

## Fluctuations in growth processes

Why do cells always split in two? And not three or four? Why do humans rarely give birth to more than 10 children over their lifetimes, whereas salmon may lay a million eggs? These questions are broad enough to try out a very simple model. Ingredients should be multiplicative growth (like cell division) and a bit of randomness (we don't know which egg may survive). An important model is geometric Brownian motion (GBM) because other, more complex, models converge to it in the appropriate limit. In GBM fluctuations reduce growth, and strategies to reduce fluctuations are beneficial. Many such strategies involve cooperation: through pooling and sharing resources fluctuations can be diminished and growth accelerated. Does this mean that big things grow at higher exponential growth rates? Interestingly, this echoes findings from the literature on wealth inequality – once someone has become wealthy, it has been reported, he tends to experience higher exponential growth rates. This project will be about variations of GBM that exhibit these aspects. It will combine some mathematics of stochastic processes with applications in biology and welfare economics.