

# Many Cheerful Facts

Organizers: Yael Degany & Jason Ferguson

Friday, 2:00pm–3:00pm, 939 Evans
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Feb. 19      **Michael Pejic**, UC Berkeley

## *Freaky Fractional Derivatives*

We are all familiar with the Leibniz notation for repeated differentiation:  $\frac{df}{dx}$ ,  $\frac{d^2f}{dx^2}$ ,  $\frac{d^3f}{dx^3}$ , and so on.

However, can any meaning be ascribed to the symbols  $\frac{d^{\frac{1}{2}}f}{dx^{\frac{1}{2}}}$  or even  $\frac{d^{.2+.3i}f}{dx^{.2+.3i}}$ ? I would like to convince you that not only is the answer a qualified yes, but also that the concept actually has practical applications.

I am assuming knowledge of basic calculus and complex analysis (contour integrals and the like).

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.  
I'm very good at integral and differential calculus;  
I know the scientific names of beings animalculous:  
In short, in matters vegetable, animal, and mineral,  
I am the very model of a modern Major-General.