1163-92-659 **Javier Arsuaga***, Department of Molecular and Cellular Biology, Department of Mathematics, On Shields Avenue, Davis, CA 95616. *Mathematical analysis of DNA packing in bacterial viruses.*

Bacterial viruses pack their genome in a small protein structure called capsid. Inside the capsid the dsDNA molecule is found at a concentration of 200 mg/ml-800mg/ml and an osmotic pressure of 60 atmospheres. How DNA organizes under these extreme conditions remains to be understood.

In this talk I will present results from three different mathematical approaches to study the problem of dsDNA packing in bacteriophages. The first approach complements the cryoEM observations and uses the formation of knots inside viral capsids as a probe for DNA packing. These results suggest that DNA knots are highly likely upon confinement and that the DNA molecule is chirally organized inside the viral capsid. The second approach aims at identifying the possible sources of the chiral organization of the genome and employs methods from random knotting and brownian dynamics. Our third approach uses continuum mechanics models to describe cryoEM observations as the minima of a liquid crystalline phase. The emergent picture of these approaches suggest that DNA is in a chirally organized liquid crystalline phase in which knots may be the product of liquid crystal defects. (Received September 11, 2020)