The atomic structure of the Au 6 x 6 on Si(111) phase has been determined using direct methods and surface X-ray diffraction data. This surface structure is very complicated, with 14 independent gold atoms, relaxations in 24 independent silicon sites and three partially occupied gold sites. In one sense the structure can be described as microdomains of the parent root 3 x root 3 Au on Si(111) structure. A better description is in terms of a tiling of incomplete pentagonal and trimer units, essentially a pseudopentagonal glass. In terms of these structural units it appears possible to explain all the gold structures in the coverage range of 0.8-1.5 monolayers as pseudoglasses with strong short range order but varying degrees of long range order.