Scientific disciplines generate data. Much of the time that data offers clues to the generative mechanisms behind it, if only we could untangle them. This is especially the case with data generated in the life sciences which is often very noisy, has missing components and very little prior knowledge exists to explain its generation. One powerful approach lies in the belief that the observed data may be explained via a set of unknown latent variables. The number and form of these variables is typically not known and is to be inferred from the data.

This talk explores the development of such latent variable models and explores their applications to a range of problems. It will discuss inference from a Bayesian perspective with emphasis on real-world use of Bayesian inference. Case examples will look at application domains from bird navigation studies, analysis of brain activity and more. Emphasis will be placed on the choice of priors and on the important issues of model selection and structure determination.