

Abstract:

FINITE DIMENSION: a Mathematical Tool to Analyse Glycans

Juan M. Alonso*

Finite dimension, denoted dim_f , is a recently introduced adaptation to finite sets of the classical Hausdorff (or “fractal”) dimension. It can be used to analyse glycans —the application discussed here— and, in work in progress, to study the ontogenesis of plants and of roots. An important reason behind the definition of dim_f is the increasing importance of finite sets in modelling natural, technological or social phenomena, as well as the ubiquity of computers in modern life and science, computers that can only deal with finite sets.

Our research was motivated by basic questions about glycan structure: Are (the graphs of) glycans special in some way? Are they different from general chemical graphs? If so, in which way? Are glycans that appear *exclusively* in Bacteria and those that appear *exclusively* in Eukaryota, significantly different? To answer these, we considered a large sample of glycans and stripped them of all information, except for the underlying mathematical graph. When considered as mathematical graphs, glycans can be described as trees —branched or linear— and, less frequently, cyclic graphs. We then used dim_f to map the sample to *Glycan Space*, a certain subset of the plane. This map answers the questions above and raises new, interesting questions of biochemical relevance.

* joint work with Agustina Arroyuelo, Pablo J. Garay, Osvaldo A. Martin, and Jorge A. Vila, researchers at IMASL-CONICET, Universidad Nacional de San Luis.

Biography:

Juan M. Alonso obtained his MA from Cornell University (USA) and his PhD from the University of Stockholm (Sweden), both degrees in mathematics. He is a professor at Universidad Nacional de San Luis (also of Universidad Nacional de Cuyo), Department of Mathematics, and a researcher of BIOS (Structural Bioinformatics Group) at IMASL (Instituto de Matemática Aplicada de San Luis). He has published more than 35 papers in reputed journals.