1046-92-1079 **Andrew Gillette*** (agillette@math.utexas.edu), Department of Mathematics, 1 University Station C1200, Austin, TX 78712, and **Chandrajit Bajaj** (bajaj@cs.utexas.edu). *Applications of the Hodge Decomposition to Biological Structure and Function Modeling.* Preliminary report.

The Helmholtz decomposition ensures that a sufficiently smooth vector field can be written uniquely as the sum of a curl-free component, a divergence-free component and a harmonic component. The Hodge decomposition generalizes this result to differential forms and relates closely to solutions of Poisson's equation over the underlying space. Recent work has examined how these decompositions relate to singularities of vector fields for various types of flow. In this preliminary report, we will discuss why these results are relevant to biological structure and function modeling, especially in the context of electromagnetic forces between molecules. (Received September 16, 2008)