1049-54-125 **R Varela*** (rocco.varela@gmail.com), Department of Computer Science, 1600 Holloway Ave., TH 906, San Francisco, CA 94132, **K Hinson** (kehinson@uncc.edu), Mathematics and Statistics Fretwell 376, 9201 University City Blvd., Charlotte, NC 28223, **J Arsuaga** (jarsuaga@math.sfsu.edu), Department of Mathematics, 1600 Holloway Ave., TH937, San Francisco, CA 94132, and **Y Diao** (YuananDiao@uncc.edu), Mathematics and Statistics Fretwell 376, 9201 University City Blvd., Charlotte, NC 28223. *A fast ergodic algorithm for generating ensembles of equilateral random polygons.*

Knotted structures are commonly found in circular DNA and along the backbone of certain proteins. In order to properly estimate properties of these three-dimensional structures it is often necessary to generate large ensembles of simulated closed chains (i.e. polygons) of equal edge lengths (such polygons are called equilateral random polygons). Finding efficient algorithms that properly sample the space of equilateral random polygons is a difficult problem. We have developed a method that generates equilateral random polygons in a 'step-wise uniform' way. We have proven that this method is ergodic in the sense that any given equilateral random polygon can be generated by this method and we can demonstrate the time needed to generate an equilateral random polygon of length n is linear in terms of n. These two properties provide very significant improvements over existing generating methods. (Received February 28, 2009)