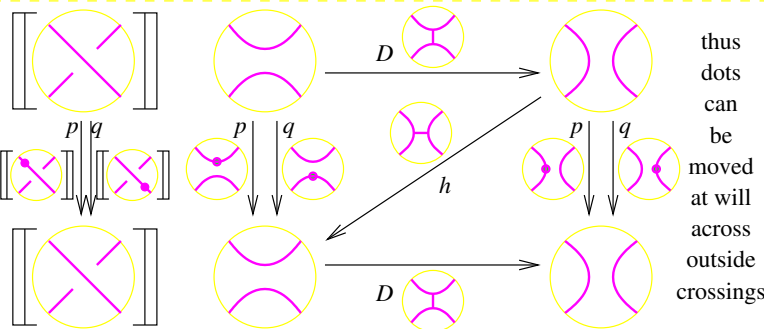
Assume "flip over" mutation and connectivity as shown.



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



The Outside Story



thus dots can be moved at will across outside crossings

## Inside meets Outside.

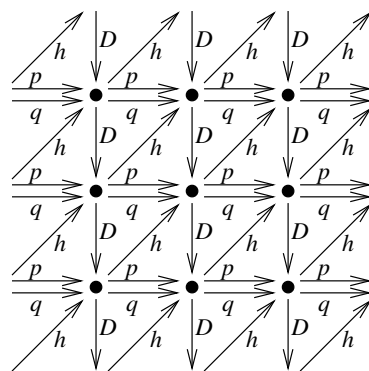
**Theorem.** If two horizontal differentials are homotopic relative to the vertical differential, the two double complexes obtained are isomorphic.

D p q p,q h

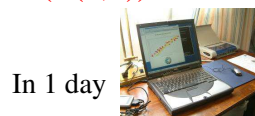
Old techniques: Many computers, long time, no counterexample.



Snowbird, Utah



## Kh(T(7,6)).



says



Old techniques:

~1,000 years,  
~1GGB RAM.

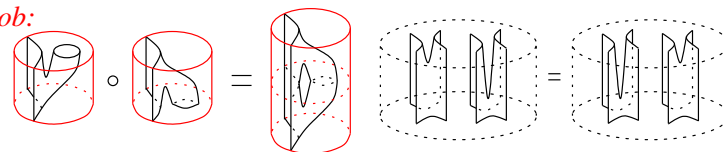
$\dim_j H_r$  is given by:

$j \setminus r$	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
57																				1	1
55																				1	1
53															1	2			1	1	
51														1	1	2			1	1	
49														3	1				1		
47														3	1	1					
45													2	1	2						
43									1	1	2										
41						1	1	2													
39					1	1	1														
37			1	1																	
35				1																	
33			1																		
31	1																				
29	1																				

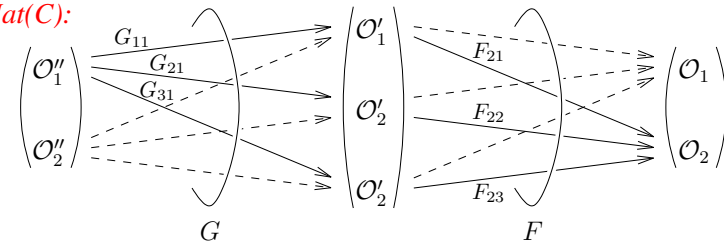
the alternating knots zone

## More formulas.

**Cob:**



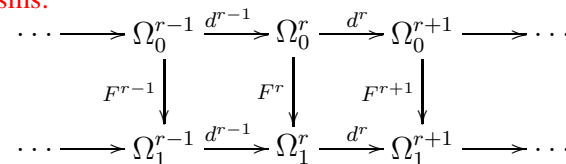
**Mat(C):**



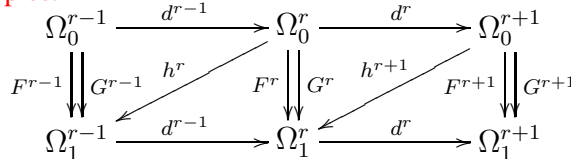
## Complexes:

$$\Omega = (\Omega^{-n} \longrightarrow \Omega^{-n+1} \longrightarrow \dots \longrightarrow \Omega^n)$$

## Morphisms:



## Homotopies:



$$F^r - G^r = h^{r+1}d^r + d^{r-1}h^r$$

**Conjecture:** (I. Frenkel, though he may disown this version)

1. Every object in mathematics is the Euler characteristic of a complex.
2. Every operation in mathematics lifts to an operation between complexes.
3. Every identity in mathematics is true up to homotopy at complex-level.

I. Frenkel



All arrows in an arbitrary additive category!