The classical sampling and reconstruction problem consists of recovering a function f from its samples $f(X) = \{f(x_j)\}_{x_j \in X}$. There are many situations in which the function f is an initial distribution that is evolving in time under the action of a family of evolution operators $\{A_t\}_{t \in [0, \infty)}$:

$$f_t(x) = (A_t f)(x).$$

The current approaches to solving the reconstruction problem, however, are not designed to take into account this time dependency. Together with A. Aldroubi and J. Davis we explore new approaches that incorporate the additional temporal information. In particular, we study the conditions for lossless trade-off between spacial and temporal samples and design algorithms for recovering the initial distribution f and the evolution operators A_t. In the talk I will discuss the simplest instances of the dynamical sampling problem based primarily on linear algebra.