The quasiparticle concept is the foundation of our understanding of the dynamics of quantum many-body systems. It originated in the theory of metals, which have electron-like quasiparticles, but it is also useful in more exotic states like those found in fractional quantum Hall systems. However, many modern materials exhibit a `strange metal' phase to which the quasiparticle picture does not apply, and developing its theory remains one of the important challenges in condensed matter physics. I will describe the simplest known quantum many-body models without quasiparticle excitations. Some of these models have a dual description as black holes in a curved spacetime with an emergent spatial direction, and the black hole mapping has proved useful in understanding some experiments.