MANY CHEERFUL FACTS

presents

What Everyone Should Know About Inner Products

a talk by Dave Penneys

12:10–13:00 on Wednesday, March 19, in Evans 1015.

If I had to pick a favorite function, it would be an inner product. Actually, it might be the trace on a II_1 factor, but if I gave a talk about that, not many people would show up. Plus, the trace gives an inner product, but that's not on the quiz at the end, so you don't have to know that.

We will briefly discuss the merits of an inner product, e.g. it gives a norm in which balls are round, and it gives a canonical identification of H with H^*. We will then solve the fundamental problem of the inner product: is it linear on the left or on the right? (In case you were wondering, the answer is: "it should depend on the following notation:

$$\langle x, y\rangle = \langle y|x\rangle$$

where the left one is linear on the left, and the right one is linear on the right." Now you don't even have to show up!) The solution will segway nicely into a discussion on Dirac notation, which will ultimately meander into the world of C^*-valued inner products. Actually, we won't be meandering whatsoever since I will have led us there all along.

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, $P \circ P$

The website for Many Cheerful Facts is
`http://math.berkeley.edu/~mcf/`