

# MANY CHEERFUL FACTS

presents

**Dude, where's my title? (Dave, I  
can't think of a title... 'First  
steps in Geometric Invariant  
Theory might be OK' )**

a talk by Tony Varilly

1:10 pm - 2:00 on Wednesday, October 5th, in room  
1015.

A basic question in geometric invariant theory is the following: suppose you have an algebraic variety  $X$  and a group  $G$  acting on it. Is the orbit space  $X/G$  an algebraic variety? Even in some of the simplest cases the answer is no (we'll see an example where  $X/G$  is a line with a double origin), but perhaps there is a variety that is not too far off from  $X/G$ .

These are called ~~cheerful~~ categorical quotients; these objects may not give useful information (many a times the categorical quotient is just a point!), so one may wonder if there are conditions under which the categorical quotient's points are in 1-to-1 correspondence with the set  $X/G$ . When this happens we say the categorical quotient is a geometric quotient. This talk will be a guided tour of examples of categorical and geometric quotients. Along the way, I'll illustrate a few results about these quotients.

I am the very model of a modern Major General,  
I've information vegetable, animal, and mineral,  
I know the kings of England, and I quote the fights historical  
From Marathon to Waterloo, in order categorical;  
I'm very well acquainted, too, with matters mathematical,  
I understand equations, both the simple and quadratical,  
About binomial theorem I'm teeming with a lot o' news,  
With many cheerful facts about the square of the hypotenuse!

- Gilbert & Sullivan  $P \circ P$