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Master Equation Approach to Protein Assembly – Degradation of Protein Aggregates GEORG MEISL, University of Cambridge — Protein aggregation is dependent on several microscopic processes such as nucleation, elongation and fragmentation of aggregates. Applying simple chemical kinetics to these processes allows one to derive master equations describing the entire system. In almost all cases they take the form of highly non-linear coupled differential equations for which no exact analytical solutions can be derived. Nonetheless an analytical description of the problem is absolutely essential to determine the relative importance of different microscopic processes and develop a rational approach to finding cures. Using a self consistent approach, my group has recently made headway in finding approximate analytical solutions for several systems and successfully applied them to explain a wide range of experimental observations (Knowles et al., Science 326, 1533 (2009)). I have generalised this description to include degradation of aggregates by various cellular processes. These degradation processes are thought to play an important role in vivo in determining when aggregation speed becomes critical and leads to disease.

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