Phenomena surrounding and arising from the topological features of nucleic acids and the metric geometry of proteins form the basis of many fundamental questions in molecular biology. The tools of low-dimensional topology and knot theory have been highly visible in providing descriptions of phenomena associated with supercoiling, knotting, and catenation in DNA and RNA strands. Many other challenges in biology demand the qualitative tools that topology provides. Questions in protein structure determination and structural biology require deciphering the connection between local geometric properties and global topological features such as folding patterns. Furthermore, there has been recent fascinating work on understanding the broader biological impact and consequences of topological features of macromolecules. At a higher level of abstraction, there is a developing body of work on applying topological ideas to the study of the properties of gene regulation networks and protein interaction graphs, much of which implicates topological methods. The mathematics of genomic data is under intense development that would benefit from qualitative, robust tools.

Although there has been rapid uptake of certain topological ideas in the biological community (for instance the work on linking numbers and writhe in DNA strands), an increase in the breadth and depth of this interaction necessitates a mixing of research communities that this workshop will provide.

Speakers:

Dorothy Buck (Imperial College London)
Zhe (Sage) Chen (Massachusetts Institute of Technology)
Carina Curto (University of Nebraska)
Yuri Dabaghian (Rice University)
Steven Neil Evans (University of California, Berkeley)
Erica Flapan (Pomona College)
Tomas Gedeon (Montana State University)
John L. Harer (Duke University)
Susan Holmes (Stanford University)
Steve Horvath (University of California, Los Angeles)
Hiroshi Kokubu (Kyoto University)

Pek Lum (Ayasdi, Inc.)
Julia C. Mitchell (University of Wisconsin, Madison)
Monica Nicolau (Stanford University)
Henri Orland (Commissariat à l’Énergie Atomique Saclay [CEA])
Xavier Pennec (Institut National de Recherche en Informatique Automatique [INRIA])
Raul Rabadan (Columbia University)
Christian M. Reidys (University of Southern Denmark)
Alexander Vologodskii (New York University)
Yusu Wang (The Ohio State University)
Guowei Wei (Michigan State University)