Nonabelian multiplicative integration on curves is a classical theory, going back to Volterra in the 19th century. In differential geometry this operation can be interpreted as the holonomy of a connection along a curve. In probability theory this is a continuous-time Markov process.

This talk is about the 2-dimensional case. A rudimentary nonabelian multiplicative integration on surfaces was introduced in the 1920's by Schlesinger, but it is not widely known.

I will present a more sophisticated construction, in which there is a Lie group H, together with an action on it by another Lie group G. The multiplicative integral is an element of H, and it is the limit of Riemann products. Each Riemann product involves a fractal decomposition of the surface into kites (triangles with strings). There a twisting of the integrand, that comes from a 1-dimensional multiplicative integral along the strings, with values in the group G.

My main result is a 3-dimensional nonabelian Stokes Theorem. This result is new; only a special case of it was predicted (without proof) in papers in mathematical physics.

The motivation for my work was a problem in twisted deformation quantization. It is related to algebraic geometry (the structure of gerbes), algebraic topology (nerves of 2-groupoids), and mathematical physics (nonabelian gauge theory). I will say a few words about these relations at the end of the talk.

The talk itself is a computer presentation with numerous color pictures. I recommend printing a copy of the notes before the talk, from the link below. The talk should be accessible to a wide mathematical audience.