We have argued that time plays a unique role in quantum mechanics. It is unlike other observables and one cannot naively assume it to be measurable. We have examined a number of different types of measurements of the time of an event, including measurements hich involve continual monitoring of the system, coupling to physical clocks, not need to agree. In particular, at high accuracy, continuous measurements give rise to entirely different behavior – the particle never arrives. The time-of-arrival on the other hand, can be measured to any accuracy.

system must satisfy constraints hich are equivalent to reparametrization of the time variable.

The situation is some hat analogous to being inside a box, and having some external observer eigh the box ith high accuracy [40]. In order to keep the box at this fixed eight, the external experimenter cannot measure observables hich evolve in time. Quantum mechanics also dictates that the observer ill see people inside the box in a superposition of many different ages. This is because observables hich ould allo one to infer the time are (in a sense) conjugate to energy (they can't be exactly conjugate to the energy as e learned in Chapter 4). This gives us a rather interesting ay to perform the Schrödinger cat experiment [41] (see the Figure at the beginning of this Chapter). Take an animal (Schrödinger's poodle, for example), stick her in a box, and eigh the box accurately. If the box is sufficiently isolated from the environment (a very difficult task), the poor poodle ill be in a superposition of herself at different stages of her life. If e eigh the box very accurately, and later look at the age of the poodle, e ill