

Mathematics Department Colloquium

Organizer: John Strain

Thursday, 4:10–5:00pm, 60 Evans

Nov 2 **Franziska Michor**, Harvard

The mathematics of cancer therapy

Evolutionary concepts such as mutation and selection can best be described when formulated as mathematical equations. Cancer arises as a consequence of somatic evolution. Therefore, a mathematical approach can be used to understand the process of cancer initiation, progression and treatment. I will discuss a mathematical analysis of chronic myeloid leukemia (CML) during therapy with the chemotherapeutic agent Gleevec. CML is caused by an abnormal chromosome called the Philadelphia chromosome. Gleevec therapy leads to a bi-phasic exponential decline of the leukemic cell burden. I design a mathematical model based on ODEs and use clinical data of treatment responses to estimate parameter values of the leukemic differentiation hierarchy. I find that leukemic stem cells cannot be depleted by therapy and hence Gleevec cannot cure the disease. Then I use stochastic processes to calculate the probability that resistance against Gleevec emerges. Finally I develop a model of blast crisis CML and discuss the implications of my findings for future treatment options.